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11.212.01

February 13, 2017

VIA EMAIL AND FEDEX

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Re: Comments of Backcountry Against Dumps and Donna Tisdale on the Comprehensive Renewable Energy Plan ("CREP") Phase I Report and Recommendations for Phase II

Dear Chair Jacob and Honorable Members of the Board:

On behalf of Backcountry Against Dumps and Donna Tisdale (collectively, "Backcountry"), we submit the following comments[1] on the Phase I Draft Report ("Report") and Executive Summary Report ("Executive Summary")[2] for San Diego County's ("County's") proposed Comprehensive Renewable Energy Plan ("CREP") and recommendations for Phase II. Backcountry encourages the County to take a three-pronged approach: (1) maintain limits on

[1] Please also include in the public record Backcountry's comments on CREP that were submitted to the Planning Commission on October 12, 2016 for its October 14 hearing. Those comments were omitted from the public input section of both the Planning Commission Staff Report for the October 14 hearing and from the County Staff's Land Use Agenda Item Report concerning CREP prepared for the Board of Supervisors' February 15, 2017 hearing. The Land Use Agenda Item Report also omits any mention of the 54 letters that the County Planning Commission received from the Boulevard/Jacumba communities opposing any energy overlay zone and large-scale energy projects in their communities, but supporting point-of-use generation and other alternatives.

[2] San Diego County, September 2016, Phase I Comprehensive Renewable Energy Plan Executive Summary Report, prepared by Ascent Environmental (attached hereto as Exhibit 1).

large-scale renewable energy projects and protect the County's unique backcountry ecosystems and cultural heritage from industrial despoilment, (2) promote and improve distributed renewable energy resources, such as roof-top solar, and (3) continue to study the health and environmental impacts of renewable energy generation and transmission.

I. Maintain Limits on Large-Scale Renewable Energy Projects

The County has already removed too many of the regulatory protections against overdevelopment of the County's backcountry. It's time to draw a line and halt the further industrialization of the County's backcountry backbone. Yet the County Planning Commission and staff now propose the opposite.

Best management practice ("BMP") 10, identified in the Report and Executive Summary and recommended (recommendation #4) by the Planning Commission and staff, calls for creating an "overlay zone that provides a streamlining mechanism" for the permit and environmental review processes.[3] This would almost certainly encourage development of more large-scale renewable energy projects, unless restricted to distributed generation facilities. As the Executive Summary boasts, a "renewable energy overlay zone can save the developer and the government money by reducing planning process time and providing more certainty to investors. It also indicates to investors that the County wants to develop renewable energy resources in specific locations in the County" (Executive Summary, p. 34).

Backcountry staunchly opposes this outcome, as do countless backcountry residents whose communities and environments are being torn asunder by the proliferation of industrial-scale electrical generation and transmission facilities. At both the September 13, 2016 Boulevard public workshop and the September 26, 2016 Campo Lake Morena Community Planning Group meeting and in comments submitted to the County thereafter, residents voiced "strong opposition to an overlay zone (BMP #10)" and concern that "an overlay zone would result in releases of greenhouse gas emissions and cause a disproportionate share of energy costs to the backcountry of San Diego County" (Hearing Report, p. 14).

The Board should not ignore the backcountry residents' justified concerns. Inviting more massive developments to the area would foist an even larger burden on those communities and ecosystems than they already suffer as a result of the County's 2013 loosening of the restrictions on East County wind energy development via the Wind Energy Ordinance, and its approval of multiple large-scale renewable energy projects in the area.

The Boulevard and Jacumba area already houses the 25-turbine, 50-megawatt Kumeyaay Wind Project, the 150-foot-tall, 500-kilovolt Sunrise Powerlink and Southwest Powerlink

[3] San Diego County Planning Commission, October 14, 2016, Hearing Report for the Comprehensive Renewable Energy Plan Phase I Report, p. 19 ("Hearing Report") (attached hereto as Exhibit 2),

transmission lines, the East County Substation and the Energia Sierra Juarez gen-tie line, which imports electricity from the landscape-dominating ESJ Wind Project just across the border in Mexico. Soon to be added to those projects is the monstrous 12,000-plus-acre, nearly-200-megawatt Tule Wind Project, with more than 65 wind turbines, which will join the Sunrise Powerlink in defiling the once-pristine and still ruggedly scenic and ecologically robust McCain Valley. The County has also approved 160 megawatts of industrial-scale solar developments in the backcountry, including the Rugged Solar (765 acres), Tierra del Sol (420 acres) and Jacumba Solar (300+ acres) projects. And that's to say nothing of the massive Ocotillo Wind Energy Facility just over the Imperial County border to the East, and the slew of large-scale solar projects metastasizing across southern Imperial County. Figure 1-9 from the April 2016 Jacumba Solar Project Draft Environmental Impact Report (attached hereto as Exhibit 3) depicts many of these projects and the vast acreage they consume in the backcountry region and environs. The County should spare its backcountry from further electrical industrialization.

But even without a renewable energy overlay encouraging yet more large-scale projects in the area, the Wind Energy Ordinance and related amendments the Board adopted in May 2013 are likely to spur more industrial development in the backcountry.[4] Among other things, the Ordinance and General Plan amendments concentrated large-scale wind energy project development almost solely within the Boulevard and Jacumba region, as shown in the Wind Resources Map adopted along with the Ordinance.[5] In addition, the Board's actions eliminated blade swept area and turbine height restrictions, and reduced the minimum setbacks required for large wind turbines, and allowed electricity generated by the turbines to be exported off site (Exhibit 4). They also removed blade swept area restrictions, increased allowable height and reduced minimum setbacks for small wind turbines, all while allowing more turbines per parcel and eliminating the discretionary permit requirement that had previously applied to some turbines (Exhibit 4).

Going even further, the Board eliminated the community-designed and drafted prohibitions on large wind turbines in the Boulevard Chapter of the Mountain Empire Subregional Plan (Exhibit 4). Similarly, the Board eviscerated the Borrego Springs Community Plan's prohibition on wind turbine projects in "areas where viewsheds would be adversely impacted" by allowing ministerial permitting of small turbines in those sensitive areas.[6]

Now the County threatens to make renewable energy project permitting even easier, at a

[4] May 8, 2013 San Diego County Staff Report to the Board on the Wind Energy Ordinance ("Wind Energy Ordinance Report") (attached hereto as Exhibit 4) which describes the Ordinance and related General Plan amendments in detail.

[5] Wind Resources Map, Wind Energy Ordinance Report, Appendix E (attached hereto as Exhibit 5).

[6] Resolution Approving GPA 12-003, Wind Energy Ordinance Report, Appendix D, p. 105 (attached hereto as Exhibit 6).

high risk of environmental, social and health impacts. As Backcountry has detailed many times over the years, these impacts include significant harm to wildlife, especially birds – like golden eagles – and bats,[7] safety risks to workers, nearby residents and passersby from wind turbine blade throw, turbine collapse and fires, stress and health risks due to wind turbine, transmission line and substation noise and electromagnetic frequency emissions,[8] groundwater depletion, and destruction of once scenic vistas.

Incredibly, in comparing the costs and benefits of the overlay zone, the Report and Executive Summary do not even consider the unequal environmental, social and health impacts that the backcountry has already suffered from this electrical industrialization, and which an overlay zone would exacerbate. The sole listed "Disadvantages" are "Staff time and Resources" and "High Start-Up Costs" (Executive Summary, p. 34). That claim is demonstrably false. The adverse impacts to wildlife, scenery, groundwater, wildfire risk and human health and safety are both significant and well-documented.

The Board should remove the overlay zone option (BMP #10) from consideration. But if it proceeds to study it in more depth, the County must analyze and compare the *full* range of social, environmental and economic costs and benefits.

While Backcountry opposes BMP #10, the CREP Report proposes numerous other BMPs that will promote distributed renewable energy generation, which Backcountry supports. Those BMPs are discussed below.

II. Promote Expansion of Distributed Renewable Energy Generation

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[7] *See* Johann Köppel (Ed.), 2017, *Wind Energy and Wildlife Interactions: Presentations from the CWW2015 Conference*, Springer; Gregory Johnson *et al.*, 2003, "Mortality of Bats at a Large-scale Wind Power Development at Buffalo Ridge, Minnesota," *Am. Midl. Nat.* 150:332-342 (attached hereto as Exhibit 7); Ren Lohoefener, August 1, 2014, Letter to Amy Parsons (attached hereto as Exhibit 8); explaining, among other things, that the U.S. Fish & Wildlife Service "characterize[s] the entire Tule Wind Project as a Category 1 – High Risk Project because it poses a high risk to eagles and the potential to avoid or mitigate impacts is low").

[8] *See* Michael Nissenbaum *et al.*, 2011, "Adverse health effects of industrial wind turbines: a preliminary report," in proceedings of 10th International Congress on Noise as a Pubic Health Problem, London, UK, July 24-28, 2011 (attached hereto as Exhibit 9); Eja Pedersen, 2011, "Health aspects associated with wind turbine noise—Results from three field studies," *Noise Control Engineering* 59(1):47-53 (attached hereto as Exhibit 10); Daniel Shepherd *et al.*, 2011, "Evaluating the impact of wind turbine noise on health-related quality of life," *Noise & Health* 13(54):333-339 (available at: http://www.noiseandhealth.org/printarticle.asp?issn=1463-1741;year=2011;volume=13;issue=54;spage=333;epage=339;aulast=Shepherd).

The second prong – expansion of distributed renewable energy generation – is needed to prevent overdevelopment while simultaneously providing renewable energy to the County. As discussed above, the County has removed too many regulatory protections against large-scale industrial overdevelopment, sacrificing the habitat of its wildlife and jeopardizing the health and safety of its residents in the process. By promoting the expansion of distributed renewable energy generation, the County will both meet its goals of providing sufficient renewable energy while also ensuring that the environment and its residents' health and safety are protected.

The CREP Report proposes BMPs that would promote the expansion of distributed renewable energy generation. Those BMPs, with a few minor changes, should be implemented in Phase II to encourage the growth of distributed generation throughout the County.

For example, BMP 3 (Establish Institutional Capacity (Staff Recommendation #1)) calls for the establishment of institutional capacity through the formation of Community Choice Aggregation ("CCA") programs, Direct Access ("DA") programs, or Sustainable Energy Utilities ("SEUs"). All of these options will encourage the expansion of renewable energy resources, yet the County Staff's February 15 Report limits its consideration to CCAs and DAs. However, the County should focus its efforts on SEUs as well. SEUs provide energy efficiency, energy conservation and customer-sited renewable energy to end users, just like traditional utilities provide gas and electricity to their customers. However, SEUs utilize a much more comprehensive approach to energy production which is ultimately aimed at "help[ing] residents and business use less energy and generate their own clean energy."[9] Furthermore, SEUs are "publicly accountable and can be financially self-sufficient." Exhibit 11 at 2. As such, an SEU would help increase distributed generation in the County at a reasonable cost while still maintaining accountability. This can be seen, for example, in Marin Clean Energy, California's first community choice aggregation program which also provides renewable energy for thousands of residents in the counties of Marin and Napa and the cities of Richmond, Benicia, El Cerrito, San Pablo, Walnut Creek and Lafayette.

Similarly, BMP 4 (Establish Financing Capacity (Staff Recommendation #7)) would also promote the expansion of distributed renewable energy generation by providing increased financing capacity. Expanding distributed generation financing options, especially for residents, would help increase distributed generation in the County. Additional finance capacity for research and development of sustainable energy technologies is imperative to an environmentally-friendly, sustainable future for the residents of San Diego County.

BMP 7 (Increase the County's Percentage of Energy Derived From Various Renewable Energy Technologies (Staff Recommendation #5)) directly addresses the County's need for increased renewable energy resources by demanding an increase in the percentage of the

[9] Houck, J., Rickerson, W, April 2009, "The Sustainable Energy Utility (SEU) Model for Energy Service Delivery," *Bulletin of Science, Technology & Society*, vol. 29, no. 2, 96, (attached hereto as Exhibit 11).

County's energy that is derived from renewable resources. An increase in renewable energy technologies will help the County move away from its unnecessary reliance on traditional, non-renewable energy sources. However, in implementing this BMP the County should focus on *distributed* renewable energy sources. Any increase in the County's percentage of energy derived from renewable technology must be accomplished in ways that protect the environment, such as distributed generation. We cannot have a productive economy unless it is coupled with environmental health and safety for San Diego residents.

BMP 8 (Establish a Renewable Energy Group Procurement Initiative (not included in the Staff Recommendation)) will similarly encourage distributed energy generation production by allowing groups of individuals, residents, and business to work together to procure the needed infrastructure for distributed generation. A Renewable Energy Group Procurement Initiative will be both economically and environmentally beneficial, especially for rooftop solar panels and other infrastructure needed for distributed energy generation. By establishing a Group Procurement Initiative the County will lead the way by example, potentially reducing the cost of distributed generation infrastructure for both the County and its residents.

As discussed above, BMP 14 (Start a Community Solar Initiative (Staff Recommendation #2 considers both solar *and* wind initiatives under the label of BMP #14)) would help promote distributed renewable generation if the community initiative were limited to small-scale and distributed generation projects. A community solar initiative should not be used to develop more industrial-scale projects that will further degrade the environment and endanger the health and safety of the County's residents. However, community initiatives would benefit the County and its residents when utilized to promote distributed generation technologies.

BMP 16 (Establish Electric Vehicle and Charging Programs (Staff Recommendation #6)) will also aid in the expansion of distributed renewable energy generation through the promotion of electric vehicle use throughout the County. Incorporation of electric vehicles and charging programs into the County's fleet of vehicles is both economically and environmentally beneficial. Furthermore, such a program could aid in expansion of e-vehicle facilities and financing to backcountry, East County and other residents distant from urban hubs.

Lastly, BMP 17 (Develop Legislative Strategy to Support Renewable Energy Programs (Staff Recommendation #9)) will also promote expansion of distributed generation technologies, especially if the legislative strategy that is developed focuses on increasing the cap on net energy metering credits used to meet RPS. Any strategy should be specifically tailored to ensure the promotion of *distributed* renewable energy technology that will benefit both the environment and the residents of San Diego.

These BMPs, along with those discussed below, will encourage the expansion of distributed renewable energy generation, and therefore protect the environment and the residents of San Diego County.

III. Continue to Study the Health and Environmental Impacts of Renewable Energy Generation and Transmission

Similarly, those BMPs proposed to expand education and information about renewable energy generation and transmission in San Diego County should be studied in Phase II. Education and research are imperative to a thorough, economically viable, and environmentally friendly energy policy. Continued studies into the health and environmental impacts of renewable energy generation and transmission will help the sector grow in the safest, least harmful and most efficient and reliable means possible.

Furthermore, the County has already committed itself to continuing this type of research and education. Indeed, the County made a promise to regularly review and report on the literature on the health impacts of wind energy generation and transmission. On July 20, 2012, the Planning Commission approved the Wind Energy Ordinance Amendment Project with the condition that the County "[r]eport back to the Planning Commission in three years with a literature review of the most current research regarding human health effects from wind turbine."[10] Then, as part of its May 15, 2013 Board approval of the Wind Energy Ordinance, the Board instructed the "Chief Administrative Officer to return to the Board annually with a report on the implications of [the] Ordinance."[11] And as the County's Deputy Public Health Officer concluded in his "Memorandum for the Record" dated that same day, "*[m]ore research on this topic is necessary* to enlighten the scientific, medical, and legal communities, as well as the public."[12]

In order to continue to encourage this vitally important research and education, to which the County has already committed for other related projects, the following BMPs should be implemented:

- BMP 2 (Establish a New Office of Sustainability (Staff Recommendation #10)) which would provide for a more comprehensive approach to promoting renewable energy by centralizing the County's sustainability efforts. While there are costs associated with this BMP, that should not prevent the County from doing all that it can to promote sustainability and the wise utilization of renewable resources. Indeed, the County could dedicate funding and/or staff to studying the environmental and health impacts of renewable energy development, allowing the County to both conduct research and thereby educate itself and its residents while simultaneously meeting its previous commitments to

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[10] Summary of Planning Commission Hearing/Workshop for the Wind Energy Ordinance Amendment Project, POD10-007 (attached hereto as Exhibit 12).

[11] San Diego County Board of Supervisors, May 15, 2013, Minute Order No. 8, Wind Energy Zoning Ordinance Amendment, POD 10-007, p. 19 (attached hereto as Exhibit 13).

[12] Eric McDonald (Deputy Public Health Officer), San Diego County Health and Human Services Agency, May 13, 2013, Memorandum for the Record #2, Wind Energy Zoning Ordinance Amendment, POD 10-007, p. 1 (attached hereto as Exhibit 14).

study wind turbine health impacts.

- BMP 9 (Participate in the Creation of a New Regional Energy Network (Staff Recommendation #11)) will also aid in continuing the County's education and research into renewable technology. Regional coordination across San Diego County to encourage energy efficiency is an important part of promoting renewable resources.
- BMP 11 (Develop a Building Energy Disclosure Program (not included in the Staff Recommendation)) would also facilitate continued research and education about renewable energy sources and transmission through a market-based mechanism to encourage both building-specific and project-level energy efficiency in the County. One of the first steps to energy efficiency is determining the types and amounts of energy currently used and identifying opportunities to reduce consumption and emissions. A Building Energy Disclosure Program would allow the County to better understand its current energy usage and thereby educate itself and its residents on ways to increase efficiency. For example, in December 2015 the City of Berkeley, California adopted the Berkeley Energy Saving Ordinance ("BESO") which requires building owners to complete energy efficiency opportunity assessments and publicly report the building's energy efficiency information with the goal of helping building owners save energy and motivating them to participate in whole-building energy efficiency programs. The assessments are conducted by registered energy assessors who provide tailored recommendations on how to save energy and link building owners to incentives for energy efficiency upgrade projects. Furthermore, costs associated with creating this information collection system would likely be offset by energy production savings and environmental benefits that would result from the information obtained.
- BMP 13 (Increase Renewable Energy Education and Outreach (Staff Recommendation #8)) will allow community members to remain informed and involved with the County's renewable energy planning process. Greater public outreach will help ensure that the County is aware of residents' concerns and ideas, and will provide County residents with the opportunity to do their own research and education where necessary.

Research, studies, and education are crucial to the County's energy efficiency efforts and therefore, the BMPs identified above should be implemented in Phase II as well as Phase III of the Plan.

IV. Review All Future Phase II Actions under CEQA

As both the February 15, 2017 Board Letter for Agenda Item Number 1 (Comprehensive Renewable Energy Plan Phase I Report) and the October 14, 2016 San Diego County Planning Commission Hearing Report state, the Board's actions in reviewing the Phase I Report and County staff's recommendations thereon are limited to directing further study of potential future actions. However, before the Board or other County body may approve and implement those future actions identified in Phase II, they must thoroughly review the actions under the California Environmental Quality Act ("CEQA"), Public Resources Code section 21000 *et seq.*, and other relevant planning, zoning and environmental review laws. As the Planning Commission acknowledges, "All recommendations identified under Phase II of the work plan *will be reviewed under CEQA* and will be presented to the Board for consideration." October 14, 2016 San Diego County Planning Commission Hearing Report at 21 (emphasis added).

Thank you for considering our comments on this important matter.

Very truly yours,

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EXHIBIT LIST

Exhibit 1: San Diego County, September 2016, Phase I Comprehensive Renewable Energy Plan Executive Summary Report, prepared by Ascent Environmental

Exhibit 2: San Diego County Planning Commission, October 14, 2016, Hearing Report for the Comprehensive Renewable Energy Plan Phase I Report

Exhibit 3: Figure 1-9 from the April 2016 Jacumba Solar Project Draft Environmental Impact Report

Exhibit 4: May 8, 2013 San Diego County Staff Report to the Board on the Wind Energy Ordinance

Exhibit 5: Wind Resources Map, Wind Energy Ordinance Report, Appendix E

Exhibit 6: Resolution Approving GPA 12-003, Wind Energy Ordinance Report, Appendix D

Exhibit 7: Gregory Johnson *et al.*, 2003, "Mortality of Bats at a Large-scale Wind Power Development at Buffalo Ridge, Minnesota," *Am. Midl. Nat.* 150:332-342

Exhibit 8: Ren Lohoefener, August 1, 2014, Letter to Amy Parsons

Exhibit 9: Michael Nissenbaum *et al.*, 2011, "Adverse health effects of industrial wind turbines: a preliminary report," in proceedings of 10th International Congress on Noise as a Pubic Health Problem, London, UK, July 24-28, 2011

Exhibit 10: Eja Pedersen, 2011, "Health aspects associated with wind turbine noise—Results from three field studies," *Noise Control Engineering* 59(1):47-53

Exhibit 11: Houck, J., Rickerson, W, April 2009, "The Sustainable Energy Utility (SEU) Model for Energy Service Delivery," *Bulletin of Science, Technology & Society*, vol. 29, no. 2

Exhibit 12: Summary of Planning Commission Hearing/Workshop for the Wind Energy Ordinance Amendment Project, POD10-007

Exhibit 13: San Diego County Board of Supervisors, May 15, 2013, Minute Order No. 8, Wind Energy Zoning Ordinance Amendment, POD 10-007

Exhibit 14: Eric McDonald (Deputy Public Health Officer), San Diego County Health and Human Services Agency, May 13, 2013, Memorandum for the Record #2, Wind Energy Zoning Ordinance Amendment, POD 10-007

EXHIBIT
1

ASCENT
ENVIRONMENTAL

Phase I Comprehensive Renewable Energy Plan Executive Summary Report

September 2016

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County of San Diego Planning & Development Services

Phase I Comprehensive Renewable Energy Plan

Executive Summary Report

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ACRONYMS AND ABBREVIATIONS

AFV	Alternative fuel vehicle
ARB	California Air Resources Board
BMP	Best management practices
Board	County of San Diego Board of Supervisors
CALGreen	California Green Building Standards
CAP	Climate Action Plan
CCA	Consumer Choice Aggregation
CEC	California Energy Commission
CO_2	Carbon dioxide
County	County of San Diego
CREB	Clean Renewable Energy Bond
CREP	Phase I Comprehensive Renewable Energy Plan
DA	Direct Access
DOE	Department of Energy
DRECP	Desert Renewable Energy Conservation Plan
EAP	Energy Assurance Plan
ECR	Enhanced Community Renewables
Empower Report	Phase I Comprehensive Renewable Energy Plan Report
EPAct	Energy Policy Act of 1992
EPAct 2005	Energy Policy Act of 2005
ESP	Electric service provider
ESCo	Energy Service Company
EVSE	EV supply equipment
FHFA	Federal Housing Finance Agency
FIT	Feed-in-Tariff
GHG	Greenhouse gas
GTSR	Green Tariff Shared Renewables
HERO	California Home Energy Renovation Opportunity
IEPR	Integrated Energy Policy Report
IOU	Investor-owned utility
kW	Kilowatt
kWh	Kilowatt per hour

LCE	Lancaster Choice Energy
MCE	Marin Clean Energy
MW	Megawatts
NEM	Net energy metering
OPR	Governor's Office of Planning and Research
P2P	Peer-to-peer
PACE	Property Assessed Clean Energy
PG&E	Pacific Gas and Electric
PPA	Power Purchase Agreement
PTC	Production tax credit
QECB	Qualified Energy Conservation Bond
REN	Regional energy network
SCE	Southern California Edison
SCEF	Sonoma County Efficiency Financing
SCP	Sonoma Clean Power
SDG&E	San Diego Gas and Electric
SEU	Sustainable Energy Utility
TAC	Technical Advisory Committee
WIOA	Workforce Innovation and Opportunity Act
ZEV	Zero-emission vehicles
ZNE	Zero net energy

1 EXECUTIVE SUMMARY

In July 2015, the Phase I Comprehensive Renewable Energy Plan (CREP) Report (Empower Report) was prepared in response to the County of San Diego (County) Board of Supervisor's (Board) direction to research and develop renewable energy options in the County. This summary report presents the key points from the Empower Report. The Empower Report can be found in Attachment A.

Covering the residential, commercial, and industrial sectors of the County, with a particular focus on unincorporated areas, the CREP presents a comprehensive approach to renewable energy and energy efficiency. The Empower Report considers technology, appropriate zoning and development standards; and fiscal and financial impacts and community benefits, including costs to consumers.

This summary highlights the most pertinent information from the Empower Report, beginning with a review of existing conditions, which includes an updated energy-related regulatory settings section, and a preliminary overview of existing renewable energy resources within the County (see Section 2). Section 3 of this summary report analyzes the most commonly used alternative energy models that provide customer options beyond the traditional investor-owned utility (IOU) model that the County could pursue: Community Choice Aggregation (CCA), Direct Access (DA), and Sustainable Energy Utility (SEU). It also provides an overview of the financing mechanisms the County could use to implement these models. Section 4 summarizes the various programs, policies, and efforts that constitute best management practices (BMPs) for promoting sustainable renewable energy development in other jurisdictions. The County could choose to focus on a mix of these BMPs in its renewable energy planning effort. Section 5 summarizes the results of the economic analysis performed in the Empower Report, which explores the current patterns of economic activity and energy consumption. Finally, Section 6 summarizes key conclusions from the Empower Report.

1.1 SUMMARY OF CREP AND CLIMATE ACTION PLAN RELATIONSHIP

The County's CREP and Climate Action Plan (CAP) efforts are separate, but related projects. Increasing renewable energy use is one of many actions the County can take to reduce greenhouse gas (GHG) emissions and is one component of climate action planning. The County is currently in the outreach phase of drafting a new CAP. The purpose of the CAP will be (1) to address issues related to growth and climate change and (2) work alongside objectives in the CREP.

Integration of CREP BMPs, including identification of alternative energy models, can be pursued through CAP reduction measures and actions. By integrating objectives of the CREP with renewable energy components of the CAP, commitments can be tied to a plan and specific GHG reductions associated with renewable and energy efficiency projects. More information on the relationship between the CREP and CAP can be found in the CAP Alignment Memo. Initial recommendations for BMPs that can better align with the County CAP are summarized below.

1.2 RECOMMENDATIONS

The Empower Report provides a thorough assessment of BMPs to provide a variety of potential programs, policies, and models that the County could later adopt and implement as part of the CREP. Determining which mix of BMPs will work best for the County depends on a number of social, economic, and political factors. Each BMP is analyzed in Sections 4 and 6 of this report, with summary tables that more thoroughly consider the costs and benefits of implementation (i.e., advantages, disadvantages, financing options, and implementing body), along with the overall return on investment to the County. A ranking system, based on overall return on investment was used to determine the mix of BMPs anticipated to be most effective for the County. A low, medium, or high return on investment ranking was assigned based on a number of social, economic, and political factors. For more information on how rankings were determined, see Section 4 of this summary report.

- **Focus on BMPs with Medium or High Return on Investment Rankings.** While all of the BMPs can arguably provide value and promote more renewable energy development in the County, it is important for the County to focus on the BMPs that will provide the highest return on investment, or the most benefit for the money spent. The summary tables and analyses in Sections 4 and 6 of this report provide an initial ranking of the cost and benefits. For further consideration in the CREP process, the County should focus on the BMPs that have medium or high return on investment rankings.

- **Top BMP Recommendations for Phase II of the CREP.** Based on an assessment of cost, financing options, advantages, disadvantages, and overall opportunity to increase renewable energy development, the following four BMPs have been identified as the top recommendations for the County to pursue in Phase II of the CREP.

  - **Develop a CCA Feasibility Study (BMP #3).** Compared to other alternative energy models proposed (i.e., Direct Access (DA), Sustainable Energy Utility (SEU)), pursuing development of a CCA through a feasibility study would be the best use of County resources. Given current restrictions, the ability for a DA program to increase renewable energy development is limited. The County could lobby both the California Public Utilities Commission (CPUC) and/or the State legislature to open up DA beyond its current limits, but this could be time extensive and results are not guaranteed. Regarding an SEU, a CCA could provide a similar energy integrator role and financing opportunities. The County could explore developing an SEU if it doesn't choose to pursue a CCA program, but it is important to keep in mind that SEUs still require legislative action in order to implement.

    There are a number environmental, economic, and administrative advantages to creating a CCA. Given the significant amount of investment, resources, and staffing needed to establish, run, and operate a CCA, it is important that the County conduct a feasibility study before arriving at a decision. However, to avoid duplicated efforts and to ensure more unified results, the County should consider other CCA feasibility studies being prepared in the region before drafting its own study. The City of Solana Beach recently completed a feasibility study in April 2016. Also, the City of San Diego is in the beginning stages of drafting a citywide CCA feasibility study. The County should coordinate and work with the City of San Diego on these efforts to determine ways to supplement information on a county-wide level.

    The County's feasibility study should be clear in its objectives for the program, sources of funding, and economic viability. The study should consider San Diego Gas and Electric (SDG&E) load data and renewable resource assessments to identify potential projects; assess the potential size of the program in terms of number of customers and electricity sales; develop a financial and cash-flow model; predict the overall return on investment; quantify the jobs created under various procurement scenarios; and outline how start-up costs would be financed. If the feasibility study finds that a CCA program would be viable for the County, the benefits could well outweigh the costs.

  - **Create a Renewable Energy Overlay (BMP #10).** By reducing planning process time and by providing more certainty to investors, a renewable energy overlay zone can save both the developer and the government money. It also sends a signal to investors that the County wants to see renewable energy in specific locations in the County. While it may be difficult to secure funding for an overlay zone, the potential benefits for creating an overlay zone are worth considering. The County could better direct renewable energy development and identify opportunity areas that consider current and proposed land uses and environmental conditions.

  - **Track Community Solar Initiative Legislation (BMP #14).** Because many people are not able to install solar photovoltaic (PV) systems on their rooftops for a number of reasons (i.e., limited or no space, financial restrictions, living in a rental or multi-family unit, or poor rooftop solar orientation), Community Solar can help consumers gain access to solar opportunities. It also minimizes the usual high upfront solar costs and supports the local solar industry. Community Solar could also promote the development of more solar developments in the County. The County should be involved in tracking the regulatory decisions established by Senate Bill (SB) 43 and consider how it could implement a Community Solar initiative in the future. The county should also look to other cities that have implemented Community Solar (e.g., City of Carlsbad).

- **Establish a Microgrid and Develop Policies Related to Microgrids (BMP #15).** Microgrids, which are self-contained power systems that have on or more power sources (often renewable), offer a number of economic, environmental, power quality, and security benefits. The primary benefit of a microgrid is reliability and its ability to keep critical infrastructure, such as transportation systems, hospitals, data centers, water treatments facilities, police and fire departments, operating, particularly during times of crisis. As an example, Borrego Springs was funded through a variety of agencies and partners (i.e., Department of Energy [DOE], SDG&E, California Energy Commission [CEC], IBM, Motorola), suggesting that microgrids are an important asset and worth investing in. The County could begin by partnering with SDG&E and University of California San Diego (UCSD) on microgrid policies and identifying potential sites in the County where microgrids would be ideally suited.

- **Additional Recommendations with a Medium or High Return on Investment Ranking.** A high return on investment ranking, was given to BMPs that the County could most feasibly finance and gain support on at a political or organizational level. BMPs that had a clear path to implementation, or clear action items to determine feasibility, were also given a high ranking. Finally, BMPs with the highest potential to increase renewable energy opportunities in the County, were given a higher ranking, even if associated costs were high. A medium return on investment ranking was given to BMPs where some uncertainty existed as to whether the County could feasibly finance and gain support at a political or organizational level. BMPs with high start-up costs, and/or with less certain potential to increase renewable opportunities, were also given a medium ranking.

  The following BMPs with a medium or high return on investment ranking should also be considered by the County:

  - BMP #4: Establish Financing Capacity (i.e., Property Assessed Clean Energy [PACE] and Bonds)
  - BMP #5: Develop a Solar Energy Workforce Development Initiative
  - BMP #7: Increase the County’s Percentage of Energy Derived from Various Renewable Energy Technologies
  - BMP #13: Increase Renewable Energy Education and Outreach
  - BMP #16: Establish Electric Vehicle Programs
  - BMP #17: Develop a Legislative Strategy to Support Renewable Energy Programs

- **Avoid Costly BMPs That Require Too Many Existing Resources or New Staffing.** A low return on investment ranking was given to BMPs that had more disadvantages than advantages and/or required a significant amount of additional research to determine feasibility of implementation. BMPs that were costly (or costs were undetermined) and had low potential to increase renewable energy opportunities in the County were also given a low ranking. A number of BMPs presented in this summary were ultimately given a low return on investment rating due to the level of new and existing staff time and resources needed for implementation and execution. These include:

  - BMP #2: Establish a New Office of Sustainability
  - BMP #8: Establish a Renewable Energy Group Procurement Initiative

- BMP #9: Participate in the Creation of a New Regional Energy Network
- BMP #11: Develop a Building Energy Disclosure Program

A number of these BMPs are administrative in nature and also require large operating budgets that may prove difficult to fund. For example, the expenditures required to keep an Office of Sustainability (BMP #2) in operation are extensive and would put additional pressure on existing staff and resources that oversee it. Not only is a significant amount of research needed to determine whether a Group Procurement Initiative (GPI) would be feasible for the County (BMP #8), it may not be the best use of current staff time and resources due to the high level of coordination needed to implement a GPI. The same is true for creating a new regional energy network (REN) (BMP #9); the administrative burden placed on current staff as a result of extensive coordination and time needed to get a REN up and running makes it a less desirable option for the County to pursue. Finally, the actual coordination and manpower needed to create, implement, and oversee a Building Energy Disclosure Program (BMP #11) is quite high for the overall end gain.

- **Some BMPs are Better Addressed in the County's CAP.** A number of the BMPs address ways the County can increase renewable energy opportunities by creating additional planning documents. While plans help to consolidate policies and convey a unified approach to an issue, they can also be costly and hard to finance (i.e., unless the County can secure grant money). Because the County is already working on a CAP, the same objectives proposed in certain BMPs can be addressed in the CAP. For example, rather than prepare an Energy Element for the County's General Plan (BMP #1), it would be better to align renewable energy directives with the upcoming CAP and to ensure its consistency with the General Plan. While an Energy Assurance Plan (EAP) addresses energy security (BMP #6), other planning documents (e.g. Hazard Mitigation Plan and the County's CAP) may be better positioned to begin to outline key assets and ways to increase energy supply resiliency.

  Additionally, certain policy and program BMPs should be addressed in the CAP to ensure their implementation and GHG reduction potential. The advantages associated with increasing the renewable energy mix in the County are important environmentally and will also help towards achieving legislative targets. Because the County is currently using a relatively small amount of renewable energy, there is an opportunity to increase this percentage mix by implementing changes (BMP #7). The exact percentage reduction should be aligned with Renewable Portfolio Standard (RPS) requirements and should also help achieve GHG reduction targets identified in the CAP. Also, the establishment of additional Electric Vehicle (EV) programs (BMP #16) have important implications to the reductions of GHGs in the County. Programs should be included in the County's CAP to quantify their GHG reduction potential.

- **Focus on Partnership and Collaborations.** Some BMP programs would be more effective if the County chose to partner and collaborate with other agencies, entities, and organizations. Identifying appropriate partnership and collaboration opportunities will not only help implementation of certain BMPs, but strengthen existing programs that currently exist. The County should continue to support PACE programs (BMP #4) and help educate residents about the availability of these programs and encourage participation as a means to help reduce the region's electricity demand. The County should also explore how it might support efforts to create a PACE district in San Diego administered by the Ygrene Energy Fund or a similar entity. Regarding whether the County should develop a Solar Energy Workforce Development Initiative (BMP #5), there are already a number of other organizations providing workforce development in the County. Rather than developing an entirely new initiative, it may be more beneficial to build upon existing programs and partner with other agencies and organizations who are already offering similar services. Furthermore, the County could also look to partner with other agencies and organizations that are already focused on renewable energy education and outreach to further success with BMP #13. Finally, the County could take advantage of legislation that supports renewable energy programs by working with the Office of Strategy and Intergovernmental Affairs (OSIA) to develop a legislative strategy that builds upon their existing legislative review process (BMP #17).

1.3 NEXT STEPS

The CREP marks an important step in identifying the most effective tools to promote renewable energy. The County needs to consider which mix of renewable energy policy options outlined in the BMPs would garner the highest returns on investment and most effectively promote renewable energy development in the County. Information gathered from the Empower Report, this Summary Report, and feedback from the CREP's Technical Advisory Committee (TAC) will inform the County's Staff Report to the Board. The Board will provide policy direction for the CREP in late 2016 or early 2017.

2 EXISTING CONDITIONS

2.1 REGULATORY SETTING

2.1.1 Federal

ENERGY POLICY ACT OF 1992

The Energy Policy Act of 1992 (EPAct) was passed to reduce the country's dependence on foreign petroleum and improve air quality. EPAct includes several parts intended to build an inventory of alternative fuel vehicles (AFVs) in large, centrally fueled fleets in metropolitan areas. EPAct requires certain federal, state, and local government and private fleets to purchase a percentage of light duty AFVs capable of running on alternative fuels each year. In addition, financial incentives are included in EPAct. Federal tax deductions will be allowed for businesses and individuals to cover the incremental cost of AFVs. States are also required by the act to consider a variety of incentive programs to help promote AFVs.

ENERGY POLICY ACT OF 2005

The Energy Policy Act of 2005 (EPAct 2005) was signed into law on August 8, 2005. EPAct 2005 provides for renewed and expanded tax credits for electricity generated by qualified energy sources, such as landfill gas; provides bond financing, tax incentives, grants, and loan guarantees for a clean renewable energy and rural community electrification; and establishes a federal purchase requirement for renewable energy.

2.1.2 State

GREENHOUSE GAS LEGISLATION

In September 2006, Governor Schwarzenegger signed Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006. AB 32 establishes regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions and a cap on statewide GHG emissions. AB 32 requires that statewide GHG emissions be reduced to 1990 levels by 2020. This reduction will be accomplished through an enforceable statewide cap on GHG emissions and is being implemented through the California Cap-and-Trade regulation starting in 2012, along with other regulations and programs.

In December 2008, the California Air Resources Board (ARB) adopted its Climate Change Scoping Plan, which contains the main strategies California will implement to achieve GHG reductions of approximately 22 percent from the State's projected 2020 emission levels under a business-as-usual (BAU) scenario. In 2014, ARB adopted the First Update to the Climate Change Scoping Plan to identify the next steps in reaching AB 32 goals and evaluate the progress that has been made between 2000 and 2012. According to the update, California is on track to meet the near-term 2020 GHG limit and is well positioned to maintain and continue reductions beyond 2020. The update also reports the trends in GHG emissions from various emission sectors.

In September 2016, Governor Brown signed Senate Bill (SB) 32 and AB 197 to extend California's GHG reduction programs beyond 2020. SB 32 authorizes ARB to achieve a statewide GHG emission reduction of at least 40 percent below the AB 32 2020 limit by no later than December 31, 2030. SB 32 codified the target established by Executive Order (EO) B-30-15 for 2030, which sets the next interim step in the state's continuing efforts to pursue the long-term target of 80 percent below 1990 emission levels by 2050. SB 32 does not include an authorization to extend the Cap-and-Trade program beyond the existing 2020 targets; this program is currently continuing under existing statutory authority in AB 32. AB 197 was written to accompany SB 32 and establishes new statutory directions, including creating a six-member Joint Legislative Committee on Climate Change Policies to make recommendations to the Legislature. ARB is required to appear before this committee annually to present information on sectors covered by the Scoping Plan. AB 197 also requires ARB to consider social costs when adopting emission reduction rules and policies; prioritize direct emission reductions at large stationary sources and mobile sources; and identify ranges of GHG and air pollution reductions for every emissions reduction measure identified in subsequent Scoping Plan updates.

ADVANCED CLEAN CARS PROGRAM

In January 2012, ARB approved the Advanced Clean Cars program which combines the control of GHG emissions and criteria air pollutants, as well as requirements for greater numbers of zero-emission vehicles (ZEV), into a single package of standards for vehicle model years 2017 through 2025. The new rules strengthen the GHG standard for 2017 models and beyond. This will be achieved through existing technologies, the use of stronger and lighter materials, and more efficient drivetrains and engines. The program's ZEV regulation requires battery, fuel cell, and/or plug-in hybrid electric vehicles to account for up to 15 percent of California's new vehicle sales by 2025. The program also includes a clean fuels outlet regulation designed to support the commercialization of zero-emission hydrogen fuel cell vehicles planned by vehicle manufacturers by 2015 by requiring increased numbers of hydrogen fueling stations throughout the state. The number of stations will grow as vehicle manufacturers sell more fuel cell vehicles. By 2025, when the rules will be fully implemented, the statewide fleet of new cars and light trucks will emit 34 percent fewer GHG emissions and 75 percent fewer smog-forming emissions than the statewide fleet in 2016 (ARB 2011).

SENATE BILL 1389, INTEGRATED ENERGY POLICY REPORTS

SB 1389 requires CEC to prepare a biennial integrated energy policy report that contains an assessment of major energy trends and issues facing the state's electricity, natural gas, and transportation fuel sectors and provides policy recommendations to conserve resources; protect the environment; ensure reliable, secure, and diverse energy supplies; enhance the state's economy; and protect public health and safety (Public Resources Code § 25301[a]). The CEC prepares these assessments and associated policy recommendations every two years, with updates in alternate years, as part of the Integrated Energy Policy Report (IEPR). Preparation of the IEPR involves close collaboration with federal, state, and local agencies and a wide variety of stakeholders in an extensive public process to identify critical energy issues and develop strategies to address those issues. (CEC 2012a).

ENERGY IMPROVEMENT AND EXTENSION ACT OF 2008

The Energy Improvement and Extension Act of 2008 provides a one-year extension of the production tax credit (PTC) for wind energy, keeping the credit in effect through 2009. The bill also provides a two-year PTC extension, through 2010, for electricity produced from geothermal, biomass, and solar energy facilities, as well as trash-to-energy facilities, small hydropower facilities using irrigation water, capacity additions to existing hydropower plants, and hydropower facilities added to existing dams. In addition, the bill creates a new PTC for electricity produced by marine and hydrokinetic renewable energy systems (also called advanced water power systems) with a rated capacity of at least 150 kilowatt (kW) and placed in service by 2011. To help on the financing end, the bill authorizes $800 million in new Clean Renewable Energy Bonds for all of the above technologies.

CALIFORNIA LONG-TERM ENERGY EFFICIENCY STRATEGIC PLAN

On Sept. 18, 2008, the CPUC adopted California's first Long Term Energy Efficiency Strategic Plan, presenting a single roadmap to achieve maximum energy savings across all major groups and sectors in California. This comprehensive Plan for 2009 to 2020 is the state's first integrated framework of goals and strategies for saving energy, covering government, utility, and private sector actions, and holds energy efficiency to its role as the highest priority resource in meeting California's energy needs. The plan was updated in January 2011 to include a lighting chapter.

CALIFORNIA BUILDING ENERGY EFFICIENCY STANDARDS (TITLE 24, PART 6)

Buildings in California are required to comply with California's Energy Efficiency Standards for Residential and Nonresidential Buildings (i.e., Title 24, Part 6 of the California Code of Regulations), established by the CEC to institutionalize energy conservation standards. The standards were first adopted in 1978 and are updated approximately every three years. All buildings for which a building permit is submitted on or after July 1, 2014 must follow the 2013 standards (CEC 2012b). The CEC Impact Analysis for California's 2013 Building Energy Efficiency Standards estimates that the 2013 Standards are 23.3 percent more efficient than the previous 2008 standards for multi-family residential construction and 21.8 percent more efficient for non-residential construction (CEC 2013:3). CEC adopted the 2016 Building Energy Efficiency Standards in 2015. The 2016 Title 24 standards will go into effect on January 1, 2017. For single-family residences, the 2016 Title 24 standards will result in about 28 percent less energy use for lighting, heating, cooling, ventilation and water heating than the 2013 Title 24 standards (CEC 2015a). For non-residential land uses, the 2016 standards would result in 5 percent less energy use than those built to 2013 standards (CEC 2015b).

CALIFORNIA GREEN BUILDING STANDARDS (TITLE 24, PART 11)

The California Green Building Standards (CALGreen) feature regulations for energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality. CALGreen has mandatory provisions for commercial, residential, and public school buildings, along with appendices with voluntary provisions. Mandatory provisions for nonresidential buildings require that buildings facilitate future installation of EV supply equipment (EVSE), by including the proper wiring and electrical components needed for EV charging stations. Provisions further dictate the number of required EV charging spaces that are required, based on number of actual parking spaces.

CALIFORNIA ZERO NET ENERGY BUILDING GOALS

In 2007, the CPUC set a goal that all new residential construction in California will be zero net energy (ZNE) by 2020, and all new commercial construction will be ZNE by 2030. The CPUC reiterated its commitments to these goals when it adopted the California Long Term Energy Efficiency Strategic Plan in 2008. The California Energy Commission adopted the goal to achieve zero net energy building standards by 2020 for homes and 2030 for commercial buildings in its 2007 Integrated Energy Policy Report (IEPR), and reaffirmed that goal in its 2011 IEPR. The Zero Net Energy Building goals have also been supported in the California Energy Action Plan, the AB 32 Scoping Plan, the Governor's Clean Energy Jobs Plan, and the Clean Energy Futures Vision. In order to effectively implement each of the California Long Term Energy Efficiency Strategic Plan's goals, the CPUC has initiated individual goal area Action Plan efforts to create work plans and to continue the stakeholder engagement process that was used in the strategic plan. In 2011, the CPUC launched a ZNE Commercial Building Action Plan, which is designed to help commercial building owners in the state take advantage of the latest technologies and financial incentives to help reduce building energy use to "net-zero" through greater efficiency and on-site clean energy production. CPUC and CEC drafted the Zero Net Energy Action Plan in June 2015 specifically for new residential construction. The Action Plan provides a foundation for the development of a robust and self-sustaining ZNE market for new homes over the next five years, supports future codes and standards for ZNE, and inspires voluntary actions to meet California's goal.

ASSEMBLY BILL 758, COMPREHENSIVE ENERGY EFFICIENCY PLAN FOR EXISTING BUILDINGS

AB 758 (Skinner, Chapter 470, Statutes 2009) requires the CEC, in collaboration with the CPUC and stakeholders, to develop a comprehensive program to achieve greater energy efficiency in the state's existing buildings. The Existing Buildings Energy Efficiency Action (EBEE) Plan was released in 2015 and provides a 10-year framework to focus state and local governments, the building, contracting industries, and real estate industries, financial market actors, and other key stakeholders on achieving much greater energy and water efficiency in existing residential, commercial, and public buildings. The EBEE Action Plan covers all existing buildings in the single-family, multifamily, commercial, and public buildings sectors

SENATE BILL X1-2, THE CALIFORNIA RENEWABLE ENERGY PORTFOLIO STANDARD

SB X1-2 of 2011 requires all California utilities to generate 33 percent of their electricity supply (portfolio) from renewables by 2020. SB X1-2 sets a three-stage compliance period requiring all California utilities, including independently owned utilities, energy service providers, and community choice aggregators, to generate 20 percent of their electricity from renewables by December 31, 2013; 25 percent by December 31, 2016; and 33 percent by December 31, 2020. SB X1-2 also requires the renewable electricity standard to be met increasingly with renewable energy that is supplied to the California grid from sources within, or directly proximate to, California. SB X1-2 mandates that renewables from these sources make up at least 50 percent of the total renewable energy for the 2011-2013 compliance period, at least 65 percent for the 2014-2016 compliance period, and at least 75 percent for 2016 and beyond. The CPUC and the CEC jointly implement the statewide RPS program through rulemakings and monitoring the activities of electric energy utilities in the state.

SENATE BILL 350, THE CLEAN ENERGY AND POLLUTION REDUCTION ACT OF 2015

In consideration of the approaching expiration of SB X1-2 goals, SB 350 of 2015 calls for 1) a new objective for procure 50 percent of the state's electricity from renewables by 2030 and 2) a doubling of statewide energy efficiency savings in electricity and natural gas final end uses of retail customers by January 1, 2030 with annual targets established by the CEC.

CALIFORNIA QUALIFYING FACILITY AND COMBINED HEAT AND POWER PROGRAM SETTLEMENT

In December 2010, the CPUC approved California's Qualifying Facility and Combined Heat and Power (CHP) Program Settlement, which established a CHP framework for the state's investor-owned utilities. The settlement established a near-term target of 3,000 megawatts (MW) of CHP for entities under the jurisdiction of the CPUC, although this target includes not just new CHP, but capacity from renewal of contracts due to expire in the next three years. The CPUC has also adopted a settlement agreement that includes reforms to the Electric Rule 21 interconnection process to provide a clear, predictable path to interconnection of distributed generation while maintaining the safety and reliability of the grid. Electric Rule 21 is a tariff that describes the interconnection, operating, and metering requirements for generation facilities to be connected to a utility's distribution system, over which the CPUC has jurisdiction (CEC 2013).

ALTERNATIVE AND RENEWABLE FUEL AND VEHICLE TECHNOLOGY PROGRAM

AB 118 (Statues of 2007) created the CEC's Alternative and Renewable Fuel and Vehicle Technology Program. The statute, subsequently amended by AB 109 (Statutes of 2008), authorizes the CEC to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. The statute allows the CEC to use grants, loans, loan guarantees, revolving loans, and other appropriate measures. Eligible recipients include: public agencies, private businesses, public-private partnerships, vehicle and technology consortia, workforce training partnerships and collaboratives, fleet owners, consumers, recreational boaters, and academic institutions. The CEC must prepare and adopt an Investment Plan and convene an Advisory Committee to assist in preparing the Investment Plan.

SENATE BILL 43, THE GREEN TARIFF SHARED RENEWABLES PROGRAM

SB 43, passed in 2013, directed the CPUC to implement the Green Tariff Shared Renewables (GTSR) program to expand customer access to "all eligible renewable energy resources to all ratepayers who are currently unable to access the benefits of onsite generation." The law sets a sunset date of January 1, 2019 for the GTSR program, unless extended. The GTSR program applies to the three largest IOUs (i.e., Pacific Gas and Electric [PG&E], Southern California Edison [SCE], and SDG&E) and mandates that they administer the GTSR program in their service territory. The GTSR program allows both a Green Tariff Option and Enhanced Community Renewables (ECR) option to facilitate shared solar in California. SB 43 does not mandate how procurement should be divided between the Green Tariff and ECR programs. In 2015, the CPUC approved GTSR programs for SDG&E, PG&E, and SCE (EPIC 2015).

SAN DIEGO GAS & ELECTRIC INDEPENDENT MARKETING DIVISION COMPLIANCE PLAN (CPUC RESOLUTION E-4874)

In July 2016, the CPUC approved SDG&E's proposal to form an Independent Marketing Division (IMD) to lobby or market against CCAs. Under SB 790 (signed in 2011), the CPUC was required to create a Code of Conduct, which prohibited utilities from lobbying against CCAs, unless it forms an IMD that is funded exclusively by its shareholders. The IMD must also be functionally and physically separate from ratepayer divisions. SDG&E chose to house its IMD inside an already existing affiliate, Sempra Services Corporation (SSC). SDG&E is the first utility in the state to apply for approval from the CPUC for such a division (CPUC 2016a).

GUIDANCE FOR INITIAL ENERGY EFFICIENCY ROLLING PORTFOLIO BUSINESS PLAN FILINGS (CPUC DECISION 16-08-019)

In August 2016, the CPUC passed a decision addressing next steps for RENs, the appropriate baselines to be used to measure energy savings for specific programs and measures, transition for statewide and third-party programs, and changes to the evaluation and shareholder incentive frameworks. The decision states that RENs will retain their designation status as pilots and are requested to submit business plans in coordination with the other energy efficiency program administrators. REN proposals will also need to be vetted through the stakeholder process at the California Energy Efficiency Coordinating Committee (CAEECC) prior to submission to the CPUC. REN programs, and therefore administrative expenses, will only be funded to the extent that they are determined by the CPUC to provide value (or the promise of value) to ratepayers in terms of energy savings and/or market transformation results for energy efficiency (CPUC 2016b).

2.1.3 Local

SAN DIEGO COUNTY GENERAL PLAN

The Conservation Element of the San Diego County General Plan (2011) contains policies related to energy efficiency and renewable energy development. Policies range from encouraging development projects to use renewable energy (COS-14.7); requiring County facilities to meet "green building" programs (COS-15.3), requiring development to meet Title 24 Energy Standards (COS-15.4); encouraging energy efficiency audits (COS-15.5); incentivizing low- and zero- emission vehicles and equipment (COS-16.3); and exploring the development of alternative fuel sources (COS-16.4).

SAN DIEGO COUNTY STRATEGIC ENERGY PLAN

The Strategic Energy Plan provides high-level energy and sustainability objectives and goals in the areas of energy and water conservation and efficiency, sustainable design, energy supply, distributed generation, vehicular transportation, energy and sustainability education and outreach, energy consumer choice, recycling and landfill diversion, and GHG emissions reductions. The Strategic Energy Plan applies to County municipal operations only and is based on a three to five-year cycle with updated plans developed to address regulatory, technical, economic and societal changes. The latest Strategic Energy Plan was released in 2015 and covers priorities for 2015-2020.

SAN DIEGO GAS & ELECTRIC CONNECTED TO THE SUN PROGRAM

San Diego's Connected to the Sun Program allows business and residential customers to have the option to purchase 100 percent renewable energy. This program was approved by the CPUC on January 29, 2015 and is administered through SDG&E. The Program includes two pilot program options: Share the Sun and SunRate. Share the Sun allows bundled customers to work directly with solar providers to acquire rights to a portion of the energy produced by a specific solar power facility and receive a bill credit for the value of that energy. SunRate allows bundled customers to buy some or all of their energy from local solar projects already under contract with SDG&E through a "green tariff." SunRate implementation is targeted for early 2016 and Share the Sun will take a couple years after signing an agreement with a solar provider.

DESERT RENEWABLE ENERGY CONSERVATION PLAN

Initiated in 2008 by Executive Order S-14-08, the Desert Renewable Energy Conservation Plan (DRECP), includes 22.6 million acres across seven California counties, with the eastern portion of San Diego County included in the impact area. The general purpose of the DRECP is to streamline siting and construction of renewable energy power facilities and transmission lines through streamlined environmental review and permitting, while conserving and managing plant and wildlife communities in the desert regions. This desert conservation and renewable energy and transmission focus will be covered through three separate components of the DRECP: A U.S. Bureau of Land Management Land Use Plan Amendment; a U.S. Fish and Wildlife Service General Conservation Plan; and a California Department of Fish and Wildlife Natural Communities Conservation Plan. Proponents of the DRECP are looking for a comprehensive, landscape approach that considers an entire region for development versus the project-by-project approach that tends to dominate planning efforts in many California counties today. The DRECP was driven early in part by the intent to meet the State's 33 percent by 2020 RPS. DRECP proponents plan to develop 20,000 MW of renewable energy power over the next 25 years, which is a significant undertaking.

2.2 EXISTING RENEWABLE ENERGY RESOURCES

2.2.1 County-Owned Facilities

As of 2016, the County is supplying 2.5 percent of its annual electricity needs through a number of small photovoltaic (PV) systems at local parks and recreation centers as well as through a Power Purchase Agreement (PPA) completed in 2011. Construction was completed on the new Alpine Library, the County's first ZNE building. As a ZNE building, the total amount of energy used by the Alpine Library on an annual basis is roughly equal to the amount of renewable energy created on the site. The Imperial Beach Library is currently under construction to be the next ZNE County facility.

Table 2-1 shows the list of renewable energy systems at County facilities installed since 2009.

Table 2-1 List of Renewable Energy Systems at County Facilities Installed Since 2009

Facility	City/Community	Completed	Nominal Output (kW)	Annual Output (kWh)
Spring Valley Community Center	Spring Valley	2009	10	15,000
Lakeside Community Center	Lakeside	2010	45	67,500
Fallbrook Community Center	Fallbrook	2010	25	37,500
Ramona Library	Ramona	2011	50	75,000
Sheriff Crime Lab	San Diego	2011	45	67,500
Wilderness Gardens Preserve	Pala	2012	5	6,750
Sweetwater Regional Park	Bonita	2012	185	277,500
Guajome Regional Park	Oceanside	2013	100	150,000
Lincoln Acres	Lincoln Acres	2013	30	45,000
COC Conference Center	San Diego	2013	18	26,400
Alpine ZNE Library[1]	Alpine	2016	N/A	N/A
Imperial Beach ZNE Library[2]	Imperial Beach	2016	N/A	N/A
Older Systems (pre-2009)			285	427,500
Sub-Total			**661**	**916,500**
Photovoltaic System Power Purchase Agreement				
East Mesa Detention Facility-Juvenile Detention	San Diego	2011	1,000	1,500,00
TOTAL SYSTEMS SERVING COUNTY FACILITIES			**1,661**	**2,416,500**
Hosting SDG&E PV System				
COC Parking Structure A	San Diego	2011	425	637,500
Owned Solar Thermal Systems				
COC Conference Center	San Diego	2012		1,050[3]

Notes: kW = kilowatt, kWh = kilowatt-hour, PV = photovoltaic, ZNE = zero net energy, N/A = Not Available

[1] In 2016 construction was completed on the new Alpine Library, the County's first zero net energy building. As a zero net energy building, the total amount of energy used by the Alpine Library on an annual basis is roughly equal to the amount of renewable energy created on the site.

[2] The Imperial Beach Library is currently under construction to be the next zero net energy County facility.

[3] Amount reported is in therms.

Source: San Diego County (2009)

2.2.2 Non-County Owned Facilities

From fiscal years 2014 to 2016, there was an average of 6,555 PV permits issued each year in the unincorporated area of the County, with a 90 percent increase from 2014 to 2016. In 2015 the County Board of Supervisors approved ordinances amending County Building Code to promote photovoltaic, wind energy and electric vehicle charging systems and to streamline processing of small, residential, rooftop solar energy permits. The County has permitted more than 189 Mega Watts of renewable energy in the unincorporated area, saving approximately 133 Metric Tons of greenhouse gas emissions from entering the atmosphere

3 ALTERNATIVE ENERGY MODELS

There are a number of alternative energy models that provide consumers options beyond the traditional investor-owned utility model. This chapter summarizes these institutional arrangements, along with potential financial mechanisms that could help the County diversify its energy mix. For more specific information regarding alternative energy models, see Section 4 of the Empower Report. BMP #4 (Establish an Institutional and Financing Capability), described below in Chapter 4.3, assesses the costs and benefits of each model and financing mechanism.

3.1 COMMUNITY CHOICE ALTERNATIVES

Alternative energy models, or institutional arrangements, are organizational and administrative entities that help foster investment in renewable energy and overall energy efficiency.

3.1.1 Community Choice Aggregation

CCA allows city and county governments to aggregate or pool electricity customers to purchase and develop power, while also allowing them to administer energy programs on behalf of their residents and businesses. A CCA works in partnership with a region's existing utility, which continues to deliver power, maintain the grid, and provide consolidated billing and other customer services. Considered to be a hybrid-approach to the provision of energy services, a CCA is part IOU and part municipal public utility. This alternative energy model allows a local community to shape the CCA program to prioritize desired benefits, including but not limited to, increased investment in renewable energy sources and energy efficiency, economic development, carbon reduction strategies, and workforce development efforts. It is important to note that only the electricity portion of energy services can be provided by a CCA entity. To date, CCAs have been established by law in six states (California, Illinois, Massachusetts, New Jersey, Ohio, and Rhode Island).

REGULATORY BACKGROUND

In 2002, the California Legislature passed AB 117, which enacted legislation permitting the creation of CCA programs. Under the legislation, a city, county, or Joint Powers Authority (JPA), comprised of two or more cities and counties, may implement a CCA program. Governor Jerry Brown signed California SB 790 in October 2011, which also allowed a CCA to be formed by the Kings River Conservation District, the Sonoma County Water Agency, and any California public agency possessing authority to generate and deliver electricity at retail within its designated jurisdiction. In January 2012, the authority to form a CCA was furthered expanded by SB 4, which allows special districts to also become community choice aggregators. For additional detail on how a CCA functions, see Section 4.2.1 of the Empower Report.

ADVANTAGES OF COMMUNITY CHOICE AGGREGATION

CCA programs offer a number of local, economic, environmental, and social benefits. Advantages include, but are not limited to the following:

- **Revenue-Based Financing.** CCAs are not reliant on tax dollars or public funds and are financed from revenues received from customers.

- **Community-Based Investment.** CCAs redirect revenue streams previously under IOU control and place them under local control, allowing for reinvestment back into the community and for targeted renewable energy and energy efficiency investments and programs.

- **Economic Benefits.** An entity could enjoy significant economic benefits due to the reduction in electricity consumption and a resource mix that drives down costs on electricity services. These savings could also lead to job creation in renewable energy for the region.

- **Increased Choices.** CCAs increases customer choice, by allowing the option to receive electricity from a CCA or an IOU.

- **Centralized Energy Services.** Through public-private partnerships, a CCA can leverage private capital and coordinate efforts of third-party programs for more centralized community energy services.

- **Reduced GHGs.** CCAs can substantially reduce GHGs associated with electricity consumption.

- **Rate Stability.** By increasing the amount of power obtained from long-term contracts or self-owned generation facilities, a CCA program may be able to lock-in electricity prices and provide improved stability to its customers.

DISADVANTAGES OF COMMUNITY CHOICE AGGREGATION

Despite the number of advantages that a CCA program provides, there are also risks associated with CCA program development. Risks can be divided into the following three categories:

- **Planning and Implementation Risks.** Establishing a CCA requires a number of political, engineering, legal, and financial steps. A detailed implementation plan, which often requires technical consultants, also needs to be submitted and certified by the CPUC. Start-up costs could range between $1 to $3 million. Funds expended from these start-up costs are not always recoverable.

- **Operational Risks.** If CCA energy costs exceed that of IOU rates, customers may choose to opt out of the program. If this occurs, there is a risk that the CCA will have contracted more electricity than it can sell to residents, and will have to sell excess electricity to a third party at a loss. Furthermore, customer rates are subject to the prevailing market price of electricity, but if the CCA has locked in electricity prices, customers could end up paying higher rates than what the market dictates. Changes in rules and tariffs administered by the CPUC could also adversely affect rates.

- **Regulatory Oversight Risks.** In contrast to the high-degree of regulatory oversight that IOUs face, the CPUC has limited oversight of CCA programs. Rather than have rate increases determined at a CPUC proceeding, CCAs rely on a Board of Directors to make such decisions. Therefore, it is critical that the CCA Board be made up of knowledgeable professionals that will conduct CCA-related matters in an open and transparent way.

STATEWIDE USE

Since its passing in 2002, a number of CCA programs have been proposed in the State, including programs in San Francisco (CleanPowerSF), the East Bay (Oakland, Berkeley, and Emeryville), and the San Joaquin Valley (San Joaquin Valley Power Authority). The first CCA program to operate in California, Marin Clean Energy (MCE), was formed in Marin County and began serving customers in May 2010. Sonoma County launched Sonoma Clean Power in 2014 and the City of Lancaster, through Lancaster Choice Energy (LCE), began offering service to select customers in May 2015, with broad public enrollment in late 2015.

REGIONAL USE

Locally, the cities of San Diego, Encinitas, Del Mar, Solana Beach, and Carlsbad are considering the formation of a CCA to provide an alternative energy source than what is provided by SDG&E. For Del Mar, the option to join a CCA is an option outlined in its CAP, which was adopted by City Council in June 2016 (Del Mar 2016). Also, the City of San Diego CAP has a goal to achieve 100 percent renewable electricity by 2035 city-wide, with a commitment to complete a city-wide CCA Feasibility Study (City of San Diego 2014). The City is currently in the beginning stages of drafting a feasibility study. Solana Beach in April 2016 completed a technical report analyzing the feasibility of a CCA. The report concluded that a CCA could be feasible, but that additional research is needed if the City decides to pursue a CCA (Solana Beach 2016). Most recently, the CPUC approved SDG&E's proposal to form an independent district to lobby or market against CCAs. Under State law, utilities are prohibited from lobbying against CCAs unless it forms an independent district that is funded by shareholders, not ratepayers. SDG&E is the first utility in the State to apply for approval from the CPUC (KPBS 2016).

Summaries of the most prominent CCAs currently operating in California are provided below. For a more extensive review of CCA examples, see Section 4.2.7 of the Empower Report.

Marin Clean Energy

MCE offers its customers three different product offerings: Light Green, Deep Green, and Local Sol. Customers in the MCE service territory are automatically enrolled in Light Green, which provides customers with 50 percent renewable energy from sources such as solar, wind, bioenergy, geothermal, and small hydroelectric power facilities. In addition to the three product offerings, MCE also serves as a platform for several local energy programs that encourage the development of distributed energy resources, which are described below:

- **Net Energy Metering.** Net energy metering (NEM) is a billing arrangement that provides credit to customers with solar PV systems for the full retail value of the electricity their system generates. Under NEM, the customer's electric meter keeps track of how much electricity is consumed by the customer and how much excess electricity is generated and sent back to the utility grid. MCE pays its customers a $0.01/kWh premium over the retail rate paid by the local IOU, PG&E.

- **Feed-in-Tariff.** The Feed-in-Tariff (FIT) program is a wholesale renewable energy purchase program designed to provide competitive, predictable energy prices for local small-scale renewable energy developers over a 20-yr contract term. This standard agreement provides a high level of certainty with respect to the revenue stream generated by the project and eliminates the need for contract negotiations, keeping transaction costs low. MCE's first FIT-supported project was at the San Rafael Airport in October 2012. This project created three new locally-based full-time employees, used materials manufactured in the area, and was financed locally.

- **Energy Efficiency Programs.** MCE manages energy efficiency programs for residential and commercial customers, integrating diverse program offerings under one umbrella. These programs are designed to maximize investments in a property, reducing energy use, water use, and GHGs. They also provide participants with a single point of contact from initial contact to project completion. Rebates and financing options are also available.

- **Workforce Development Program.** MCE's workforce development program provides workers, including those in disadvantaged communities, with a broad spectrum of transferrable skills to work in a variety of "green" jobs. MCE also works with local experts to align, leverage, and influence existing training programs and markets in the MCE service territory.

Sonoma Clean Power

Sonoma Clean Power (SCP) participants include the cities of Windsor, Cotati, Sebastopol, Santa Rosa, Sonoma, Cloverdale, Rohnert Park, Petaluma, and the unincorporated area of Sonoma County. As of December 2014, service is provided for 20,000 commercial customers and 200,000 residential customers, with an 89 percent retention rate.

SCP provides two product offerings to its customers: CleanStart and EverGreen. CleanStart is SCP's default service and provides 33 percent renewable power from sources such as geothermal, solar, and wind. EverGreen is 100 percent local renewable energy initially comprised of geothermal power sourced from facilities in northeastern Sonoma County. By 2018, 23 percent of SCP's resource portfolio will come from geothermal power. To help stimulate local energy projects and use, SCP offers NetGreen, which is a NEM program that is structured similarly to MCE'S NEM program. ProFIT is SCP's feed-in tariff renewable energy purchasing program which sets the rules and price for SCP to purchase electricity from small-scale wholesale renewable electricity projects within SCP's service territory. Similar to MCE's feed-in tariff program, standard 10- or 20-year contracts are offered to keep costs low.

Lancaster Choice Energy

LCE is the latest CCA program in California starting May 7, 2015. Phase one of the program roll-out encompassed more than 850 accounts including all municipal accounts as well as residents and businesses that have elected to enroll early in the program. Phase two began in November 2015 with small commercial accounts joining the program, with the remaining customers enrolling in Early Spring 2016. Lancaster's City Council will oversee the program and be responsible for various elements of the program, including rate setting. Customers still receive their bills from SCE. Under LCE's default program, Clear Choice offers customers 35 percent renewable energy and an on average 3 percent savings on their monthly bill. LCE's Smart Choice rate plan offers customers the option of choosing a 100 percent renewable energy option. Currently, renewable energy generated is from wind sources, but LCE has plans to add solar and hydroelectric into their renewable energy mix (City of Lancaster 2016).

3.1.2 Direct Access

Through DA, eligible retail customers have the choice to purchase electric power directly from an independent electric service provider (ESP) rather than through an IOU exclusively. While similar to a CCA program, DA is different in that it is: (1) not available to residential customers; and (2) by law (i.e., SB 695) is capped to a set number of gigawatt-hour (GWh) ESPs from which an individual commercial or industrial customer can purchase its power. This limits the County's ability to ensure that a DA program could deliver increased levels of renewable energy and energy efficiency, as well as reduced levels of GHGs. The County currently participates in a DA program, in which it contracts with a third party to provide electricity on the open market. The County's contractor provides the cheapest electricity, which may not always include renewable energy. To date, DA has saved the County approximately $3 million, freeing up Department of General Service (DGS) funds for use in other energy-related projects.

REGULATORY BACKGROUND

DA was first instituted as an option for retail electric service in 1998, as part of an electric industry restructuring program to bring retail competition to the California electricity market. However, in 2001 DA transactions were suspended due to the electricity crisis. Subsequently, in 2009, SB 695 was signed into law, reauthorizing the DA program. This allowed only individual retail non-residential end-use customers to acquire electric service from other providers in each electrical corporation's (i.e., all providers) distribution service territory, up to a maximum allowable total kWh annual limit. This limit, or cap, is currently managed through a wait list process by the CPUC that is reset each calendar year. The CPUC also currently sets rates for DA (SDG&E 2016).

ADVANTAGES OF DIRECT ACCESS

There are a number of advantages to a DA program, which include, but are not limited to the following:

- Customer Savings. Through a DA program, participating customers have an opportunity to save money by procuring electricity from an ESP instead of through a bundled IOU. Between 2009 and 2012, the County saved $3.7 million, or approximately 9 percent, average savings for County facilities over bundled service from SDG&E using DA electricity procurement.

- **Increased Choice.** DA programs offer participating customers more choices for their energy sources.
- **Reduced GHGs.** DA programs can reduce GHGs associated with electricity consumption by providing renewable energy options.

DISADVANTAGES OF DIRECT ACCESS

While DA programs offer more choice and savings to customers, there are a number of downsides that are described below:

- **Limited Customers.** Currently DA is only available to nonresidential customers and due to current caps, the number of customers that can participate is limited.
- **Small Portion of Electricity Consumption.** Given current restrictions, DA accounts for a relatively small portion of electricity consumption. The capped load allowance only permits ESPs to serve approximately 13 percent of the total IOU load in California.
- **Less Certain Focus on Renewables.** Current restrictions provide little incentive to drive investment in renewable energy and energy efficiency.

3.1.3 Sustainable Energy Utility

An SEU is an independent and financially self-sufficient entity responsible for delivering energy efficiency, energy conservation, and customer-sited renewable energy to end users. SEUs target all sectors and fuels, including electricity, transportation, and heating. Through an SEU, energy users throughout a city or state can build a relationship with a single organization whose direct interest is to help residents and businesses use less energy and generate their own clean energy. As a nonprofit umbrella entity at a city, county, or state level, an SEU relies on a third-party management model, competitive contracting, and performance incentives to deliver sustainable energy services across all sectors and customer classes. As such, an SEU is publicly accountable and can be financially self-sufficient. It also has access to a range of potential funding sources and revenue streams, and can achieve energy savings without raising taxes or utility rates.

A typical SEU would capitalize a fund with relatively low-interest state or municipal bonds and use that capital to contract with private Energy Service Companies (ESCos) to conduct energy audits and perform building energy efficiency and renewable energy upgrades. Once the project is completed, the energy customer would share the savings resulting from lower energy costs with the SEU to repay the bond and to fund the SEU's activities. Because it can aggregate a large amount of demand for ESCo services, the SEU can help lower costs further by standardizing offerings, negotiating bulk discounts, and otherwise streamlining the process of identifying and executing cost-effective energy efficiency and renewable energy upgrades

REGULATORY BACKGROUND

The State of Delaware first adopted the SEU model along with bond financing structure in 2007 as an independent, non-profit organization to foster a sustainable energy future. Development of the SEU model began in 2006. In 2011, Delaware's SEU issued the Energy Efficiency Bond Series. This financing created over $145 million in guaranteed dollar savings to enable a host of state buildings and higher education facilities.

ADVANTAGES OF SUSTAINABLE ENERGY UTILITY

There are a number of advantages to an SEU program, which include, but are not limited to the following:

- **Central Coordination.** An SEU provides a single point-of-contact for efficiency and self-generation in the same way that conventional utilities are the point of contact for energy supply.
- **Comprehensive Programs.** Programs target efficiency, conservation, and renewable energy across all fuels (e.g., electricity, heating, transportation) and customer classes (e.g., low-income, government, industrial, commercial, residential), regardless of utility service territory.
- **Flexible Incentives.** Sustainable energy services are not constrained by strict programmatic criteria that might exclude, or inadequately serve, certain customer groups.
- **Financial Self-Sufficiency.** A financing plan ensures long-term self-sufficiency by generating revenue through the supply of customer-sited sustainable energy services.
- **Competitive Procurement.** A governance system is based on competitive contracting of independent management services.
- **Job Creation.** An SEU can facilitate increased investments in energy efficiency and customer-sited renewable systems, which in turn, can help facilitate a more robust regional economy. The Delaware SEU created nearly 980 jobs in construction, project engineering, and building management.
- **Economic Growth.** The SEU model can continuously organize investments, creating significant potential for the model to meaningfully impact the regional energy economy. At the same time, an SEU keeps value in the local economy due to the employment of local contractors and its emphasis on local production of the equipment used to meet energy needs.

DISADVANTAGES OF SUSTAINABLE ENERGY UTILITY

While there are a number of advantages to starting an SEU program, there are also some disadvantages to consider:

- **Legislative Action Needed.** Forming an SEU requires legislative action in order to implement, which can require a large amount of time, money, and resources to build political consensus and support.
- **Few SEU Examples.** Since few SEUs have been established since the Delaware SEU was created in 2007, there are not a lot of examples of SEUs to consider for BMPs.
- **High Costs.** Start-up and implementation costs to create an SEU program could be high and may not be recovered (Katz 2011).

STATEWIDE USE

Sonoma County Efficiency Financing Program

The Sonoma County Water Agency partnered with the Foundation for Renewable Energy & Environment to develop the Sonoma County Efficiency Financing (SCEF) Program. The SCEF is a scaled-down model that does not require legislative action and under this program participating organizations contract with a private ESCo to complete energy and water conservation measures. Improvements can include street lighting, building lighting, system controls, water pumps, heating, ventilation and air condition (HVAC) systems; boilers, chillers, and others. The participating organizations receive substantial utility cost-savings, including a contractual guarantee sufficient to cover the full cost of all retrofit work. The program uses tax-exempt bonds to finance projects. For more details on financing a SCEF, see Section 4.4.3.5 of the Empower Report.

3.2 FINANCING MECHANISMS

This section describes the financing mechanisms that are most often used to direct capital for investment and subsequent deployment of energy efficiency and renewable energy systems. An alternative energy model could be financed through one or more of the mechanisms described below.

3.2.1 Property Assessed Clean Energy Financing

Property Assessed Clean Energy (PACE financing is a loan alternative designed to encourage the installation of distributed renewable energy systems and energy efficiency measures by helping property owners overcome the barrier of high up-front energy equipment and installation costs. Under PACE programs, jurisdictions form special tax districts that allow property owners to finance efficiency (i.e., energy and water) and renewable energy projects on existing and, in some cases, new residential and commercial structures through a voluntary special tax assessment. These energy efficiency or renewable energy assessments are tied directly to the house or commercial property and repaid via the property owner's tax bill. Because the assessment and lien are tied directly to the property, they can be transferred upon sale. PACE assessments are not legally considered loans. Property owners who invest in energy efficiency measures and small renewable energy systems typically repay these assessments over 15 to 20 years via additional payments on their property tax bills. During the repayment period, the property owner realizes reduced electric utility bills as a result of the energy investment. Not unlike a mortgage, homeowners receive a tax deduction for the interest on a PACE assessment, but not for the principal.

PACE financing can help state and local governments address two major roadblocks to clean energy development at both the commercial and residential level: (1) lack of capital and (2) reluctance to make long term energy efficiency and/or renewable energy investments. PACE assessments are transferable, which provides property owners the opportunity to recoup their investment upon sale.

A critical design element of the PACE financing model is the use of special tax districts known as clean energy assessment districts. These districts are regularly used in the financing of traditional local government projects (e.g., sewers and streetlights), and they provide two benefits for jurisdictions. First, the special district shields the jurisdiction from risk, ideally helping to protect its overall debt rating. Second, the special district allows the additional assessment to be placed only on properties whose owners opt to participate in the program.

REGULATORY BACKGROUND

PACE financing programs can be established and administered under two different statutory frameworks: The Improvement Act of 1911 (as amended by AB 811) or the Mello-Roos Act (under a city's charter authority or as amended under SB 555). Both acts authorize creation of special tax districts, voluntary contractual agreements for financing between an authorized entity and the property owner, use of available funding from any source including existing bond issuing statutes and attachment of the assessment for payment of the assessment to the property (as opposed to the individual owner). For more information on the differences between the Mello-Roos Act and the Improvement Act see Section 4.5.3.1 of the Empower Report.

Residential PACE financing has faced opposition as early as 2009 from the Federal Housing Finance Agency (FHFA), which regulates Fannie Mae and Freddie Mac. In 2010, the FHFA issued a determination that PACE programs presented significant safety and soundness concerns to existing mortgages and therefore to the entities that underwrite or insure those mortgages. In 2011, FHFA affirmed that Fannie Mae and Freddie Mac would no longer purchase mortgages secured by a property with an outstanding PACE assessment that originated after July 6, 2010. This effectively stopped residential PACE financing programs in California and only recently have programs begun offering residential financing again. For more information regarding the obstacles facing residential PACE financing, see Section 4.5.3.2 of the Empower Report.

PACE IN SAN DIEGO COUNTY

There are several different PACE programs currently available to the County residents and businesses, which are determined by the County's Finance and General Government Group. In 2013, The County Board of Supervisors approved the expansion of the County's commercial PACE Program. CaliforniaFIRST, California Home Energy Renovation Opportunity (HERO), and Figtree's OnDemand program all offer PACE financing for commercial properties in the County. In July 2014, HERO financing was extended to residential properties in the San Diego area. As of July 2014, the HERO program has funded 206 residential projects, worth $4.9 million, in cities within the County. The program continues to show signs of accelerating and has received over 1,200 loan applications from the area since inception.

Clean Energy San Diego is a coalition of business leaders, environmentalists, and San Diego citizens working with Ygrene Energy Fund to create a PACE district in San Diego. Ygrene is already operating in Chula Vista, with 50 projects worth $4.5 million completed or under construction in 2014. In January 2015, Ygrene announced that local governments can join its program in as little as 30 days, under a new arrangement with a local housing finance authority in Sacramento named Golden State. Ygrene is the only PACE lender in California offering 30-year solar loans to homeowners at this time. The loan carries an interest rate of 8.49 percent. Ygrene's interest rate on a five-year loan is 5.99 percent while that on a 20-year loan is 8.25 percent.

3.2.2 Bonds

QUALIFIED ENERGY CONSERVATION BONDS

A Qualified Energy Conservation Bond (QECB) is a bond that enables qualified state, tribal, and local government issuers to borrow money at attractive rates to fund energy conservation projects. QECBs are taxable bonds, which means investors must pay federal taxes on QECB interest they receive. Most QECBs are issued as direct subsidy bonds and are among the lowest-cost public financing tool because the U.S. Department of the Treasury subsidizes the issuer's borrowing costs. The U.S. Congress authorized $3.2 billion of QECB issuance capacity, which has been allocated to jurisdictions based on population.

CLEAN RENEWABLE ENERGY BONDS

Clean Renewable Energy Bonds (CREBs) are primarily used in the public sector to finance renewable energy projects. The bondholder receives federal tax credits in lieu of a portion of the traditional bond interest, resulting in lower effective interest rate for the borrower. The issuer remains responsible for repaying the principal on the bond. CREBs differ from traditional tax-exempt bonds in that the tax credits issued through CREBs are treated as taxable income for the bondholder. The tax credit may be taken each year the bondholder has a tax liability as long as the credit amount does not exceed the limits established by the federal Energy Policy Act of 2005.

Through allocations by the Energy Improvement and Extension Act of 2008 and the American Recovery and Reinvestment Act of 2009, $2.4 billion are available for CREBs. With close to $1.4 billion in volume cap for new CREBs remaining, in February 2015, the IRS announced a March 5, 2015 opening of the rolling volume-cap application window for governments.

MUNICIPAL BONDS

A municipal bond is issued by a local government or its agencies. There are two basic types of municipal bonds: General Obligation Bonds and Revenue Bonds. General obligation bonds often require voter assent and tend to have lower interest rates than revenue bonds. This is because the principal and interest are secured by the credit of the issuer and usually supported by the issuer's taxing power. With revenue bonds, the principal and interest is secured by revenues derived from tolls, charges, or rents from the facility built with the proceeds of the bond issuance. Revenue bonds typically do not require electorate assent.

3.2.3 Peer-to-Peer Lending/Crowdfunding

Over the past ten years, Crowdfunding and peer-to-peer (P2P) lending organizations have emerged as financing mechanisms that offer easy, efficient, and low-cost sources for capital investments, loan repayment, and project funding. Crowdfunded projects use large groups of people pledging money to their cause to reach a monetary goal, without the promise of repayment. P2P lending is geared towards individuals seeking financing for investments, loans, and new businesses, with the promise that the lenders will get their money paid back to them in a timely manner.

Everybody Solar was created in Santa Cruz in 2011 to help nonprofits use solar energy to lower their operating costs. Everybody Solar is involved from the beginning stages of raising funds to the installation of the solar panels (through a partnership with a nonprofit solar installer). Everybody Solar, which uses a crowdfunding model, solicits donations online. While donations can come from anywhere, much of the fundraising outreach is focused in the communities where projects are proposed. Besides protecting the environment, Everybody Solar provides additional benefits. By lowering nonprofits operating expenses those organizations have more resources to put towards meeting their stated objectives (Mosaic 2012). In 2009, a renewable P2P lending company named Mosaic was launched in Oakland and has since become the third largest renewable specific lender in the world. Since its public launch in 2013, Mosaic has helped finance $7 million for 20 solar energy projects with a combined capacity of 18 MW. Mosaic gets investments from people or companies who want to finance solar energy projects, and give that money to the borrowers who want to construct a project. The typical payback period to investors is 10 years with a 5 percent return on investment.

4 BEST MANAGEMENT PRACTICES

The Best Management Practices (BMPs) summarized below are meant to provide a range of potential programs and policies that could later be adopted and implemented as part of the CREP. The programs, policies, and financial mechanisms presented have been proven to be innovative and effective tools and strategies for supporting renewable energy and energy efficiency advancement across several jurisdictions the nation. Each BMP is outlined below, with summary tables that consider overall advantages and risks of implementation. Where possible, more detail regarding costs, financing options, and responsible parties are provided. A ranking system, based on overall return on investment, was used to determine which mix of BMPs are anticipated to be most effective for the County. A low, medium, or high return on investment ranking was assigned based on a number of social, economic, and political factors:

- **High Return on Investment.** Top priority, or a high return on investment ranking, was given to BMPs that the County could most feasibly finance and gain support on at a political or organizational level. BMPs that had a clear path to implementation, or clear action items to determine feasibility, were also given a high ranking. Costs of implementation were also considered in rankings, but BMPs with a high potential to increase renewable energy opportunities in the County were given a higher ranking, even if associated costs were high.

- **Medium Return on Investment.** A medium return on investment ranking was given to BMPs where some uncertainty existed as to whether the County could feasibly finance and gain support at a political or organizational level. A medium ranking was also given to BMPs that might require additional collaboration or partnerships for proper implementation. BMPs with high start-up costs, and/or with less certain potential to increase renewable energy opportunities, were also given a medium ranking.

- **Low Return on Investment.** A low return on investment ranking was given to BMPs that had more disadvantages than advantages and/or required a significant amount of additional research to determine feasibility of implementation. BMPs that were costly (or costs were undetermined) and had low potential to increase renewable opportunities in the County were also given a low ranking.

See Section 5 of the Empower Report for more in-depth discussion of each BMP.

4.1 BMP #1: AMEND THE GENERAL PLAN AND ADD AN ENERGY ELEMENT

The General Plan expresses the County's development goals and embodies public policy relative to the distribution of future land uses, both public and private. The County's General Plan was last updated in 2011. Under State law, every local general plan must include seven elements: land use, circulation, housing, conservation, open space, noise, and safety. The Governor's Office of Planning and Research (OPR) recommends adding an eighth element in General Plans that cover energy (OPR 2003).

4.1.1 Costs and Benefits

Table 4-1 BMP #1: Amend the General Plan and add an Energy Element

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Planning	Planning & Development	Varies	CEC Grant Funding	Pursue Grant Funding with CEC	- Consolidation of Policies - Commitment to Renewable Energy	- Staff Time and Resources - Start-Up and Implementation Costs	Low

Notes: CEC = California Energy Commission

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-1 summarizes the key components of BMP #1. While adding an Energy Element to the County's General Plan has a number of advantages (i.e., consolidates major energy production and consumption policies, and reflects a commitment to renewable energy), preparation costs will vary depending on staff availability and the need to hire a consultant to do the work. Other timing considerations also include time and resources associated with developing a proposal, cost to prepare environmental documentation for the General Plan Element, expected time for public review and comment, and other actions associated with amendments to a General Plan. The CEC, through Assembly X1 13, has already awarded $3.3 million in renewable energy planning grants to five counties in 2013. Considered one of the 15 qualified counties to receive this grant funding, the County is eligible to receive any remaining funds (CEC 2016). The grant money can be applied to preparing an Energy Element, but can also be used to revise policies, ordinances, and to create streamlining programs.

4.1.2 County Actions and Recommendations

Although an Energy Element could provide a clear vision for energy-related decision-making, without further research and funding, an Energy Element could remain vague and lack specificity. If the County wants to pursue adding an Energy Element to the General Plan, it would be advisable to apply for grant funding through the CEC, or other grant funding that is available. However, because the County's current General Plan does include policies that support renewable energy (see Section 2.1.3), it may be more worthwhile to align renewable energy directives with the upcoming Climate Action Plan and to ensure its consistency with the General Plan rather than prepare a new, potentially redundant Energy Element.

4.2 BMP #2: ESTABLISH A NEW OFFICE OF SUSTAINABILITY

A local Office of Sustainability is a centralized authority responsible for developing and implementing sustainability programs and policies that advance energy, economic, and environmental priorities. The presence of an Office of Sustainability is now a prerequisite for many federal, state, and private funders, as many prefer to see a centralized office to execute their funded initiatives.

4.2.1 Costs and Benefits

Table 4-2 BMP #2: Establish a New Office of Sustainability

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Administrative	- DGS - Planning & Development - Executive's Office	- $595,000 (Wages) - $400,000–$3.5M (Budget) - 1-6 FTEs	- General Fund - Special Fees - EECBG - Grants	- Office Could Implement CREP - CREP TAC Could Advise New Office	- Commitment to Renewable Energy - Centralized Data Collection, and Consolidation - Attention from Funding Entities	- Staff Time and Resources - Start-Up, Implementation, and Operating Costs - Reorganization of County Departments/ Structure	Low

Notes: DGS = Department of General Services, EECBG = Energy Efficiency and Conservation Block Grant, FTE = Full-Time Equivalents, TAC = Technical Advisory Committee, M = Million

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-2 above summarizes the main features of BMP #2. Establishing an Office of Sustainability has a number of advantages attributed to consolidation and centralization of data, programs, resources, information, outreach, and funds. It would also demonstrate a commitment to a comprehensive approach to sustainability and would potentially increase attention from funding entities. However, samples from other Offices of Sustainability around California demonstrate that not only are there high costs associated with start-up and implementation, but ongoing operation and staffing would be expensive as well. Furthermore, a new centralized office does not fit within the County's current organizational structure and could dismantle or cause confusion on current interdepartmental coordinated sustainability efforts.

4.2.2 County Actions and Recommendations

While there are a number of advantages to creating a new Office of Sustainability, the expenditures required to keep such an office running are extensive and finding the right funding mechanism would be critical. Creating a new office would also put additional pressure on staff and resources that oversee it if it not appropriately staffed and funded. The County has an opportunity to build upon and formalize interdepartmental coordination already occurring on sustainability efforts, without restructuring the County's organizational framework. A sustainability task force or working group can be formalized to promote, track, and report on department-wide sustainability efforts. A task force has the opportunity to achieve the intended advantages of a new Office of Sustainability without the high costs associated with establishing an entirely new office.

4.3 BMP #3: ESTABLISH INSTITUTIONAL CAPACITY

Institutional arrangements can be described as the organizational and/or administrative entities that help foster investment in renewable energy and energy efficiency. It may also include increasing the number of renewable energy sources and/or providers, which provides additional choices for consumers.

4.3.1 Costs and Benefits

The institutional arrangements, or alternative energy models, examined in the CREP are CCA, DA, and SEU. These models are described in additional detail in Section 3 of this document and are summarized below in Table 4-3.

Table 4-3 BMP #3: Establish an Institutional and Financing Capability

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Community Choice Aggregation (CCA)							
Organizational/ Institutional	- JPA - County - Special District	- $400,000 (Feasibility Study) - $1-3M (Start-Up) - 21 FTEs	- Loans - Revenue	Authorize Development of a CCA Feasibility Study	- Increases Renewable Energy Sources - Reduces GHGs - More Consumer Choice - SDG&E Continues Services	- High Start-Up Costs - Relies on High Customer Participation - Vulnerable to Market Risks	High
Direct Access (DA)							
Organizational/ Institutional	CPUC	Varies	Varies	- Support Enhanced Customer Choice Through and Expanded DA	- Reduces GHGs - More Consumer Choice	- Staff Time and Resources - Implementation Costs - N/A to Residential Customers - Capped Enrollment - Limited Control	Medium
Sustainable Energy Utility (SEU)							
Organizational/ Institutional	- Nonprofit - Water Agency	Varies	- Tax-Exempt Bonds - Other Bond Financing Structures	- Explore the Formation of a Down-Scaled SEU Model	- Creates Jobs - Localized Economic Investment - Increases Investments in Energy Efficiency - Single Point of Contact	- Requires Legislative Approval - Staff Time and Resources - Start-Up and Implementation Costs	Medium

Notes: JPA = Joint Powers Authority, CPUC = California Public Utilities Commission, SDG&E = San Diego Gas & Electric, M = Million, N/A = Not Applicable

Source: Empower Devices (2015) and Ascent Environmental (2016)

4.3.2 County Actions and Recommendations

CCA. As outlined in Section 3 of this summary and in Table 4-3 above, there are a number of environmental, economic, and administrative advantages to creating a CCA. Given the significant amount of investment, resources, and staffing needed to establish and operate a CCA, it is important that the County conduct a feasibility study before arriving at a decision. However, to avoid duplicated efforts and to ensure more unified results, the County should consider other CCA feasibility studies being prepared in the region before starting to draft their own. The City of Solana Beach recently completed a feasibility study in April 2016. Also, the City of San Diego is in the beginning stages of drafting a citywide CCA feasibility study. The County should coordinate and work with the City of San Diego on these efforts to determine ways to supplement information on a county-wide level.

This feasibility study should be clear in its objectives for the program, sources of funding, and economic viability. The study should also use SDG&E load data and renewable resource assessments to identify potential projects; assess the potential size of the program in terms of number of customers and electricity sales; develop a financial and cash-flow model; predict the overall return on investment; quantify the jobs created under various procurement scenarios; and outline how start-up costs would be financed. The plan could also determine staffing requirements and examine the risks associated with establishing a CCA and how those risks would be mitigated. Feasibility studies could cost about $400,000 to complete. If the feasibility study finds that a CCA program would be viable for the County, the benefits could very well outweigh the costs.

DA. Given current restrictions, DA accounts for a small percentage of the electricity consumed in the County (i.e., 3 percent) and the ability for customers to participate is limited. The County could consider lobbying both the CPUC and/or the State legislature to open up the DA beyond its current limits.

SEU. Although a CCA program could provide a similar energy integrator role and financing opportunities, the County may wish to further explore how an SEU model can help it attain its climate goals, particularly if the County does not pursue the formation of a CCA program. Because forming an SEU requires legislative action in order to implement, The County may wish to replicate a scaled-down version of an SEU (e.g., SCEF).

4.4 BMP #4: ESTABLISH FINANCING CAPACITY

A financial mechanism is a tool for directing capital for investment and subsequent deployment of energy efficiency and renewable energy systems.

4.4.1 Costs and Benefits

PACE, Bonds, and P2P Lending/Crowdfunding are mechanisms that could be used to finance renewable energy and energy efficiency projects. These financing mechanisms are examined in detail in Section 3 of this document and are summarized below in Table 4-4.

Table 4-4 BMP #4: Establish an Institutional and Financing Capability

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Property Assessed Clean Energy (PACE)							
Financial	- JPA - COGs - Private Companies - County	N/A	- Private - Municipal Bonds - Revenue Bonds - Banks	Continue to Support PACE Programs	- Accessible Renewable Energy and Energy Efficiency Programs for County Residents - Reduces High Up-Front Costs	- Staff Time and Resources - Implementation Costs	Medium
Bonds							
Financial	Lenders	Amounts Vary	- Federal - Revenue	Use Various Bonds to Help Finance Energy Projects	- Tax Exemptions - Lower Interest Rates - Electoral Assent Not Required - High Impact - Repayment Through Savings	Staff Time and Resources	Medium
Peer-to-Peer (P2P) Lending/Crowdfunding							
Financial	Private	N/A	- Private - Individuals	Explore a PPP with a P2P Lending Entity to Establish a RE and EE specific P2P Lending Program	- Low Cost - Distributes Capital Throughout the Region - Residents Have Ownership in Energy Investment	- Start-Up and Implementation Costs - Staff Time and Resources	Low

Notes: JPA = Joint Powers Authority, COG = Council of Government, N/A = Not Available, PPP = Public Private Partnership,

Source: Empower Devices (2015) and Ascent Environmental (2016)

4.4.2 County Actions and Recommendations

PACE. Despite the challenges with FHFA over the lien priority of PACE assessments, PACE financing in the residential sector is experiencing a resurgence in California. Commercial PACE financing, not having faced the same hurdles, has continued to prove successful. The County currently has an opportunity to help educate residents about the availability of these programs and encourage participation as a means to help reduce the region's electricity demand. Increased competition among the various PACE programs should result in better product offerings for County residents. As such, the County should explore how it might support efforts to create a PACE district in the County. With additional research to determine feasibility, a PACE district could be administered by Ygrene Energy Fund, another qualified entity, or by the County.

Bonds. The County should investigate harnessing revenue bonds to help finance energy projects. In the context of renewable energy systems, revenue streams from the sale of electricity would be tied to the repayment of the bonds. In the context of energy efficiency, the bonds would be repaid via energy savings achieved through the project.

P2P and Crowdfunding. Given that P2P and Crowdfunding are relatively new, and most examples are focused on solar energy, successful models for all types of renewable energy are still uncertain. Continued research is needed to identify additional applications of Crowdfunding and P2P renewable energy projects to help determine County feasibility and its role in the process. In regards to P2P, the County could explore a public-private partnership with Mosaic, or a similar P2P lending entity, to establish a renewable and energy efficiency specific P2P lending program. Such a program could harness distributed capital throughout the region while also allowing residents to have a sense of ownership in the region's energy investments. The County could also explore a partnership with Everybody Solar, to help crowdfund solar projects in the County.

4.5 BMP #5: DEVELOP A SOLAR ENERGY WORKFORCE DEVELOPMENT INITIATIVE

The County could use Workforce Innovation and Opportunity Act (WIOA) funds to develop an initiative to create more renewable energy jobs. As part of a larger Solar Energy Workforce Development Initiative, the County could work with local partners on a major sector-driven approach to workforce development that focuses on the needs of regional employers within the renewable energy industry.

4.5.1 Costs and Benefits

Table 4-5 BMP #5: Establish a Solar Energy Workforce Development Initiative

BMP Type	Responsibility	Duration	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Programmatic	- DGS - Office of Education - Partner Organizations	- 1-3 Years (Implementation) - 3-6 Months (Start-Up)	$500,000 to $8.5M (Budgets)	WIA, via the WIOA	Determine Workforce Needs in Phase II of the CREP	- Creates Jobs - Reduces Industry Costs - County Could Partner with Organizations	- Staff Time and Resources - Start-Up Costs - High Cost of Training Programs - Time to Build Support	Medium

Notes: DGS = Department of General Services, WIA = Federal Workforce Investment Act, WIOA = Workforce Innovation and Opportunity Act, M = Million

Source: Empower Devices (2015) and Ascent Environmental (2016)

As outlined above in Table 4-5, near-term costs associated with starting a Solar Workforce Initiative are high, with significant staff time required to generate support from existing and new foundational partners for the initiative. Building support at the local, regional, state, and federal levels for redirecting money for such an initiative can also take time and requires careful organizing.

4.5.2 County Actions and Recommendations

Ultimately, more research is needed to determine whether a separate Solar Energy Workforce Development Initiative is needed in the County. The County in Phase II of the CREP could identify more specific renewable energy workforce needs and opportunities, while also determining how WIOA funds could help fund these efforts. There are also a number of other organizations providing workforce development in the County. SDG&E works with the County and nonprofits on a number of market and skill building programs and the County's Office of Education works with trade schools, community college network and four-year colleges on workforce development efforts. Rather than developing an entirely new initiative, it may be more beneficial to build upon existing programs and partner with other agencies and organizations who are already offering similar services. The County should investigate how WIOA funds could help support existing programs and how they could be expanded to support clean-sector jobs.

4.6 BMP #6: BUILD AN ENERGY ASSURANCE PLAN

An Energy Assurance Plan (EAP) is an emergency management plan that ensures that key assets within the community will remain operational in the event of a power outage. An EAP would explore how energy is used across the County and would identify key assets and mitigate negative impacts to energy disruption on these assets. It could also help the County discover ways to reduce its energy demand and make its energy supply more resilient.

4.6.1 Costs and Benefits

Table 4-6 BMP #6: Build an Energy Assurance Plan (EAP)

BMP Type	Responsibility	Duration	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Planning	- Planning & Development - DGS	6 months (Draft EAP)	- $250,000 (Budget) - 1 FTE	Potential Grant Opportunities	- Prioritize Development of an EAP - Identify Projects That Could Increase Energy Resilience	- Furthers Direction on HMPs, CAPs, EEPs, or COOPs - Addresses Energy Disruption - Increases Energy Supply Resiliency - Reduces Energy Demand - Supports Public Health - Identifies Key Assets	- Staff Time and Resources - Start-Up and Implementation Costs - High Overall Costs	Low

Notes: DGS = Department of General Services, FTE = Full-Time Equivalents HMP = Hazard Mitigation Plan. CAP = Climate Action Plan, EEP = Energy Emergency Plan, COOP = Continuity of Operations Plan

Source: Empower Devices (2015) and Ascent Environmental (2016)

Developing an EAP would identify ways to address energy disruption in the event of a crisis and increases energy supply resiliency. An EAP would also further direction on a number of planning documents, including CAPs. Similar to other planning documents, an EAP could cost around $250,000 to produce and require an average of 6 months (with consultant help) to draft.

4.6.2 County Actions and Recommendations

While energy security is a major issue, other planning documents (e.g., Hazard Mitigation Plan and CAPs) may be better positioned to begin to outline key assets and ways to increase energy supply resiliency rather than an EAP. SDG&E is also already pursuing methods to address energy disruption, so collaboration on information and tactics is important. Because financing options are not clearly laid out to fund an EAP, the same issues could be addressed in future planning or updates to pertinent documents.

4.7 BMP #7: INCREASE THE COUNTY'S PERCENTAGE OF ENERGY DERIVED FROM VARIOUS RENEWABLE ENERGY TECHNOLOGIES

As described in Section 2.2 the County is currently capturing 2.3 percent of its annual electricity needs through a number of small PV systems as well as through a PPA completed in 2011. The County could increase its percentage of energy derived from various renewable energy technologies through policies and administrative actions.

4.7.1 Costs and Benefits

Table 4-7 BMP #7: Increase the County's Percentage of Energy Derived from Various Renewable Energy Technologies

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Administrative	- Planning & Development - DGS	- $4,000 - $30,000 (Residential Wind Turbines) - $24,000 – 34,000 (PV Systems) - $4,000- $8,000 (Solar Water Heaters)	- Incentives - Federal Income Tax Credits (Residents)	- Analyze Long-Term Costs and Benefits of Increasing the Percentage of Renewable Energy Used - Review Permitting Process for Solar Water Heaters	- Reduces GHGs - Controls Utility Costs - Achieves Emissions Targets - Could Align with CAP Targets	- Staff Time and Resources - Start-Up and Implementation Costs	High

Notes: DGS = Department of General Services, PV = Photovoltaic, GHG = Greenhouse Gas, CAP = Climate Action Plan

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-7 summarizes the main components of BMP #7. Costs associated with installing specific renewable energy technologies vary, but can be made more affordable to residents and building owners through incentives and tax credits. However, it would be important to streamline permitting processes for renewable technologies and a significant amount of staff time and resources would be needed.

4.7.2 County Actions and Recommendations

Increasing the renewable energy mix in the County would provide environmental co-benefits and would also help towards achieving legislative targets. Because the County is currently using a very small amount of renewable energy, there is an opportunity to increase this percentage mix by implementing small changes. The exact percentage reduction should be aligned with RPS requirements and should also help achieve GHG reduction targets identified in the CAP.

4.8 BMP #8: ESTABLISH A RENEWABLE ENERGY GROUP PROCUREMENT INITIATIVE

4.8.1 Costs and Benefits

A Renewable Energy Group Procurement Initiative (GPI) is a regional, multi-agency collaborative purchase of renewable energy equipment (e.g., rooftop solar PV panels) for public agency facilities (e.g., city halls, fire stations, libraries, and community centers).

Table 4-8 BMP #8: Establish a Renewable Energy Group Procurement Initiative (GPI)

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Administrative	- DGS - Third Party (Owner of Property)	- Varies - ½ FTE for 3 Months, then 10 Hours per Month for 1-3 Years - Technical, Financial, and Legal Costs.	PPA	- Research lessons learned from SV-REP - Research GPI Implementation Along with CCA - REN & Microgrid Projects - Encourage SANDAG to pursue a GPI - Consider Tribal Members in a County-Led GPI	- Economies of Scale - Reduces Redundancies - Increases Purchasing Power - Economic Activity - Creates Jobs	- Staff Time and Resources - Start-Up and Implementation Costs - Staffing Budget	Low

Notes: DGS = Department of General Services, FTE = Full-Time Equivalents, PPA = Power Purchase Agreement, CCA = Community Choice Aggregation, SV-REP = Silicon Valley Renewable Energy Project, REN = Regional Energy Network, SANDAG = San Diego Association of Governments

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-8 summarizes the main attributes of BMP #8. A major benefit of a GPI is the ability to obtain significant discounts when purchasing products and services in bulk. Group purchasing can also lower transaction costs, staff time, organizational burden, and risk for each participant. The major disadvantage of a GPI is that the amount of collaboration needed amongst stakeholders, staff, and participants in order to implement a successful program is significant.

4.8.2 County Actions and Recommendations

A significant amount of research is still needed to determine whether a GPI would be feasible for the County, including how GPI implementation would work alongside a CCA or Microgrid (see BMP #15). While there is potential for cost savings, this may not be the best use of current staff time and resources due to high level of coordination needed to implement a GPI. There are also a number of technical, financial, and legal costs to consider. For more information on costs see Section 5.9.1.4 of the Empower Report.

4.9 BMP #9: PARTICIPATE IN THE CREATION OF A NEW REGIONAL ENERGY NETWORK

First introduced in California in 2012, RENs were designed to give local governments more flexibility and independence in managing rate-payer funded energy efficiency programs. A REN is a formal collaboration between local governments in which they act as energy efficiency program administrators. A REN can design and implement energy efficiency programs and can submit proposals directly to the CPUC. REN programs are designed to supplement, not supplant existing IOU efforts in energy efficiency programs.

4.9.1 Costs and Benefits

Table 4-9 BMP #9: Participate in the Creation of a New Regional Energy Network (REN)

BMP Type	Responsibility	Cost	Duration	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Programmatic	- DGS - Partners	$18.6 M - $22.4 M (Yearly Budget)	2 Years (Start Up)	SDG&E Funding via rate-payers as required by CPUC	- Approach CPUC as a Third Pilot REN with SANDAG - Participate in REN Development Opportunities in the Region	- Funding Resource Outside IOU - Formalizes County Commitment to Renewable Energy - Reduces Redundancies	- Staff Time and Resources - Long Start-Up	Low

Notes: DGS = Department of General Services, M = Million, SDG&E = San Diego Gas & Electric, REN = Regional Energy Network, SANDAG = San Diego Association of Governments, IOU = Investor-Owned Utility

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-9 summarizes the key components of BMP #9. Through a REN, there is the potential to raise energy funds outside of traditional IOU channels with greater ease. It also formalizes the County's commitment to renewable energy, and creates less duplication among jurisdictions. However, full development of a REN could take years and costs associated with implementation are high, with budgets ranging from $18 to 22 million for other RENs. Existing RENs in California (i.e., SoCalREN and BayREN) currently only target energy efficiency and do not address opportunities to advance renewable energy.

4.9.2 County Actions and Recommendations

The County should continue to monitor CPUC regulations for any changes related to the formation of a REN and the role of Local Government Partnerships. Because other RENs do not specifically address opportunities to advance renewable energy, additional efforts would be needed to identify if a REN could advance renewable energy in the County. Staff time and resources needed to coordinate the start-up of a REN should be considered. The County could continue to collaborate with regional partners, such as SANDAG and other cities, to identify future opportunities to create a REN.

4.10 BMP #10: CREATE A RENEWABLE ENERGY OVERLAY / COMBINING ZONE

Overlay zoning is a regulatory tool used to streamline the planning process so that renewable energy project construction can occur more expediently. Implemented by amending the County's existing zoning code, an overlay zoning ordinance would provide a supplemental layer of regulations for purposes of renewable energy development. A renewable energy overlay would be placed over existing base zone(s) and would identify requirements and allowable uses for renewable energy development. The process for adopting an overlay zone are the same for adopting a zoning or rezoning provision. The overlay provisions, as well as any changes to the County's zoning map, must be approved by the Board of Supervisors for adoption. The overlay zone must also be in line with objectives of the County's General Plan.

4.10.1 Costs and Benefits

Table 4-10 BMP #10: Create a Renewable Energy Overlay / Combining Zone

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Planning	Planning & Development	$100,000 - $250,000	General Fund	- Define the Purpose, Identify Areas, and Rules of the Overlay Zone District.	- Reduces Processing Time for Renewable Energy Projects - Saves Developers Time and Money - Allows for Better Siting of Renewable Energy Development	- Staff Time and Resources - High Start-Up Costs	High

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-10 above summarizes the main features of BMP #10. An overlay zone is an alternative to the existing segmented approach of re-writing the zoning code to approve a specific use in a particular area. Creating an overlay zone can help speed-up the permitting process by saving time and certainty for both developers and County staff. It can also help ensure renewable energy projects are sited thoughtfully considering both near- and long-term uses and also environmentally sensitive areas.

4.10.2 County Actions and Recommendations

A renewable energy overlay zone can save the developer and the government money by reducing planning process time and providing more certainty to investors. It also indicates to investors that the County wants to develop renewable energy resources in specific locations in the County. While it may be difficult to secure funding for an overlay zone, the potential benefits for creating an overlay zone are worth considering. The County could better direct renewable energy development and identify opportunity areas that consider current and proposed land uses and environmental conditions.

4.11 BMP #11: DEVELOP A BUILDING ENERGY DISCLOSURE PROGRAM

Building energy disclosure involves the analysis and documentation of a building's energy performance as a way to drive improvements in energy efficiency and reduce energy use. Establishing a program would help to incorporate a home or commercial building's energy performance into its overall value, thus further incentivizing energy efficiency improvements.

4.11.1 Costs and Benefits

Table 4-11 BMP #11: Establish Building Energy Disclosure Policies

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Policy	- DGS - Building Services	- Monitoring and Verification Costs - Consultant Fees - Incentive Payments to Building Owners - 1 FTE - Residential: $200-500 (Energy Ratings) and $200-$400 (Energy Audit)	General Fund	- Inventory Commercial Buildings - Research Role of Incentives in Disclosure Policies - Create Database of Building Performance	- Buyers Access Property Data - Sellers Can Distinguish Themselves	- Staff Time and Resources - Start-Up and Implementation Costs - Staffing Requirements - Potentially Significant Costs to Homeowners - Costs Vary Depending on Building Type	Low

Notes: DGS = Department of General Services, FTE = Full-Time Equivalents

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-11 summarizes the key components of BMP #11. By providing information on energy-related costs, building owners can make more informed decisions on cost-effective improvements. Home sellers also benefit by being able to distinguish themselves from similar homes in the market. Building energy disclosure is especially beneficial in the commercial sector as energy costs can affect their bottom line. A disadvantage to this program is that the monitoring and verification needed for implementation would be quite expensive for the County. Collecting data to support the program would also be costly and hiring an outside consultant may be needed for proper project oversight and implementation.

4.11.2 County Actions and Recommendations

To begin to develop a Building Energy Disclosure Program, the County could start by creating an inventory of commercial buildings and a database of building performance. The County could also research the role of incentives in disclosure policies. While a Building Energy Disclosure Program could provide the County with a lot of relevant data, the actual coordination and manpower needed to create, implement and oversee the program is quite high for the overall end gain. It would take time and money to develop an appropriate rating system and the County would likely need to incentivize customers joining the program (e.g., subsidizing meters for building owners).

4.12 BMP #12: PROMOTE MORE AGGRESSIVE BUILDING STANDARDS INCLUDING THE SIGNIFICANT RETROFIT OF EXISTING BUILDINGS

Building energy efficiency standards in California are designed to generally ensure new and existing buildings achieve energy efficiency and preserve outdoor and indoor environmental quality. Building energy codes set minimum standards to which buildings can be constructed. These measures are listed in Title 24 Part 6 of the California Code of Regulations. The County could establish a stronger array of programs and policies for new construction and for significant retrofits of existing buildings.

4.12.1 Costs and Benefits

Table 4-12 BMP #12: Promote More Aggressive Building Standards Including the Significant Retrofit of Existing Buildings

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Policy	- DGS - Building Services	Additional $2,300 to New Residential Construction[1]	General Fund	- Create ZNE definition and policy for County - Work to Include Prewiring for EVs for Residential and Commercial Buildings	- Creates Market Solutions - Building Professional Training - Implementation Costs Can Be Recovered Through Energy Savings - Reduces GHGs	- Staff Time and Resources - Start-Up and Implementation Costs - Additional New Construction Costs	Low

Notes: DGS = Department of General Services, ZNE = Zero Net Energy, EV = Electric Vehicle, GHG = Greenhouse Gas

1 Costs to Implement 2013 Title 24 added $2,300 to New Residential Construction Projects

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-12 above summarizes the main details of BMP #12. By establishing more aggressive building standards including significant retrofits of existing buildings, the County can cost-effectively meet its own renewable energy goals. By continuing to adopt advanced energy standards the County can continue to lead by example by promoting stricter construction practices. Costs to implement 2013 Title 24 standards added $2,300 to new residential construction projects, which homeowners saved in energy costs within the first 18 months of occupancy. Energy efficient construction provides multiple long-term benefits to building owners and occupants.

4.12.2 County Actions and Recommendations

While there is an opportunity to achieve cost-savings and energy efficiency through stricter building standards, as outlined in Section 2.1.2 of this summary, the State has already approved more aggressive building standards and this BMP is already being addressed. The 2016 Title 24 standards (effective January 1, 2017) will result in about 28 percent less energy use for lighting, heating, cooling, ventilation and water heating than the 2013 Title 24 standards for single-family residences. For non-residential land uses, the 2016 standards would result in 5 percent less energy use than those built to 2013 standards. Additionally, the 2016 CALGreen Building Standards (effective January 1, 2017) will require pre-wiring for electric vehicles. The State has also established ZNE building goals to have all new residential construction be ZNE by 2020 and all new commercial construction be ZNE by 2030. In regards to retrofits of existing buildings, there is opportunity to reduce energy use, but defining what constitutes a “significant” retrofit could prove to be controversial. Implementation of such standards would also increase staff time and resources who would have to deal with implementation.

4.13 BMP #13: INCREASE RENEWABLE ENERGY EDUCATION AND OUTREACH

Education and outreach programs support and often enable technology-heavy renewable energy programs and policies by educating public policy makers and citizens about potential options, thus resulting in more exposure (and sometimes more funding) for these practices. Education and outreach efforts are often considered a separate and distinct program under government operations area since they tend to cut across multiple sectors. Education and outreach programs can be grouped into five categories; meetings and special events; general renewable energy campaigns and outreach products; internet-based outreach; publications; and technology and issue-specific campaigns, including financing information.

4.13.1 Costs and Benefits

Table 4-13 BMP #13: Increase Renewable Energy Education and Outreach

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Programmatic	- Planning & Development - DGS - Other County Departments	Varies. $10,000 - $1M[1]	- General Funds - Pursue Grant Funding - Partnerships	- Update County's Website for RE Efforts - Consider Mobile Apps with Resources - Partner to Leverage Marketing and Outreach	- Educates Residents and Policy Makers - Increases Funding Opportunities - Encourages Innovation	- Staff Time and Resources - Start-Up and Varied Implementation Costs	Medium

Notes: DGS = Department of General Services, RE = Renewable Energy, M = Million

1 Outreach Can Account for 10 Percent of Program Budgets

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-13 summarizes the key components of BMP #13. Greater awareness of renewable energy leads to enhanced customer knowledge and increased renewable energy use. This can lead to more renewable energy projects, particularly rooftop solar applications. Varying substantially in costs, education and outreach programs can range from a $10,000 renewable energy information kiosk in a public library to a $1 million energy awareness project for local governments managed by IOUs. Other energy outreach programs in California can range anywhere from $50,000 to $250,000. Education and outreach programs can account for 10 percent of total program costs on large multi-year renewable energy projects.

4.13.2 County Actions and Recommendations

There are a number of resources in the County that are already providing education and outreach programs in clean energy (e.g., SDG&E). There is an opportunity to promote solar PV and EVs in the County through education and outreach. The County could also utilize its own website to promote these programs. Sonoma County, Los Angeles County, San Francisco, and Santa Monica all have websites that invite participation in renewable energy programs, while also educating the public about energy issues. Given that education and outreach costs can vary by so much, it is important that the County identify what types of programs would be most successful and cost effective. The County could also look to partner with other local agencies and organizations that are already focused on renewable energy education and outreach. If the County chose to pursue a REN, a number of outreach programs could also be implemented through the REN framework.

4.14 BMP #14: START A COMMUNITY SOLAR INITIATIVE

Community Solar is an innovative approach to reducing GHG emissions and lowering the cost of solar PV electricity through economies of scale. Community Solar helps avoid the traditionally high upfront costs of solar by spreading the investment among several customers. Community Solar programs range in size from those small enough to be installed on a building's rooftop to larger ground-mounted systems that can be located on acres of land.

4.14.1 Costs and Benefits

Table 4-14 BMP #14: Start a Community Solar Initiative

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Programmatic	- Utility - Privately-Owned - Non-Profit	N/A	- Private Investment - Community Investment - Pursue Grant Opportunities	- Encourage County Subscription to Community Solar - Reserve Portion of Projects to Low-Income Customers - Get Involved with Discussion Surrounding SB 43	- Limits Upfront Solar Costs - Supports Solar Industry - Reduces Utility Transmission and Distribution Costs - Compatible with CCA - Keeps Revenue with County - Reduces GHGs	- Staff Time and Resources - Start-Up and Implementation Costs	High

Notes: CCA = Community Choice Aggregation, GHG = Greenhouse Gas, N/A = Not Available

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-14 above summarizes the main attributes of BMP #14. Because many people are not able to install solar PV systems on their rooftops for a number of reasons (i.e., limited or no space, financial restrictions, living in a rental or multi-family unit, or poor rooftop solar orientation). Community Solar can help consumers gain access to solar opportunities. It also minimizes the usual high upfront solar costs and supports the local solar industry. In 2015, through SB 43, the CPUC began implementation of the Green Tariff Shared Renewables program to expand access of renewable energy resources for consumers through the use of community renewable programs. Because regulations following passage of SB 43 have yet to be finalized, specific costs for the program are unknown.

4.14.2 County Actions and Recommendations

Community Solar offers consumers better access to solar opportunities and could also promote the more solar development in the County. The County should be involved in tracking the regulatory decisions established by SB 43 and consider how it could implement a Community Solar initiative in the future. The County should also look to other cities that have implemented Community Solar (e.g., City of Carlsbad).

4.15 BMP #15: ESTABLISH A MICROGRID AND DEVELOP POLICIES RELATED TO MICROGRIDS

A microgrid is a self-contained power system set up for a small geographic region. It usually has one or more power sources (often renewable), advanced energy storage, and an intelligent energy management system. Microgrids tend to be cleaner and more efficient than traditional power sources because they often utilize solar, wind, and/or combined heat and power to generate power. A microgrid can operate while connected to the main grid, but can automatically disconnect itself if the main grid goes down. When disconnected, the microgrid can continue to operate, providing electricity, heat, and cooling. There are several microgrid projects in the San Diego region set up by the U.S. Department of Defense and universities in Southern California. The University of California San Diego (UCSD) microgrid is one of the larger, premier, state-of-the-art microgrid projects in the world ensuring reliable power to 45,000 people and 450 buildings.

4.15.1 Costs and Benefits

Table 4-15 BMP #15: Establish a Microgrid and Develop Policies Related to Microgrids

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Programmatic/ Policy	- Utility - Partners	$15.1M[1]	- US DOE - SDG&E - CEC - Other Partners	- Partner with SDG&E and UCSD on Microgrid Policy Development - Identify Sites in the County that Could be Tied Into a Microgrid - Identify Potential Locations for Microgrid Siting	- Continued Operation if Main Grid Fails - Increases Efficiency - Increases Security and Safety - Reduces GHGs	- Staff Time and Resources - Start-Up and Implementation Costs - Staffing Requirements	High

Notes: M = Million, DOE = Department of Energy, SDG&E = San Diego Gas & Electric, CEC = California Energy Commission, UCSD = University of California San Diego, GHG = Greenhouse Gas

[1] Cost to Build a 4MW Demonstration Microgrid in Borrego Springs, Which Was Not 100 Percent RE.

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-15 summarizes the key components of BMP #15. Microgrids offer economic, environmental, power quality, and security benefits. The primary benefit of a microgrid is reliability and its ability to keep critical infrastructure, such as transportation systems, hospitals, data centers, water treatments facilities, police and fire departments, operating, particularly during times of crisis. Microgrids work well for large institutions like universities, hospitals, and multiple-unit government facilities because of the significant amount of electricity demand concentrated in one area. Microgrids can be expensive; a 4 MW demonstration microgrid project in Borrego Springs cost $15.1 million to build.

4.15.2 County Actions and Recommendations

Increasing the number of microgrids in the County could have a number of benefits to the County. Borrego Springs was funded through a variety of agencies and partners (i.e. DOE, SDG&E, CEC, IBM, Motorola), suggesting that microgrids are an important asset and worth investing in. Microgrids need to be connected and part of a larger renewable energy plan and direction to be effective. The County could begin by partnering with SDG&E and UCSD on microgrid policies and identifying potential sites in the County where microgrids would be ideally suited.

4.16 BMP #16: ESTABLISH ELECTRIC VEHICLE AND CHARGING PROGRAMS

As the first step toward integrating a more complete review of transportation services, the County could establish EV and charging programs. California plug-in vehicles sales represent more than 40 percent of the national market and is continuing to grow. This growth necessitates development of additional infrastructure (i.e., charging stations) to support this new type of market. Because EVs both consume and produce electricity, they are also potential sources of intermittent power and a place to store electric power.

4.16.1 Costs and Benefits

Table 4-16 BMP #16: Establish Electric Vehicle (EV) and Charging Programs

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Programmatic	- DGS - Planning & Development	$4,000 per EV Parking Space	- Rebates for EVs - CEC - CSE	- Consider Public EV Charging Stations as Future Revenue Generation - Promote a Solar- and EV-Ready Ordinance - Work with SDG&E on Siting EV Charging Stations - Encourage Prewiring for Level 2 EVSE as a Percentage of Total Spaces in Multi-Family Buildings - Standardize Permitting and Inspection Processes	- Improves AQ and Health - Reduces GHGs in line with the CAP - Reduces Dependence on Petroleum - Reduced Fuel Costs - Increases Availability of Charging Station Infrastructure - State and Local Rebates	- Staff Time and Resources - Start-Up and Implementation Costs	High

Notes: DGS = Department of General Services, EV = Electric Vehicle, CEC = California Energy Commission, CSE = Center for Sustainable Energy, AQ = Air Quality, GHG = Greenhouse Gas

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-16 above summarizes the main attributes of BMP #16. EV initiatives and programs can help the County meet CAP-related and other GHG emission reduction goals. The San Diego region already has an extensive EV network in place, so further investment in programs will continue to build market share and could help expand EVs into the County. While costs of specific programs are not available, the cost for an EV parking space is about $4,000. There are also a number of rebates and incentive programs to encourage EV development and use.

4.16.2 County Actions and Recommendations

In 2012, the San Diego Association of Governments (SANDAG) established the Regional Electric Vehicle Infrastructure (REVI) Working Group which assessed planning and siting issues and typical barriers to EV development. The County could collaborate with the REVI Working Group, who has already done a lot of research on creating and adopting a formal plug-in vehicles program. The County could also work with SANDAG to identify optimum future locations for public EV charging stations that are in line with long-term development and growth areas. From a planning process perspective, the County could also work with the County's Air Pollution Control District (APCD) and other County Departments to coordinate a larger regional program with incorporated towns and cities to develop standardized permitting and inspection processes, include EVs in parking standards, and streamline zoning codes. Given that the EV market is only expected to grow and more money will likely be provided to support EVs, the County should consider ways to further promote EVs.

4.17 BMP #17: DEVELOP A LEGISLATIVE STRATEGY TO SUPPORT RENEWABLE ENERGY PROGRAMS

Legislative outreach that supports renewable energy programs was recommended by the CREP TAC on August 17, 2016. The recommendation aims to enact legislative proposals and respond to Federal and State legislation that supports renewable energy programs.

4.17.1 Costs and Benefits

Table 4-17 BMP #17: Develop a Legislative Strategy to Support Renewable Energy Programs

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Policy	- OSIA	$250,000	- General Funds	- Sponsor Renewable Energy Policy - Prioritize Renewable Energy Advocacy Efforts - Develop Legislative policy and guidelines	- Educates Residents and Policy Makers - Increases Renewable Energy Opportunities	- Staff Time and Resources - Start-Up and Implementation Costs	Medium

Notes: OSIA = Office of Strategy and Intergovernmental Affairs

Source: Ascent Environmental (2016)

Table 4-17 summarizes the key components of BMP #17. A legislative strategy could help educate residents and policymakers on pertinent legislation that supports renewable energy development that the County can take advantage of. The County of San Diego has an Office of Strategy and Intergovernmental Affairs (OSIA) that manages a Legislative Program for the Board of Supervisors. Development and implementation of legislative strategy to support renewable energy is estimated to cost $250,000.

4.17.2 County Actions and Recommendations

A legislative strategy can help the County take advantage of legislation that supports renewable energy programs. The County could work with OSIA to develop a legislative strategy that builds upon their existing legislative review process. The County could develop a strategy to address legislation that supports: Consumer Choice Alternative Energy Models such as CCAs, DA and SEU; financing and funding opportunities such as PACE, P2P, Lending, Crowdfunding and Greenhouse Gas Reduction Fund monies; Community Solar Initiatives; Net Energy Metering; Microgrids; and Regional Energy Networks, among others.

5 ECONOMIC ANALYSIS

5.1 ENERGY EXPENDITURES IN THE COUNTY

The economic analysis, summarized here and provided in full in Section 3 and Appendix A1 of the Empower Report, examines the possible economic benefits within the unincorporated areas of the County if households and businesses were to shift away from current investment patterns to pursue a more productive and cleaner energy future. More specifically, the benefits of renewable energy and energy efficiency resources are assessed, while also looking at the scale of investment necessary to drive those improvements.

With an estimated 505,000 residents, the unincorporated areas account for about 16 percent of the County's total population. Table 5-1 looks at the summary of energy expenditures in 2012 for the County as a whole, as well as the unincorporated areas. The County spends an estimated $9 billion for energy, while the unincorporated County spend around $1.6 billion. Transportation expenditures are the highest for the entire County, accounting for 60 percent of total energy costs. Natural gas and electricity account for 15 and 39 percent, respectively, of total energy costs. Given the large amount of energy expenditures with the County's current energy mix, there is opportunity for reduction by investing in renewable energy and overall energy efficiency.

Table 5-1 Summary of Energy Expenditures in 2012[1]

	Natural Gas	Electricity	Transportation	Total Energy[2]
San Diego County[3]	$389 M	$3,141 M	$5,485 M	$9,014 M
Unincorporated Areas	$40 M	$504 M	$1,025 M	$1,569 M
Total Expenditures from Unincorporated Areas	10.3%	16.0%	18.7%	17.4%

Notes: For more detailed analysis, see Empower Report. M = Millions
[1] Numbers are presented in 2012 dollars
[2] Total energy does not include use of coal, propane, compressed natural gas, and marine fuels, among other sources
[3] Includes both the incorporated and unincorporated areas of the County
Source: Empower Devices (2015)

5.2 METHODOLOGY

Using different economic scenarios with different patterns of energy use, known as "Innovation Scenarios," the analysis compares how different investments and technologies might benefit jobs, income, and net gains in overall economic activity in the County. In addition to the four Innovation Scenarios, a future "Reference Case" is used as a baseline for what the economy might look like assuming no further changes in the region's energy makeup (i.e., business-as-usual). These four Innovation Scenarios provide different insights into future energy production and consumption patterns. Analysis of the four scenarios uses the DEEPER Modeling System to determine the net economic benefits of the different investment patterns.

While there are many new emerging technologies that will undoubtedly shape future energy markets, the following innovation scenarios only explore the known and more established set of renewable energy and energy efficiency technologies:

- **Reference Case.** The Reference Case assumes that from 2015-2050 the unincorporated areas of the County will continue to follow current trends in 2012. It assumes the regional population, employment, and overall economy are projected to grow annually at about 1.1 percent, 1.5 percent, and 2.6 percent, respectively. Electricity use is projected to grow 1.4 percent annually. Natural gas consumption is projected to grow at a slower pace, about 0.5 percent per year. Real costs of energy are anticipated to escalate 1.3 percent and 3.2 percent for electricity and natural gas, respectively. The combined energy expenditure will expand at an average 2.8 percent per year, or about 0.2 percent faster than the economy as a whole. It also assumes that the State's RPS will continue to require that 33 percent of all electricity sales be provided with renewable technologies through 2050.

- **Innovation Scenario I.** Innovation Scenario I assumes that the RPS requirement of having a 33 percent renewable energy mix by 2050 will be met. It also assumes that efficiency of electricity will increase to 20 percent above the normal rate of improvement, and natural gas will increase to 15 percent by 2050.
- **Innovation Scenario II.** Innovation Scenario II assumes that the RPS requirement will be increased to 50 percent by 2030, as proposed by Governor Jerry Brown in his inaugural address on January 5, 2015 and in compliance SB 350, The Clean Energy and Pollution Reduction Act of 2015. It assumes that energy efficiency will reach 25 percent of total electricity consumption above the normal rate of improvement and natural gas will increase to 15 percent by 2050.
- **Innovation Scenario III.** Innovation Scenario III assumes that the RPS requirement will reach 50 percent in 2030, and then 80 percent in 2050. Again, electric energy efficiency is assumed to increase to 25 percent and natural gas to 15 percent by 2050.
- **Innovation Scenario IV.** Innovation Scenario IV explores the prospect of an RPS that climbs to 50 percent in 2030, and then to a full 100 percent in 2050. Electric efficiency is assumed to increase to 25 percent and natural gas to 15 percent by 2050.

5.3 RESULTS

5.3.1 Economic Benefits

Table 5-2 below shows the comparison of energy expenditures for the Reference Case and four Innovation Scenarios from 2015-2050 (in 2012 dollars). Assuming energy bill expenditures would be the same in 2015, all four Innovation Scenarios show decreasing expenditures as time passes, with ultimate reductions ranging from 16 percent in Scenario I to as much as 49 percent in Scenario IV by 2050 as compared to the Reference Case. The findings are consistent with the notion that each Scenario would provide increasing mixes of renewable energy options and efficiency, which would in turn translate to lower energy bill expenditures in the County as soon as 2025.

Table 5-2 Energy Bill Expenditures in the Unincorporated County (2015-2050)[1]

Energy Expenditure	2015	2025	2040	2050	% Change Reduction in 2050 to Reference Case
Reference Case	622	821	1,200	1,547	0%
Scenario I	622	801	1,106	1,294	16%
Scenario II	622	797	1,031	1,132	27%
Scenario III	622	796	967	922	40%
Scenario IV	622	796	934	797	49%

Notes: Numbers may not add up due to rounding. For more detailed analysis, see Empower Report. M = Millions

[1] Numbers are presented in 2012 dollars

Source: Empower Devices (2015)

Table 5-3 below summarizes the key economic impacts for each Innovation Scenario, in terms of annual average and cumulative costs and savings. The analysis weighs the costs of each Innovation Scenario, with the economic benefits that each scenario provides. Costs include policies or programs needed to implement each scenario, along with technological investments needed to increase energy efficiency and create more renewable energy options. Economic benefits include net energy savings and net job creation. Scenario I offers the highest benefit-cost ratio of 5.3, with minimal investment and program costs, for potential average energy savings of $53 million a year. Compared to the Reference Case, this activity supports an average annual gain of 600 jobs for the County. As the mix of renewable energy increases in the scenarios, so do costs associate with program development and technological investments. This does, however, translate to larger net energy savings (e.g., Scenario IV net energy savings is three times that of Scenario I) and more jobs created.

For more detailed analysis, including specific breakdown of economic impacts by 5-year increments, refer to Section 3.3.2.2 of the Empower Report.

Table 5-3 Annual Average and Cumulative Economic Impacts of Innovation Scenarios

	Benefit-Cost Ratio	ANNUAL AVERAGE[1]					CUMULATIVE[1]	
		Program/Policy Costs	Technological Investments[2]	Energy Bill Savings[3]	Net Energy Savings[4]	Net Job Creation	Investments	Energy Bill Savings
Scenario I	5.3	$2 M	$17 M	$71 M	$53 M	600	$500 M	$2,600 M
Scenario II	2.3	$5 M	$45 M	$120 M	$99 M	1,000	$1,900 M	$4,300 M
Scenario III	1.9	$9 M	$84 M	$167 M	$137 M	1,500	$3,100 M	$6,000 M
Scenario IV	1.9	$11 M	$103 M	$192 M	$161 M	1,800	$3,700 M	$6,900 M

Notes: Numbers may not add up due to rounding. For more detailed analysis, see Empower Report. M = Millions

[1] Annual and cumulative numbers are presented as 2012 dollars

[2] Technological investments include investments that promote energy efficiency and renewable energy

[3] Energy bill savings include savings from the industrial, residential, and commercial sectors

[4] Net Energy savings subtract policy/program costs (1st column) with technological investments (2nd column).

Source: Empower Devices (2015)

5.3.2 Environmental Benefits

In addition to economic benefits, reducing energy waste and converting to a larger mix of renewable energy sources, would have environmental benefits to consider as well. As shown in Table 5-4, implementation of each Innovation Scenario would result in reduced carbon dioxide (CO_2) emissions.

Table 5-4 Environmental Benefits of Innovation Scenarios

	CO_2 Emissions as Percent of 2050 Reference Case (%)
Scenario I	75
Scenario II	61
Scenario III	35
Scenario IV	19

Notes: Source: Empower Devices (2015)

The combination of renewable energy and energy efficiency technologies would equate to emissions reduction of 0.45 million metric tons of CO_2 by 2050, which is 75 percent of the Reference Case. Scenario IV, would reduce emissions by 1.34 million metric tons of CO_2 by 2050, which is 19 percent of the Reference Case. For additional environmental benefits for Scenario IV, see Table 3-5 of the Empower Report.

6 CONCLUSION

The CREP was initiated as a major first step towards promoting renewable energy in the County. The County has a number of options to consider for later adoption and implementation as part of the CREP. Table 6-1 below summarizes the BMPs proposed, sorted first by "top priority" BMPs, or ones that offer the most benefit and opportunities for renewable energy development and growth. The list is then summarized by return on investment potential. For more analysis regarding recommendations, see the Executive Summary of this report.

Table 6-1 Summary of CREP BMPs

BMP #	Title	Conclusion	Return on Investment
3	Establish Institutional Capacity	**Top Priority:** Develop a CCA Feasibility Study	High[1]
14	Start a Community Solar Initiative	**Top Priority:** Track Community Solar Legislation	High
15	Establish a Microgrid and Develop Policies Related to Microgrids	**Top Priority:** Develop Policies & Identify Sites for Future Microgrids	High
10	Create a Renewable Energy Overlay / Combining Zone	**Top Priority:** Reduces Planning Process Time & Increases Certainty	High
7	Increase the County's Percentage of Energy Derived from Various Renewable Energy Technologies	Better Addressed in the County's CAP	High
16	Establish Electric Vehicle Programs	Better Addressed in the County's CAP	High
4	Establish Financing Capacity	Establish Appropriate PACE Partnership/Collaboration	Medium[2]
5	Develop a Solar Energy Workforce Development Initiative	Establish Appropriate Partnership/Collaboration	Medium
13	Increase Renewable Energy Education and Outreach	Establish Appropriate Partnership/Collaboration	Medium
17	Develop a Legislative Strategy to Support Renewable Energy Programs	Establish Collaboration with OSIA	Medium
1	Amend the General Plan and add an Energy Element	Better Addressed in the County's CAP	Low
2	Establish a New Office of Sustainability	High Admin/Operating Costs	Low
6	Build an Energy Assurance Plan	Better Addressed in the County's CAP	Low
8	Establish a Renewable Energy Group Procurement Initiative	High Level of Coordination Needed	Low
9	Participate in the Creation of a New Regional Energy Network	High Administration Burden	Low
11	Develop a Building Energy Disclosure Program	High Admin/Operating Costs	Low
12	Promote More Aggressive Building Standards Including the Significant Retrofit of Existing Buildings	Current Legislation Already Addresses Issue	Low

Notes: CCA = Community Choice Aggregation, CAP = Climate Action Plan, OSIA = Office of Strategy and Intergovernmental Affairs

[1] CCA was determined to have a "high" return on investment ranking, DA, and SEU were both determined to have a "medium" return on investment ranking

[2] PACE and Bonds were determined to have a "medium" return on investment ranking. P2P/Crowdfunding was determined to have a "low" return on investment ranking.

Source: Empower Devices (2015)

7 REFERENCES

ARB. *See* California Air Resources Board.

California Air Resources Board. 2011b. *Facts About the Advanced Clean Cars Program.* Available at http://www.arb.ca.gov/msprog/zevprog/factsheets/advanced_clean_cars_eng.pdf. Accessed August 16, 2016.

California Energy Commission. 2012a. *Integrated Energy Policy Report Update*. Available: http://www.energy.ca.gov/2012publications/CEC-100-2012-001/CEC-100-2012-001-CMF.pdf. Accessed: August 16, 2016.

______. 2012b (May). *Building Energy Efficiency Standards: Frequently Asked Questions.* Available: http://www.energy.ca.gov/title24/2013standards/rulemaking/documents/2013_Building_Energy_Efficiency_Standards_FAQ.pdf. Accessed August 18, 2016.

______. 2013 (July). *Impact Analysis - California's 2013 Building Energy Efficiency Standards.* Available: http://www.energy.ca.gov/2013publications/CEC-400-2013-008/CEC-400-2013-008.pdf. Accessed August 18, 2016.

______. 2015a. *2016 Building Energy Efficiency Standards: Frequently Asked Questions*. Available: http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/2016_Building_Energy_Efficiency_Standards_FAQ.pdf. Accessed August 18, 2016.

______. 2015b. (June). *2016 Building Energy Efficiency Standards: Adoption Hearing*. Presentation on June 10, 2015. Available: http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/ 2015-06-10_hearing/2015-06-10_Adoption_Hearing_Presentation.pdf. Accessed August 18, 2016.

______. 2015c. (December). *Renewable Energy Projects in Development with Existing and Approved Transmission Lines.* Available: http://www.energy.ca.gov/maps/renewable/ renewable_development.pdf. Accessed August 18, 2016.

______. 2016. *Renewable Energy and Conservation Planning Grants*. Available: http://www.energy.ca.gov/maps/renewable/renewable_development.pdf. Accessed August 22, 2016.

CEC. *See* California Energy Commission.

California Public Utilities Commission. 2016a (August). *Resolution E-4874*. Available: http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M166/K269/166269927.PDF. Accessed September 27, 2016.

______. 2016b (August). *Decision Providing Guidance for Initial Energy Efficiency Rolling Portfolio Business Plan Filings.* Available: http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M166/K232/166232537.PDF. Accessed: September 27, 2016.

CPUC. *See* California Public Utilities Commission.

Del Mar, City of. 2016 (May) *Del Mar Climate Action Plan.* Available: http://www.delmar.ca.us/DocumentCenter/Home/View/2388. Accessed August 22, 2016.

Energy Policy Initiatives Center for Center for Sustainable Energy. 2015 (June). *Community Solar in California.* Available: http://www.sandiego.edu/law/documents/centers/epic/Community% 20Solar%20Final_2.2.16.pdf. Accessed August 20, 2016.

Governor's Office of Planning and Research. 2003. *State of California General Plan Guidelines.* Available: https://www.opr.ca.gov/docs/General_Plan_Guidelines_2003.pdf. Accessed August 23, 2016.

Kats, Greg. 2011 (October). *Energy Efficiency Financing – Models and Strategies.* Prepared by Capital E for the Energy Foundation. http://newbuildings.org/sites/default/files/EnergyEfficiencyFinancing_ModelsStrategies201110.pdf. Accessed September 2, 2016.

KPBS. 2016 (June). *SDG&E Gets OK to Market on Alternative Energy Program.* Available: http://www.kpbs.org/news/2016/jun/16/sdge-gets-ok-market-alternative-energy-program/. Accessed September 23, 2016.

Lancaster, City of. 2016. *Community Choice Aggregation.* Available; http://www.cityoflancasterca.org/residents/lancaster-choice-energy. Accessed August 23, 2016.

Mosaic. 2012 (December). *Solar Crowdfunding in California: Part 2, Everybody Solar.* Available: https://joinmosaic.com/blog/solar-crowdfunding-california-part-2-everybody-solar/. Accessed September 23, 2016.

San Diego, City of. 2014 (September). *City of San Diego Climate Action Plan.* Available: https://www.sandiego.gov/sites/default/files/legacy/mayor/pdf/2014/climateactionplan2014.pdf. Accessed August 20, 2016.

San Diego, County of. 2009. *County of San Diego Strategic Energy Plan.* Available: http://www.sandiegocounty.gov/reusable_components/images/dgs/Documents/Energy_StrategicEnergyPlan.pdf. Accessed August 20, 2016

San Diego Gas and Electric. 2016 (September). *Direct Access FAQ.* Available: http://www.sdge.com/customer-choice/electricity/direct-access-faq. Accessed September 22, 2016.

Solana Beach, City of. 2016 (April). *City of Solana Beach: Community Choice Aggregation Technical Analysis.* Available: http://solana-beach.hdso.net/docs/CAC/CAC-SB-CCA.pdf. Accessed September 20, 2016.

EXHIBIT
2

The County of San Diego

Planning Commission Hearing Report

Date:	October 14, 2016	**Case/File No.:**	N/A
Place:	County Operations Center 5520 Overland Avenue San Diego, CA 92123	**Project:**	Comprehensive Renewable Energy Plan Phase I Report
Time:	9:00 a.m.	**Location:**	San Diego County
Agenda Item:	#1	**General Plan:**	N/A
Appeal Status:	N/A	**Zoning:**	N/A
Applicant:	N/A	**Community:**	ALL
Environmental:	CEQA Exemption § 15262 Feasibility and Planning Studies	**APN:**	N/A

A. EXECUTIVE SUMMARY

1. Report Purpose

As directed by the Board of Supervisors, this staff report presents findings of the Comprehensive Renewable Energy Plan (CREP) Phase I work plan and proposes recommendations for Phase II. The findings include results of economic, feasibility and best management practices research and analysis. The staff report highlights the economic analysis findings that demonstrate increases in renewable energy investment are directly proportional to job creation and consumer savings.

The staff report also summarizes 17 best management practices that were developed with input from consultants, internal and external stakeholders, and the Technical Advisory Committee ("Committee"). Based on information from the technical reports and stakeholder engagement, County staff is recommending 11 best management practices for further consideration.

2. Requested Actions

The Planning Commission is requested to:

1. Review the CREP Draft Phase I Report (EMpower 2015) and Executive Summary Report (Ascent 2016);
2. Consider input from the Committee and the public on recommendations for Phase II;
3. Consider staff findings and recommendations for Phase II;
4. Recommend actions by priority for the Board of Supervisors to provide staff direction for Phase II.

B. BACKGROUND

This staff report presents the results of the Comprehensive Renewable Energy Plan (CREP) Phase I work plan and proposes recommendations for Phase II. This staff report summarizes economic, feasibility and best management practices research conducted with the assistance of outside consultants, and findings and recommendations developed through internal and external stakeholder participation. The findings include an overview of existing renewable energy conditions in San Diego County, opportunities for greater efficiencies, and a list of 17 best management practices.

The following sections outline the direction from the Board, and steps taken to identify the findings and recommendations for the Board's consideration for Phase II.

1. Board Direction

On April 10, 2013 (3), the Board of Supervisors (Board) directed the Chief Administrative Officer to research and develop options for a comprehensive renewable energy plan, and to prepare a work plan including time and cost estimates.

On September 25, 2013 (1), County staff provided the CREP Phase I work plan for consideration by the Board (Attachment A). In summary, the work plan included the following five components:

1) Coordinate with the County's Energy and Sustainability Team to analyze the County's existing renewable energy programs and efforts, finding opportunities for efficiencies and bringing resources and knowledge together into a more focused program.
2) Work with private sectors stakeholders to understand the trends, issues and challenges facing renewable energy development in our region.
3) Conduct economic, feasibility and best management practices research with the assistance of outside consultants to address the report topic areas noted below.
    a. Overview of existing renewable energy resources available within the unincorporated county
    b. Cost analysis of different types of renewable energy
    c. Cost analysis of energy delivery models
    d. Consumer choice alternatives
    e. Discussion of incentives, policies and best management practices in other jurisdictions that promote sustainable renewable energy development
    f. Overview of the renewable energy industry in San Diego County and its potential for growth
4) Develop findings and recommendations for the Board's consideration through internal and external stakeholder participation.
5) Form a Renewable Energy Advisory Committee comprised of stakeholders interested and/or involved in the promotion of renewable energy.

The County provided a presentation on the work plan, and the Board directed staff to initiate Phase I excluding 3b and 3c (Attachment B).

The Board established appropriations of $300,000 in County Planning & Development Services to fund Phase I, and directed the Director to form a Renewable Energy Technical Advisory Committee. The Board also directed staff to prepare a "pipelining" provision for existing applications for discretionary renewable energy projects.

The purpose of the "pipelining" provision is to ensure new rules or policies do not retroactively apply to or delay renewable energy projects with completed discretionary applications. Implementation of the Phase I work plan-- including consultant contracting and reporting-- does not constitute Board approval of new rules or policies that would necessitate a "pipelining" provision. No discretionary projects were delayed due to preparation of Phase I findings and recommendations. The provision will apply to new rules or policies the Board directs staff to prepare in Phase II that require a scope, schedule and appropriation of funds. As applicable, Phase II work plans will include the provision as follows: "any discretionary renewable energy project applications deemed complete prior to new rules taking effect shall be governed by existing rules and the new rules shall not be retroactively applied to such projects."

Finally, the Board directed staff to return within 14 months of executing all required consultant service contracts.

2. Consultant Service Contracts

The County prepared a consultant scope of work based on the Board's direction from September 2013. From December 2013 through January 2014, County Planning & Development Services solicited proposals for consulting services to assist with implementation of the Phase I work plan (County Request for Proposals 6312). Through a competitive bid process, staff selected EMpower Devices and Associates (EMpower) to prepare a comprehensive report to serve as a foundational resource for developing findings and recommendations concerning the County's renewable energy-related plans, programs and policies.

On June 9, 2014, the County and EMpower entered into a contract to initiate the statement of work, including the following summary of tasks:

- identify and quantify the renewable energy resources available in San Diego County based on currently available models and data to show the relative resource potential throughout the County;
- provide an overview of alternative energy models, such as Community Choice Aggregation and "Direct Access" purchasing, that provides consumers with options beyond the traditional investor owned utility model;
- identify the incentives, policies and best management practices utilized in other jurisdictions and examine whether they produce desired effects; and
- conduct an economic analysis to identify the current and potential renewable energy industry jobs and investment within the region.

In 2014, the contract was amended to include stakeholder outreach of up to six meetings throughout the County with the goal of obtaining diverse feedback and input from the public on consultant findings and recommendations.

Throughout 2014 and 2015, EMpower and the County made significant progress on the project, including coordinating two Committee meetings to discuss the research approach, economic analysis methodology, and opportunities to increase renewable energy in San Diego County. In July 2015, EMpower published the Draft Phase I Report (Attachment C). However, due to schedule delays, the contract term expired before the draft document could be finalized.

In April 2016, the County distributed the Draft Phase I Report for public review. In order to complete implementation of the Phase I work plan, the County contracted with Ascent Environmental (Ascent) to provide support. In August 2016, Ascent was contracted to assist with additional Committee meetings, meetings with the Community Planning/Sponsor Group Chairs, and public workshops to solicit input on the best management practices described in the Draft Phase I Report.

Ascent is also the prime consultant responsible for preparing the County's Climate Action Plan (CAP) and associated Environmental Impact Report. Renewable energy information gathered during implementation of the CAP public outreach and engagement process was synthesized by the County and Ascent. To date, public input on renewable energy measures was solicited during approximately 20 CAP stakeholder meetings, four CAP visioning sessions, and two CAP public workshops.

Using the remaining funds appropriated, Ascent prepared an Executive Summary Report that refines and builds upon information provided in the Draft Phase I Report, including an assessment of the anticipated return on investment and prioritization of the best management practices. Ascent published the Executive Summary Report in September 2016, and the County distributed it for public review (Attachment D).

3. Technical Advisory Committee

An Ad Hoc Technical Advisory Committee ("Committee") for the CREP was appointed by the Director of County Planning & Development Services in July 2014. The Committee was formed to provide a breadth of knowledge related to renewable energy, and contribute technical insight through a series of meetings. The Committee appointed a Chair and Vice Chair, and agreed to be governed by By-laws and Rosenberg's Rules of Order. The Committee is comprised of the following members:

1. Peder Norby, Committee Chair, County Planning Commissioner
2. Craig Benedetto, Committee Vice Chair, San Diego Regional Chamber of Commerce
3. Corinne Lytle Bonine, Chambers Group (formerly with URS Corporation)
4. Douglas Kot, American Institute of Architects, Leadership in Energy and Environmental Design, DNV GL
5. John Reaves, Attorney and Credentialed Mediator
6. Jason Anderson, Cleantech San Diego
7. Ken Parks, San Diego Gas & Electric
8. Richard Caputo, San Diego State University

Since October 2014, the County and consultants met with the Committee four times to collaborate at key milestones during implementation of the Phase I work plan.

For the Committee meetings, County staff produced agendas, presentations, and other materials to guide the discussions. Topics discussed at each meeting include:

1. introductions and research approach;
2. economic analysis methodology and opportunities to increase renewable energy in San Diego County;
3. Draft Phase I Report best management practices; and
4. staff recommendations for Board consideration.

In advance of the third meeting, County staff published a “workbook” for Committee members and public attendees to brainstorm on the advantages and disadvantages of several best management practices, and to provide input during the meeting. Although the Committee did not vote or provide consensus on findings and recommendations, they offered extensive feedback for the County to consider during each phase of the process.

The meetings were properly noticed and open to the public in accordance with Brown Act requirements. Public comments were accommodated at each meeting, and minutes and other materials were posted on the project website for public review. Technical Advisory Committee meeting minutes are included in Attachment E.

C. ANALYSIS AND DISCUSSION

Staff provided the most current information on the project website as it progressed through the planning phases. The Board letter and minute order, Draft Phase I Report, Executive Summary Report, Technical Advisory Committee meeting materials, public workshop materials and background information are provided on the project website:
http://www.sandiegocounty.gov/pds/advance/CREP.html

The following sections provide an overview of existing renewable energy resources provided by the County and available within the unincorporated communities, and summarize the results of the economic analysis, alternative energy models and best management research, and internal and external stakeholder engagement conducted during Phase I.

1. County of San Diego Achievements in Renewable Energy

The County continues to be a leader in promoting renewable energy and energy efficiency in the region. In 2009, the County approved the Strategic Energy Plan, which is a road map to improve the quality of life for San Diegans by investing in innovative ways to reduce energy and greenhouse gases at County facilities and in the larger community. The County is capturing 2.5% of its annual electricity needs for County-owned facilities through approximately 20 small photovoltaic (PV) systems at local parks and recreation centers, and through a Power Purchase Agreement completed in 2011. These efforts will provide an estimated 2,867 megawatt hours of renewable energy annually, and reduce greenhouse gas emissions by an estimated 2,015 Metric Tons per year.

The County recently updated the 2009 Strategic Energy Plan to include renewable energy goals for 2015-2020 such as:

- reduce energy use intensity by 10% comparing data from Fiscal Year 2019-2020 against baseline data from Fiscal Year 2014-2015;
- realize cost avoidance and savings through energy savings opportunities and new technology;
- realize a 10% reduction in greenhouse gas emissions for all new County-owned vehicles comparing data from 2020 against baseline data from 2015;
- facilitate development and use of renewable energy that is compatible with natural resources and community character;
- reduce demand for fossil fuel consumption and address vehicle emissions by reducing vehicle miles traveled and promoting alternative fuel vehicles; and
- develop greenhouse gas reduction targets and establish mitigation measures and adaptation strategies for unincorporated areas of the County.

On June 10, 2016, the County was recognized for being a leader in energy efficiency at the 11th Annual Energy Showcase hosted by San Diego Gas & Electric (SDG&E). The County was among 11 San Diego businesses and organizations that were named 'Energy Champions' for their investments and commitment to sustainability and energy efficiency in the San Diego region.

The Energy Showcase highlighted the County's achievements in partnering with SDG&E to implement strategies in the County's 2015-2020 Strategic Energy Plan. The Energy Champion award distinguishes the County as a leader in energy efficiency and sustainable innovation with the main focus of improving the quality of life for San Diegans.

In 2015, the County received more than $150,000 in rebates from SDG&E to replace inefficient lighting at a half dozen County facilities. The lighting projects reduced the County's utility bills by saving 3 million kilowatt hours of electricity. Similarly, the County completed retrofits of 2,246 County-owned and operated streetlights with LED fixtures, which will reduce an estimated 1.8 million kilowatts per year and provide approximately $150,000 in energy cost savings annually.

Throughout 2015 and 2016, the County installed 37 electric vehicle charging stations at 11 different sites, completing the County's Electric Vehicle Supply Equipment network for the public and County employees. The County permitted 41 electric vehicle charging stations in Fiscal Year 2016, more than triple the amount permitted in Fiscal Year 2014. In addition, the County purchased 17 hybrid vehicles to replace mid-sized, standard gas powered vehicles in the County's fleet.

In May 2016, the Alpine Library was opened as the County's first Zero Net Energy building. Using state of the art technology, the library offers the community more services and more hours in a building that is four times the size of the previous facility. As a Zero Net Energy building, the total amount of energy used by the Alpine Library on an annual basis is approximately equal to the amount of renewable energy created onsite. The Alpine Library is estimated to save $15,000 in energy costs annually. The Imperial Beach Library is currently under construction as the County's next Zero Net Energy building.

In terms of large campuses, the County Operations Center in Kearny Mesa uses high efficiency mechanical and lighting systems and onsite energy generation, which improves energy performance to 42% better than the California Energy Commission's Title 24 requirements. The campus is supplemented with electricity from the 435 kilowatt PV system on the parking facility and provides electric vehicle charging infrastructure. The campus has achieved Leadership in Energy and Environmental Design Gold and Platinum Certifications, and earned numerous awards for design and sustainability including: SDG&E Energy Leader for New Construction; California Center for Sustainable Energy Outstanding Governmental Building of the Year; San Diego Architectural Foundation People's Choice Orchid Award; and the American Institute of Architects California Council's Merit Award for Sustainable Design.

To date, the County has approved two large-scale wind projects and 10 large-scale solar projects in the unincorporated County. In 2013 and 2015, the County approved ordinances to amend the Building Code to promote photovoltaics, wind energy, and electric vehicle charging systems and to expedite processing of small, residential rooftop solar permits. The County received national, state and local awards for streamlining solar permitting. Solar permitting is available to be fully processed online, issued within the same day, and with waived fees. Some of the County's renewable energy permitting efforts include the following:

- averaged 6,555 residential PV permits issued each year, and increased residential PV permits 90% from Fiscal Years 2014 to 2016;
- permitted 7,424 residential PV permits online in Fiscal Year 2015-2016, an increase of 47% from the previous year;
- permitted 1,250 residential PV permits in-person in Fiscal Year 2015-2016, an increase of 13% from the previous year;
- permitted 70 commercial solar permits in Fiscal Year 2015-2016, an increase of 67% from the previous year;
- permitted four residential wind turbines since Fiscal Year 2014; and
- permitted more than 189,000 kilowatts of renewable energy.

The County not only provides streamlined solar and wind permitting services, but also supports financing opportunities for solar and home efficiency upgrades. As authorized under California law, the County currently participates in five different Property Assessed Clean Energy Programs (PACE) programs. These programs allow for the financing of energy efficient projects, water efficiency projects and renewable energy upgrades that can be repaid through annual property tax bills. The County provides information on the following existing PACE programs: CaliforniaFIRST; Figtree PACE; Residential HERO PACE Program; Commercial HERO PACE Program; Ygrene Energy Fund; and AllianceNRG.

In addition, a Green Working Group of the following 11 County departments was established to provide extensive functional threading and bring knowledge and resources together during development of the County's Climate Action Plan:

- Department of Planning & Development Services
- Air Pollution Control District
- Department of General Services
- Department of Public Works
- Office of Emergency Services
- Department of Agriculture, Weights and Measures
- Department of Parks And Recreation
- Health & Human Services Agency
- Department of Environmental Health
- Department of Human Resources
- Office of the County Counsel

The Green Working Group meets on a monthly basis to discuss climate planning best management practices, including potential renewable energy measures that may integrate into the Climate Action Plan.

While the County has undertaken efforts to expand renewable energy and green building development, there is an opportunity for a more comprehensive approach to increase renewable energy opportunities, create jobs in the region, and reduce costs for consumers.

2. EMpower Draft Phase I Report

The following sections summarize the economic analysis, alternative energy models and best management practice research provided by EMpower in the Draft Phase I Report.

a. Economic Analysis

The economic analysis of the Draft Phase I Report examines the possible economic benefits of investing in renewable energy within the unincorporated areas of the County. EMpower used a proprietary analytical tool to model four economic scenarios that investigate how changes in investments and technologies might benefit jobs, incomes and net gains in the renewable energy industry.

First, the model addresses changes in energy bill expenditures over time. For this task, the four scenarios assume different percentages ranging from 33%, 50%, 80% and 100% of electricity will be generated by renewable energy. All scenarios show decreasing energy bill expenditures, or an increase in consumer savings, ranging from 16% to as much as 49% by 2050 (see Table 1).

Table 1	Energy Bill Expenditures in the Unincorporated County (2015-2050)[1]				
Energy Expenditure	2015	2025	2040	2050	% Change Reduction in 2050 to Reference Case
Reference Case	622	821	1,200	1,547	0%
Scenario I	622	801	1,106	1,294	16%
Scenario II	622	797	1,031	1,132	27%
Scenario III	622	796	967	922	40%
Scenario IV	622	796	934	797	49%

Notes: Numbers may not add up due to rounding. For more detailed analysis, see Empower Report. M = Millions

[1] Numbers are presented in 2012 dollars

Source: Empower Devices (2015)

Overall, increasing mixes of renewable energy options and efficiency will translate into lower energy bill expenditures in the unincorporated areas as soon as 2025.

Next, the model weighs the costs and economic benefits of each scenario. Costs include policies or programs needed to implement each scenario, along with technological investments needed to increase energy efficiency and create more renewable energy options. Economic benefits include net energy savings and net job creation.

In the scenarios, an increase in the mix of renewable energy increases, translates to larger net energy savings and more jobs created. For more detailed analysis, including specific breakdown of economic impacts by 5-year increments, refer to Section 3.3.2.2 of the Draft Phase I Report (Attachment C).

Table 2	Annual Average and Cumulative Economic Impacts of Innovation Scenarios							
	Benefit-Cost Ratio	ANNUAL AVERAGE[1]					CUMULATIVE[1]	
		Program/Policy Costs	Technological Investments[2]	Energy Bill Savings[3]	Net Energy Savings[4]	Net Job Creation	Investments	Energy Bill Savings
Scenario I	5.3	$2 M	$17 M	$71 M	$53 M	600	$500 M	$2,600 M
Scenario II	2.3	$5 M	$45 M	$120 M	$99 M	1,000	$1,900 M	$4,300 M
Scenario III	1.9	$9 M	$84 M	$167 M	$137 M	1,500	$3,100 M	$6,000 M
Scenario IV	1.9	$11 M	$103 M	$192 M	$161 M	1,800	$3,700 M	$6,900 M

Notes: Numbers may not add up due to rounding. For more detailed analysis, see Empower Report. M = Millions

[1] Annual and cumulative numbers are presented as 2012 dollars

[2] Technological investments include investments that promote energy efficiency and renewable energy

[3] Energy bill savings include savings from the industrial, residential, and commercial sectors

[4] Net Energy savings subtract policy/program costs (1st column) with technological investments (2nd column).

Source: Empower Devices (2015)

In summary, the economic analysis in the Draft Phase I Report concludes an increase in renewable energy supply will result in an increase in consumer savings and jobs.

b. Alternative Energy Models

The Draft Phase I Report also describes alternative energy models that provide energy customers options to purchase renewable energy through different avenues from the traditional investor-owned utility. Investor-owned utilities are private electricity and natural gas providers.

The California Public Utilities Commission regulates investor-owned utilities such as San Diego Gas & Electric (SDG&E), Pacific Gas & Electric, and Southern California Edison, which comprise approximately three quarters of the electricity supply in California. SDG&E provides energy service to 3.6 million people through 1.4 million electric meters and 873,000 natural gas meters in San Diego and southern Orange counties. The SDG&E service area spans 4,100 square miles and serves the entire geographic area of San Diego County.

There are a number of alternative energy models that provide consumers options beyond the traditional investor-owned utility model. The consultant reports discuss three alternative energy models including Community Choice Aggregation, Direct Access and Sustainable Energy Utility. The reports provide examples throughout the region, and analyze the possible advantages and disadvantages of each. The following discussion summarizes and builds upon the most pertinent information from the reports.

Community Choice Aggregation (CCA) allows city and county governments to pool electricity customers to purchase power, while also allowing them to administer energy programs on behalf of their residents and businesses. A CCA works in partnership with an existing utility, which continues to deliver power, maintain the grid and provide billing. This alternative energy model allows a local community to shape the program and prioritize benefits such as increased investment in renewable energy sources, among others.

To date, CCAs have been established by law in California, Illinois, Massachusetts, New Jersey, Ohio and Rhode Island. Since its passing in 2002, a number of CCA programs have been proposed in California, including programs in San Francisco (CleanPowerSF), the East Bay (Oakland, Berkeley, and Emeryville), and the San Joaquin Valley (San Joaquin Valley Power Authority).

The first CCA program to operate in California, Marin Clean Energy, was formed in Marin County and began serving customers in May 2010. Sonoma County launched Sonoma Clean Power (including Mendocino County) in 2014. The City of Lancaster, through Lancaster Choice Energy, began offering service to select customers in May 2015, with broad public enrollment in late 2015.

Beginning in October 2016, the Peninsula Clean Energy Authority will provide residents and business in San Mateo County and the 20 incorporated cities with clean energy through a CCA. In July 2016, Los Angeles County began investigating a CCA through a feasibility study, and was directed by the Board of Supervisors in September 2016 to explore a Joint Powers Authority with approximately 80 incorporated cities. Similarly, Riverside County has hired a consultant to prepare a CCA feasibility study, and is coordinating with the Coachella Valley Association of Governments regarding local cities joining the effort. The Western Riverside Council of Governments has indicated it will solicit bids to conduct a CCA feasibility study for its 18 member cities as well. Alameda County is also pursuing a feasibility study.

In the local region, the City of Solana Beach published a CCA technical analysis in April 2016, and is continuing to explore the opportunity. The City of San Diego is conducting a CCA feasibility study to determine if community choice will help meet its Climate Action Plan goal of 100% clean energy by 2035.

The California legislature passed Senate Bill 790 in 2011, which required the California Public Utilities Commission to create a Code of Conduct to limit electrical corporations' abilities to market or lobby against Community Choice Aggregators except through shareholder-funded, pre-approved Independent Marketing Divisions. SDG&E is the first electrical corporation to seek approval of such a division. On July 14, 2016, the California Public Utilities Commission passed a resolution to approve SDG&E to form an Independent Marketing Division for CCAs. According to their website, "SDG&E supports a customer's right to choose its electricity service provider, including a Community Choice Aggregator. SDG&E will fully cooperate with the CCA or potential CCA to provide them with information to facilitate the process of investigating, forming and implementing a CCA program, consistent with state law and SDG&E's CPUC-approved tariffs/rules."

Direct Access (DA) gives eligible retail customers the choice to purchase electric power directly from an independent electric service provider rather than through an investor owned utility exclusively. During Fiscal Year 2015-2016, the County saved $2.9 million, or approximately 15%, average savings for County facilities by procuring electricity through DA.

While similar to a CCA program, DA is different in that it is: (1) not available to residential customers; and (2) by law (i.e., Senate Bill 695) is capped to a set number of gigawatt-hour electric service providers from which a customer can purchase power. This limits the County's ability to ensure that a DA program could deliver increased levels of renewable energy and energy efficiency, as well as reduced levels of greenhouse gas emissions.

Sustainable Energy Utility (SEU) is an independent and financially self-sufficient entity responsible for delivering energy efficiency, energy conservation and customer-sited renewable energy to end users. Through an SEU, energy users throughout a city or state can build a relationship with a single organization whose direct interest is to help residents and businesses use less energy and generate their own clean energy.

As a nonprofit umbrella entity at a city, county, or state level, an SEU relies on a third-party management model, competitive contracting and performance incentives to deliver sustainable energy services across all sectors and customer classes. As such, an SEU is publicly accountable and can be financially self-sufficient. It also has access to a range of potential funding sources and revenue streams and can achieve energy savings without raising taxes or utility rates.

The Sonoma County Water Agency partnered with the Foundation for Renewable Energy & Environment to develop the Sonoma County Efficiency Financing (SCEF) Program. The SCEF is a scaled-down SEU model that does not require legislative action. Under this program, participating organizations contract with private Energy Service Companies to complete energy and water conservation measures. The participating organizations receive substantial utility cost-savings, including a contractual guarantee sufficient to cover the full cost of all retrofit work. The program uses tax-exempt bonds to finance projects.

After summarizing the available alternative energy models, the Draft Phase I Report lists and describes several best management practices that may promote renewable energy throughout San Diego County.

c. Best Management Practices

In the Draft Phase I Report, EMpower identifies approximately 16 best management practices for consideration. The best management practices ("BMP") are listed below and further detailed in Attachment C.

BMP #1: *Amend the General Plan and Add an Energy Element*
BMP #2: *Establish a New Office of Sustainability*
BMP #3: *Establish Institutional Capacity such as Community Choice Aggregation, Direct Access or Sustainable Energy Utility*
BMP #4: *Establish Financial Capacity such as Property Assessed Clean Energy Program, Bonds, Peer-to-Peer Lending or Crowdfunding*
BMP #5: *Develop a Solar Energy Workforce Development Initiative*
BMP #6: *Build an Energy Assurance Plan*
BMP #7: *Increase the County's Percentage of Energy Derived from Various Renewable Energy Technologies*
BMP #8: *Establish a Renewable Energy Group Procurement Initiative*
BMP #9: *Participate in the Creation of a New Regional Energy Network*
BMP #10: *Create a Renewable Energy Overlay/Combining Zone*
BMP #11: *Develop a Building Energy Disclosure Program*
BMP#12: *Promote More Aggressive Building Standards Including the Significant Retrofit of Existing Buildings*
BMP #13: *Increase Renewable Energy Education and Outreach*
BMP #14: *Start a Community Solar Initiatives and Legislation*
BMP #15: *Establish a Microgrid and Develop Policies Related to Microgrids*
BMP #16: *Establish Electric Vehicle Programs*

3. Public Input

The Draft Phase I Report was posted online and parties were notified in April 2016. The Community Planning Group/Sponsor Group Chairs were updated on April 16, 2016 and August 20, 2016. Additional public comments were received at each Technical Adviory Committee meeting.

After the Draft Phase I Report was posted for public review, the County conducted additional stakeholder outreach to solicit input on the 16 best management practices. During a Technical Advisory Committee meeting, attendees recommended the County consider an additional measure, and a seventeenth best management practice was added to the list as follows:

BMP #17: Develop a Legislative Outreach Strategy to Support Renewable Energy Programs

County staff conducted outreach to identify the measures that are most effective in promoting renewable energy in San Diego County. In September 2016, staff solicited input on the 17 best management practices during public meetings in Valley Center and Boulevard, and no additional measures were added.

<u>Valley Center Community Planning Group</u>
On September 12, 2016, staff presented an informational update to the Valley Center Community Planning Group during their monthly meeting. Staff provided a “workbook” and answered questions regarding the 17 measures, and notified attendees of additional opportunities to become engaged in the process. In summary, some participants expressed concern about costs associated with retrofitting existing buildings (BMP #12), and potential changes to the General Plan such as creating an Energy Element (BMP #1). Some also voiced concerns about how current permit applications seek to amend the General Plan, and may affect the CREP or greenhouse gas planning efforts.

In general, attendees recommended the County consider energy conservation techniques such as roof gardens and landscaping (BMP #12), and renewable energy storage mechanisms such as batteries or water (BMP #7). Some participants expressed interest in learning more about renewable energy group procurement initiatives such as the Silicon Valley Renewable Energy Project (BMP #8). The preliminary meeting minutes are included in Attachment F.

<u>Boulevard Public Workshop</u>
On September 13, 2016, staff conducted a public workshop in Boulevard, including a facilitated exercise. Overall, staff heard concerns regarding large-scale renewable energy projects, and strong opposition to an overlay zone (BMP #10). Twenty-six community members attended and shared experiences of local renewable energy projects and potential impacts to human health, environment and workforce.

Through the exercise, workshop participants recommended the County:

- demonstrate regional leadership by generating and using more renewable energy at County facilities (BMP #7);
- consolidate a group of specialists to distribute renewable energy information and answer questions without creating an additional bureaucratic organization (BMP #2);
- be proactive in identifying and analyzing renewable energy legislation such as community solar, net metering, alternative energy models, and microgrids (BMP #17);
- consider community choice alternatives (BMP #3);
- track community solar initiatives to determine applicability to the unincorporated areas (BMP #14); and
- consider establishing a renewable energy group procurement initiative (BMP #8).

After the Boulevard Public Workshop, County staff received 54 letters from Boulevard and Jacumba residents sharing disapproval of prioritizing large-scale renewable energy infrastructure projects as means of reducing greenhouse gas emissions. The letters opposed consideration of the renewable energy overlay zone in the Boulevard and Jacumba community planning areas (BMP #10), but expressed interest in alternative energy models such as community choice and Direct Access options (BMP #3) (Attachment G).

<u>Campo Lake Morena Community Planning Group</u>
On September 26, 2016, the Campo Lake Morena Planning Group held a monthly meeting and voted on agenda item 6a “Review proposed letter for Comprehensive Renewable Energy Program report.” On September 27, 2016, staff received a letter from the planning group regarding, “Missing elements, initial draft of proposed San Diego County Comprehensive Renewable Energy Plan Report” (Attachment H).

In summary, the letter expresses concern that the Draft Phase I Report lacks a greenhouse gas analysis for the best management practices, and the CREP and Climate Action Plan “ignore soil releases altogether” when considering emissions. The letter states an overlay zone would result in releases of greenhouse gas emissions and cause a disproportionate share of energy costs to the backcountry of San Diego County. The planning group recommends that all projects complete a “cradle-to-grave review of greenhouse gas releases” including carbon release or sequestration during vegetation removal and soil disturbance, and emissions from materials manufacturing and transporting, and construction activities.

In conclusion, external stakeholders voiced concern about: renewable energy overlay zones and potential impacts to health, environment and community character; net-metering regulations; rapidly changing legislation and technology; and adding bureaucratic processes that would add little benefit to consumers and residents. Stakeholders commented the County should avoid duplication of efforts by leveraging regional collaboratives, partners and networking groups to provide services such as renewable energy education, outreach and workforce development training.

4. Technical Advisory Committee

External stakeholders were engaged through a series of Technical Advisory Committee meetings on October 2, 2014; January 9, 2015; August 17, 2016; and September 21, 2016.

August 17, 2016 Meeting
During the Committee meeting on August 17th, attendees were asked to identify the measures that would be most effective in promoting renewable energy in San Diego County. Staff presented the best management practices to the Committee members and public attendees, respectively. The "workbook" materials described each measure including potential advantages and disadvantages. Staff answered questions from the Committee members and public attendees before facilitating an exercise to prioritize the best management practices.

In summary, the Committee members and public attendees identified the following three priority recommendations in common:

- provide one point of contact for renewable energy information and sustainability-related resources (BMP #2);
- consider preparation of an overlay zone to streamline the planning and permitting process for renewable energy projects (BMP #10); and
- investigate opportunities to increase the County's percentage of renewable energy use beyond 2.5% (BMP #7).

The Committee members also commented the County should consider the following measures as priority:

- develop a legislative outreach strategy to support renewable energy programs (BMP #17);
- identify opportunities to support renewable energy financing such as PACE, bonds, lending or crowdfunding (BMP #4);
- consider forming a Regional Energy Network with regional collaborators (BMP #9); and
- identify opportunities to promote electric vehicle use and infrastructure (BMP #16).

Participants from the public recommended the County consider the following measures as priority:

- explore alternative energy models such as Community Choice Aggregation (BMP #3);
- prepare an Energy Assurance Plan to address energy security and resilience (BMP #6);
- increase renewable energy education and outreach (BMP #13); and
- consider establishing a microgrid and/or policies that remove barriers to microgrids (BMP #15).

September 21, 2016 Meeting

Staff returned to the Technical Advisory Committee on September 21, 2016 to share the potential recommendations. There was consensus the following six best management practices are lower priority:

- Amend the General Plan to Add an Energy Element (BMP #1)
- Develop a Solar Workforce Development Initiative (BMP #5)
- Build an Energy Assurance Plan (BMP #6)
- Establish a Renewable Energy Group Procurement Initiative (BMP #8)
- Develop a Building Energy Disclosure Program (BMP #11)
- Promote More Aggressive Building Standards Including the Significant Retrofit of Existing Buildings (BMP #12)

Committee members did not provide consensus on the priorities. However, the Committee and public attendees voiced general support for: investigating alternative energy models; increasing the County's regional leadership through renewable energy generation, storage, transmission or use; promoting alternative fuel and infrastructure programs such as electric vehicle charging stations and rideshare opportunities; exploring renewable energy finance programs; exploring community solar initiatives and microgrid projects and policies; enhancing renewable energy education and outreach; providing a sustainability taskforce to be one point of contact for outreach; and being more proactive through legislative outreach.

5. Ascent Executive Summary Report

Ascent prioritized the 17 best management practices based on a return on investment analysis, or the most benefit and opportunities for renewable energy development and growth. Each measure is analyzed in the Executive Summary Report, including tables that detail the costs and benefits of implementation such as advantages, disadvantages, financing options, and potential implementing body or mechanism, along with a measure of performance, or value, to the County (Attachment D).

A ranking system was used to determine the mix of measures anticipated to be most effective for the County. A low, medium, or high return on investment ranking was assigned based on a number of social, economic, and political factors. For example, a number of the best management practices address ways the County can increase renewable energy opportunities through preparation of additional planning documents. While plans help to consolidate policies and convey a unified approach to an issue, they can also be costly and hard to finance. Because the County is already heavily involved in the climate action planning work program, the same objectives proposed in certain measures can be addressed in the Climate Action Plan. Rather than prepare an Energy Element for the County's General Plan (BMP #1), it may be more beneficial to align renewable energy directives with the content of the Climate Action Plan. While an Energy Assurance Plan addresses energy security (BMP #6), other planning documents such as those from SDG&E or the County's Multi-jurisdictional Hazard Mitigation Plan and Climate Action Plan may be better positioned to outline key assets and ways to increase energy supply resiliency.

Some policy and program measures may be better addressed in the Climate Action Plan to ensure their implementation and greenhouse gas reduction potential. The advantages associated with increasing the renewable energy mix in the County are important, and because the County is currently using renewable energy, there is an opportunity to increase this percentage mix by implementing changes (BMP #7). The exact percentage change should be aligned with Renewable Portfolio Standard requirements, be consistent with the Strategic Energy Plan, and help achieve greenhouse gas reduction targets identified in the Climate Action Plan.

Overall, Ascent determined the highest return on investment would result through development of a Community Choice Aggregation Feasibility Study, tracking community solar legislation, developing microgrid policies and identifying sites for future microgrids, and creating a renewable energy overlay zone to streamline the planning process time and increase predictable development scenarios. Table 3 lists the 17 measures and prioritizes them based on return on investment.

Table 3 Prioritized Best Management Practices based on Return on Investment

BMP Title	Summary	ROI
Establish Institutional Capacity	**Top Priority:** Develop a CCA Feasibility Study	High[1]
Start a Community Solar Initiative	**Top Priority:** Track Community Solar Legislation	High
Establish a Microgrid and Develop Policies Related to Microgrids	**Top Priority:** Develop Policies & Identify Sites for Future Microgrids	High
Create a Renewable Energy Overlay / Combining Zone	**Top Priority:** Reduces Planning Process Time, Increases Certainty for Community	High
Increase the County's Percentage of Energy Derived from Various Renewable Energy Technologies	Better Addressed in the County's CAP	High
Establish Electric Vehicle Programs	Better Addressed in the County's CAP	High
Establish Financing Capacity	Establish Appropriate Partnership/Collaboration	Medium[2]
Develop a Solar Energy Workforce Development Initiative	Establish Appropriate Partnership/Collaboration	Medium
Increase Renewable Energy Education and Outreach	Establish Appropriate Partnership/Collaboration	Medium
Develop a Legislative Strategy to Support Renewable Energy Programs	Establish Collaboration with OSIA	Medium
Amend the General Plan and add an Energy Element	Better Addressed in the County's CAP	Low
Establish a New Office of Sustainability	High Admininistration/Operating Costs	Low
Build an Energy Assurance Plan	Better Addressed in the County's CAP	Low
Establish a Renewable Energy Group Procurement Initiative	High Level of Coordination Needed	Low
Participate in the Creation of a New Regional Energy Network	High Administration Burden	Low
Develop a Building Energy Disclosure Program	High Administration/Operating Costs	Low
Promote More Aggressive Building Standards Including the Significant Retrofit of Existing Buildings	Current Legislation Already Addresses Issue	Low

Notes: CAP = Climate Action Plan, OSIA = Office of Strategy and Intergovernmental Affairs, ROI = Return on Investment

[1] CCA was determined to have a "high" return on investment ranking, DA, and SEU were both determined to have a "medium" return on investment ranking

[2] PACE and Bonds were determined to have a "medium" return on investment ranking. P2P/Crowdfunding was determined to have a "low" return on investment ranking.

Source: Empower Devices (2015)

D. STAFF RECOMMENDATIONS

Staff recommendations were informed by extensive internal and external stakeholder outreach including a Planning Commission informational item, Community Planning Group Chairs meetings, Technical Advisory Committee meetings, public meetings, and Climate Action Plan Green Working Group meetings. In addition, staff referenced the project and opportunities to provide public input during approximately 20 Climate Action Plan stakeholder meetings, four visioning sessions and two public workshops to date.

Based on public input and the consultants' analyses, staff identified 11 priority measures. The recommendations consider an assessment of cost, financing options, advantages, disadvantages implementation mechanism, and overall opportunity to increase renewable energy development in San Diego County.

For those measures that recommend a study be conducted, staff would return to the Board with a scope and schedule to seek approval and appropriation of funds. In terms of climate planning, the renewable energy measures the Board may direct staff to initiate in Phase II can be integrated into the Climate Action Plan greenhouse gas reduction strategies. The Climate Action Plan will identify specific greenhouse gas reduction targets, and by aligning objectives of CREP Phase II with the renewable energy components of the Climate Action Plan, actions can be tied to specific emissions goals.

Staff recommends the following priority actions for consideration by the Board:

1. **Prepare a Community Choice Aggregation Feasibility Study** *(BMP #3)*. The County should:

   - perform a study to determine if a Community Choice Aggregation program would be feasible in San Diego County, including an analysis of existing and proposed CCAs in other regional jurisdictions such as Los Angeles County, Riverside County, City of San Diego, and City of Solana Beach, among others; and
   - continue to collaborate with regional partners such as the Climate Collaborative and Local Government Partnership member agencies to assess implementation of other consumer choice alternatives such as Direct Access and Sustainable Energy Utility, or future energy models.

2. **Track Community Solar and Wind Initiatives** *(BMP #14).* The County should:

   - track the regulatory decisions established by Senate Bill 43, which have not been finalized to date;
   - consider developing community solar and wind programs in the future for residents in the unincorporated area that are not able to install rooftop solar or wind gain access to these opportunities as a community;
   - collaborate with regional partners such as the City of Carlsbad to harvest best practices and lessons learned associated with existing and proposed community solar and wind projects; and
   - provide information to the public regarding community solar and wind initiatives.

3. **Prepare a Microgrid Feasibility Study** *(BMP #15).* The County should:

    - conduct a feasibility study to determine if a microgrid program would be feasible in San Diego County, including potential sites where microgrids would be ideally suited to promote renewable energy use, storage and security;
    - include a cost benefit analysis of implementation of a renewable energy microgrid at a County facility;
    - identify ways to streamline the permitting and environmental review process for microgrids; and
    - collaborate with San Diego Gas & Electric, University of California San Diego, local military bases, and other regional partners to address microgrid operations and energy storage and security.

4. **Prepare Renewable Energy Design and Development Guidelines and Zoning Regulations Applicable to the Unincorporated County** *(BMP #10).* The County should:

    - prepare guidance for renewable energy infrastructure projects such as microgrids, community solar and wind, small-scale solar and wind, biomass facilities, geothermal facilities, electric vehicle charging stations and alternative fuel facilities, energy storage facilities, or others; and
    - prepare an overlay zone study that provides a streamlining mechanism for the Major Use Permit and environmental review processes, including specific measures that avoid, minimize or mitigate impacts to current and proposed land uses, environmental conditions and community welfare.

5. **Increase the County's Renewable Energy Generation, Transmission, Use and Storage** *(BMP #7)*. The County should:

    - determine the specific percentage of increase based on the greenhouse gas reduction targets in the Climate Action Plan, renewable energy portfolio standards, and goals in the Strategic Energy Plan; and
    - identify and prioritize capacity for onsite renewable energy projects including, but not limited to, electric vehicles and charging infrastructure, solar, wind, geothermal, biomass, other alternative fuels infrastructure, and energy storage facilities.

6. **Develop Strategies to Address Barriers to Alternative Fuel Deployment** *(BMP #16).* The County should:

    - identify a range of strategies related to alternative fuels and electric vehicles in the Climate Action Plan;
    - continue to collaborate with regional partners such as San Diego Gas & Electric, Center for Sustainabile Energy and the San Diego Association of Governments to identify opportunities to promote alternative fuel programs such as charging stations and transportation demand management measures electric vehicle rideshare;
    - promote the benefits of the County's Solar- and Electric Vehicle-ready Ordinance;

- identify and advertise opportunities to provide incentives for multi-family units and workplace charging; and
- identify measures to encourage vendor participation.

7. **Promote Vetted Renewable Energy Finance Mechanisms such as Property Assessed Clean Energy Programs, Bonds, Peer-to-Peer Lending or Crowdfunding, Among Others** *(BMP #4).* The County should:

    - promote renewable energy financing services and training that have been vetted adequately;
    - support vetting opportunities and help consumers overcome the barriers to accessing renewable energy; and
    - promote financial mechanisms through education and outreach and by building upon strategic partnerships with the Center for Sustainable Energy and San Diego Regional Energy Partnership.

8. **Develop and Implement a Renewable Energy Education and Outreach Strategy** *(BMP #13).* The County should:

    - build a program to engage internal stakeholders, community members and decision-makers to further promote the benefits of existing and potential renewable energy policies and programs; and
    - continue to market the County's achievements in renewable energy.

9. **Develop and Implement a Strategy to Support Renewable Energy Legislation that benefits San Diego County** *(BMP #17).* The County should:

    - build upon the existing legislative review process with the Office of Strategy and Intergovernmental Affairs to focus on renewable energy;
    - actively support legislation that promotes renewable energy programs and funding opportunities; and
    - address legislation that affects consumer choices such as California Public Utilities Commission regulations, net-metering restrictions, renewable energy portfolio standards, alternative energy models, and community solar and wind, among others.

10. **Establish a Sustainability Taskforce within the County's Existing Organizational Framework** *(BMP #2)*. The County should:

    - build upon existing enterprise functional threading efforts to further promote renewable energy policies and programs, such as expanding the Climate Action Plan Green Working Group to provide support to the team responsible for implementing CREP Phase II; and
    - provide a consolidated resource for the public to learn about the County's sustainability-related efforts including: County projects, partnerships, policies, and programs; existing and proposed legislation; finance mechanisms; and training and workforce development opportunities.

11. **Participate in the Creation of a New Regional Energy Network** *(BMP #9)*. The County should:

    - continue to explore the feasibility of a Regional Energy Network with the cities of Chula Vista and San Diego, San Diego Association of Governments, and the Port of San Diego;
    - continue to collaborate with regional partners to implement and align State-mandated utilities assistance programs, energy efficiency programs, and public-interest research and development programs; and
    - continue to monitor the California Public Utilities Commission regulations related to the provision of Public Purpose Program surcharge funds.

E. CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) COMPLIANCE

Recommending actions is categorically exempt from CEQA under Section 15262 of the State CEQA Guidelines because the recommended actions involve only planning studies for possible future actions which the Board has not approved, adopted, or funded. All recommendations identified under Phase II of the work plan will be reviewed under CEQA and will be presented to the Board for consideration.

F. RECOMMENDATIONS

The Planning Commission is requested to:

1. Review the CREP Draft Phase I Report (EMpower 2015) and Executive Summary Report (Ascent 2016);
2. Consider input from the Committee and the public on recommendations for Phase II;
3. Consider staff findings and recommendations for Phase II;
4. Recommend actions by priority for the Board of Supervisors to provide staff direction for Phase II.

Report Prepared By:	**_Report Approved By:_**
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AUTHORIZED REPRESENTATIVE: ______________________

MARK WARDLAW, DIRECTOR

ATTACHMENTS:

Attachment A – Board of Supervisors Letter, September 11, 2013 (4) and September 25, 2013 (1)
Attachment B – Board of Supervisors Minute Order No. 1, September 25, 2013
Attachment C – Comprehensive Renewable Energy Plan Draft Phase I Report (EMpower 2015)
Attachment D – Executive Summary Report (Ascent 2016)
Attachment E – Technical Advisory Committee Approved Meeting Minutes for August 17, 2016, January 9, 2015, and October 2, 2014 and Draft Meeting Minutes for September 21, 2016
Attachment F – Valley Center Community Planning Group Preliminary Meeting Minutes for September 12, 2016
Attachment G – Sample of Boulevard and Jacumba Community Comment Letters Received in September through October 2016
Attachment H – Campo Lake Morena Community Planning Group Meeting Agenda and Comment Letter for September 26, 2016

Attachment A – Board of Supervisors Letter, September 11, 2013 (4) and September 25, 2013 (1)

COUNTY OF SAN DIEGO

LAND USE AGENDA ITEM

DATE: September 11, 2013 and September 25, 2013 **01**

TO: Board of Supervisors

SUBJECT: COMPREHENSIVE RENEWABLE ENERGY PLAN (DISTRICTS: ALL)

Overview

On September 11, 2013 (4), the Board of Supervisors continued the item to September 25, 2013.

On April 10, 2013 (3), the Board of Supervisors directed the Chief Administrative Officer to research and develop options for a comprehensive renewable energy plan, prepare a work plan including time and cost estimates and return to the Board within 120 days. Today's Board Letter is in response to the Board's direction and details a work plan for a comprehensive renewable energy plan including time and cost estimates.

Recommendation(s)
CHIEF ADMINISTRATIVE OFFICER

1. Receive presentation on options for a Comprehensive Renewable Energy Work Plan.

2. If the Board directs staff to commence Phase One of the Renewable Energy Work Plan:

    a. Find that implementing the Renewable Energy Work Plan is categorically exempt from the California Environmental Quality Act (CEQA) under Section 15262 of the State CEQA Guidelines because it is a project involving only planning studies for possible future actions that the Board has not approved, adopted or funded.

    b. Direct the Chief Administrative Officer to initiate Phase One of the Renewable Energy Work Plan and return to the Board within 14 months of executing all required consultant service contracts.

    c. Establish appropriations of $370,000 in the Department of Planning & Development Services, services and supplies, to fund Phase One of the Renewable Energy Plan based on Fiscal Year 2012-13 General Fund fund balance available. **(4 VOTES)**

    d. Direct the Director of Planning and Development Services to form a Renewable Energy Advisory Committee.

e. Provide direction to staff regarding the preparation of a “pipelining” provision for discretionary renewable energy projects under review and include a provision for the Board’s consideration when staff returns with the Phase One report.

Fiscal Impact

Funds for this request are not included in the Fiscal Year 2013-2014 Operational Plan. If approved, this request will result in total costs and revenue of $370,000 in Fiscal Year 2013-14. The funding source is the General Fund fund balance. There will be no change in net General fund cost and additional staff years as a result of the recommended actions.

Business Impact Statement

The proposed project will further County, state and federal goals of utilizing alternative renewable energy resources. Facilitating renewable energy development provides alternatives for consumers, protects the environment and will help reduce the potential for energy shortages and outages which could negatively impact regional businesses.

Advisory Board Statement

N/A

Background

Southern California is faced with some of the highest energy costs in the state and nation. With the emergence of renewable energy and green-building technology, consumers are realizing a growing range of options to help reduce energy costs and move towards greater energy independence. While the County has undertaken efforts to expand renewable energy and green-building development, there is an opportunity for a more comprehensive approach to increase renewable energy opportunities, reduce costs for consumers and minimize impacts to the community and its resources.

In response to the Board’s direction to research and develop options for a comprehensive renewable energy plan (REP), Planning & Development Services (PDS) staff conducted preliminary research including the review of renewable energy planning efforts in other jurisdictions and meeting with several of the County’s internal and external renewable energy stakeholders (See Table 1). The initial research and input received, found a mix of various County programs and renewable energy efforts that may become more effective if integrated into a focused renewable energy planning effort. The research also revealed an extensive amount of local private sector efforts and initiatives related to renewable energy which may serve as a knowledge base and resource for the County’s REP efforts moving forward. As a result of the preliminary research staff has prepared a two phase work program for the Board’s consideration.

Table 1 - Stakeholders

Internal	External
General Services	East County Renewable Coalition
Air Pollution Control District	Center for Sustainable Energy
Department of Parks & Recreation	Clean TECH
Department of Public Works (DPW) - Recycling	SDG&E
DPW Landfills	SANDAG

Planning & Development Services	University of California, San Diego
Office of Strategy & Intergovernmental Affairs	

Renewable Energy Work Plan

Phase One

The foundation of developing a meaningful REP is based on research and analysis. Fundamental questions and issues must be researched and analyzed to provide decision makers with the information needed to formulate policies that will yield significant results. Phase One of the proposed REP work program consist of the following:

1. Coordinate with the County's Energy and Sustainability Team to analyze the County's existing renewable energy programs and efforts, finding opportunities for efficiencies and bringing resources and knowledge together into a more focused program.

2. Work with private sectors stakeholders to understand the trends, issues and challenges facing renewable energy development in our region.

3. Conduct economic, feasibility and best management practices research with the assistance of outside consultants to address the report topic areas noted below.

   a. <u>Overview of existing renewable energy resources available within the unincorporated county</u> - This overview will identify the type, location, quantity and quality of renewable energy resources available within the unincorporated area.

   b. <u>Cost analysis of different types of renewable energy (solar, wind, etc)</u> - The cost to produce energy varies by the source. This analysis will break down the costs to develop and utilize the different types of renewable energy resources found in our region.

   c. <u>Cost analysis of energy delivery models</u> - Various methods are used to deliver energy (distributed, utility scale); therefore, this analysis will provide the costs and benefits of the different delivery models.

   d. <u>Consumer choice alternatives</u> - Provide an overview of alternative energy models, such as Community Choice Aggregation and "Direct Access" purchasing, that provides consumers with options beyond the traditional investor-owned utility model. The analysis will examine the viability and risks associated with implementing these alternative choice models and summarize the use of consumer choice alternatives throughout the state.

   e. <u>Discussion of incentives, policies and best management practices in other jurisdictions that promote sustainable renewable energy development</u> - Analyze the incentives, policies and best management practices utilized in other jurisdictions and examine whether they produce desired effects.

   f. <u>Overview of the renewable energy industry in San Diego County (jobs, economic impact, etc.) and its potential for growth</u> - Renewable Energy not only benefits the environment and consumer; it also supports a growing industry within San Diego County. Analyzing the regional impact of the renewable energy industry may help shape the County's REP.

4. Develop findings and recommendations for the Board's consideration through internal and external stakeholder participation. Anticipated recommendations from this research effort are as follow:

    a. <u>Develop a Board Policy that memorializes the County's commitment to support and encourage renewable energy development</u> - The Board has adopted similar policies for other key industries such as agriculture (Board Policy I-133).

    b. <u>Develop a legislative strategy to support renewable energy development</u> - Renewable energy is an emerging technology and, as a result, state and federal regulations continue to evolve. There is an opportunity for the County to play a role in advocating and advancing legislation that will benefit the consumer and industry as a whole.

    c. <u>Update existing plans, policies and incentives</u> - A number of existing County plans, policies and incentives include components involving renewable energy. There are opportunities to thread and leverage these renewable energy components together to maximize benefits and efficiencies.

    d. <u>Identify new plans, policies, and incentives</u> - Phase One will likely identify new plans, policies, and incentives to support renewable energy development. These new tools will be presented to the Board for consideration at the conclusion of Phase One and further developed in Phase Two upon direction from the Board.

    e. <u>Develop a marketing plan</u> - The marketing plan will educate and inform consumers about the various renewable energy options and benefits available and provide a "road map" for consumers to tap into renewable energy incentives and programs. This effort will also provide consumers with permitting information for the various renewable technologies.

5. Form a Renewable Energy Advisory Committee comprised of stakeholders interested and/or involved in the promotion of renewable energy. This Ad Hoc Committee would consist of approximately 8-10 members selected by the Director of Planning & Development Services with backgrounds in developing, permitting and advocating for renewable technologies within our local region. Staff would conduct a series of meetings with the advisory group to discuss the findings and analysis of the Phase One research and solicit input to aide in the formulation of plan, policy and incentive recommendations to be included in the Phase One report.

Community and public input will be solicited during Phase One through a Planning Commission workshop and public review. A comprehensive report detailing all research and analysis would be presented to the Board at the completion of Phase One. The report will include recommendations presented in a format that will enable the Board to choose the specific plans, policies and incentives it deems appropriate prior to committing resources to their development in the next phase.

Phase Two

Phase Two consists of developing the recommendations approved by the Board at the completion of Phase One and completing any associated environmental analysis prior to their formal adoption. The specifics of Phase Two will remain unknown until all Phase One research and analysis has been completed and its associated recommendations have been identified and reviewed by the Board. The Phase Two work plan will be developed as an action item under Phase One and presented to the Board with the Phase One comprehensive report.

Time and Costs

Staff has prepared time and cost estimates for the two phase work plan described above. The time and cost estimates provided assume consultant services will be utilized in conjunction with staff time. Phase Two time and costs are estimates based on the anticipated recommendations and will be refined based upon the recommendations ultimately approved by the Board at the completion of Phase One.

Time Cost Estimates				
Options	**Time**	**Consultant Cost**	**Staff Cost**	**Total Cost**
Phase One	18 Months	$260K	$110K	$370K
Phase Two	12 Months	$25K	$150K	$175K
Total	30 Months	$285K	$260K	$545K

Policy Issue

Pipelined Projects - Concerns are often raised that the development of new plans or policies may negatively impact projects currently under review. Determining the applicability of potential new policies and standards to applications and projects already underway may create delays or in some cases render a project infeasible. In order to alleviate concerns and provide certainty to applicants, the Board may wish to "pipeline" renewable energy projects currently under review and exempt them from any future policy changes or new requirements that may result from this REP development effort.

Upon direction from the Board, staff can prepare a "pipelining" provision for the Board's consideration at the time staff returns to present the Phase One report.

Environmental Statement

Approving the recommended actions is categorically exempt from CEQA under Section 15262 of the State CEQA Guidelines because the recommended actions involve only planning studies for possible future actions which the Board has not approved, adopted, or funded. All recommendations identified under Phase Two of the work plan will be reviewed under CEQA and will be presented to this Board for consideration.

Linkage to the County of San Diego Strategic Plan

Today's proposed actions supports the Sustainable Environments Initiative in the County of San Diego's 2013-2018 Strategic Plan by creating a comprehensive renewable energy plan that threads the County's planning efforts together to facilitate renewable energy development. The proposed action ensures that planning and infrastructure support the economy and a strong region.

Respectfully submitted,

Sarah Aghassi

SARAH E. AGHASSI
Deputy Chief Administrative Officer

ATTACHMENT(S)
Attachment A – Board of Supervisors Minute Order, April 10, 2013

SUBJECT: COMPREHENSIVE RENEWABLE ENERGY PLAN (DISTRICTS: ALL)

AGENDA ITEM INFORMATION SHEET

REQUIRES FOUR VOTES: [X] Yes [ ] No

WRITTEN DISCLOSURE PER COUNTY CHARTER SECTION 1000.1 REQUIRED
[ ] Yes [X] No

PREVIOUS RELEVANT BOARD ACTIONS:
April 10, 2013 (3), Comprehensive Renewable Energy Plan

BOARD POLICIES APPLICABLE:
N/A

BOARD POLICY STATEMENTS:
N/A

MANDATORY COMPLIANCE:
N/A

ORACLE AWARD NUMBER(S) AND CONTRACT AND/OR REQUISITION NUMBER(S):
N/A

ORIGINATING DEPARTMENT: Planning & Development Services

OTHER CONCURRENCES(S): N/A

CONTACT PERSON(S):

Mark Wardlaw, Director	Matt Schneider Planner/Project Manager
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E-mail	E-mail

Attachment B – Board of Supervisors Minute Order No. 1, September 25, 2013

COUNTY OF SAN DIEGO
BOARD OF SUPERVISORS
WEDNESDAY, SEPTEMBER 25, 2013

MINUTE ORDER NO. 1

SUBJECT: CONTINUED FROM 9/11/13 AGENDA NO. 4: COMPREHENSIVE RENEWABLE ENERGY PLAN (DISTRICTS: ALL)

OVERVIEW:
On September 11, 2013 (4), the Board of Supervisors continued the item to September 25, 2013.

On April 10, 2013 (3), the Board of Supervisors directed the Chief Administrative Officer to research and develop options for a comprehensive renewable energy plan, prepare a work plan including time and cost estimates and return to the Board within 120 days. Today's Board Letter is in response to the Board's direction and details a work plan for a comprehensive renewable energy plan including time and cost estimates.

FISCAL IMPACT:
Funds for this request are not included in the Fiscal Year 2013-2014 Operational Plan. If approved, this request will result in total costs and revenue of $370,000 in Fiscal Year 2013-14. The funding source is the General Fund fund balance. There will be no change in net General fund cost and additional staff years as a result of the recommended actions.

BUSINESS IMPACT STATEMENT:
The proposed project will further County, state and federal goals of utilizing alternative renewable energy resources. Facilitating renewable energy development provides alternatives for consumers, protects the environment and will help reduce the potential for energy shortages and outages which could negatively impact regional businesses.

RECOMMENDATION:
CHIEF ADMINISTRATIVE OFFICER
1. Receive presentation on options for a Comprehensive Renewable Energy Work Plan.

2. If the Board directs staff to commence Phase One of the Renewable Energy Work Plan:
   a. Find that implementing the Renewable Energy Work Plan is categorically exempt from the California Environmental Quality Act (CEQA) under Section 15262 of the State CEQA Guidelines because it is a project involving only planning studies for possible future actions that the Board has not approved, adopted or funded.

   b. Direct the Chief Administrative Officer to initiate Phase One of the Renewable Energy Work Plan and return to the Board within 14 months of executing all required consultant service contracts.

c. Establish appropriations of $370,000 in the Department of Planning & Development Services, services and supplies, to fund Phase One of the Renewable Energy Plan based on Fiscal Year 2012-13 General Fund fund balance available. **(4 VOTES)**

d. Direct the Director of Planning and Development Services to form a Renewable Energy Advisory Committee.

e. Provide direction to staff regarding the preparation of a "pipelining" provision for discretionary renewable energy projects under review and include a provision for the Board's consideration when staff returns with the Phase One report.

ACTION:
ON MOTION of Supervisor Jacob, seconded by Supervisor D. Roberts, the Board took the following action:

1. Received a presentation on options for a Comprehensive Renewable Energy Work Plan.

2. Found that implementing the Renewable Energy Work Plan is categorically exempt from the California Environmental Quality Act (CEQA) under Section 15262 of the State CEQA Guidelines because it is a project involving only planning studies for possible future actions that the Board has not approved, adopted or funded.

3. Directed the Chief Administrative Officer to initiate Phase One of the Renewable Energy Work Plan excluding 3b and 3c, and return to the Board within 14 months of executing all required consultant service contracts.

4. Established appropriations of $300,000 in the Department of Planning & Development Services, services and supplies, to fund Phase One of the Renewable Energy Plan based on Fiscal Year 2012-13 General Fund fund balance available.

5. Directed the Director of Planning and Development Services to form a Renewable Energy Advisory Committee.

6. Directed the Chief Administrative Officer to prepare a "pipelining" provision for discretionary renewable energy projects and to include a provision for the Board's consideration when staff returns with the Phase One report; and directed that the "pipelining" provision provide that any application for a discretionary renewable energy project filed prior to new rules taking effect shall be governed by existing rules and that the new rules shall not be retroactively applied to such projects.

AYES: Cox, Jacob, D. Roberts, R. Roberts, Horn

- - -

State of California)
County of San Diego) §

I hereby certify that the foregoing is a full, true and correct copy of the original entered in the Minutes of the Board of Supervisors.

THOMAS J. PASTUSZKA
Clerk of the Board of Supervisors

By______________________
Andrew Potter, Chief Deputy

Attachment C – Comprehensive Renewable Energy Plan Draft Phase I Report (Empower 2015)

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PHASE I OF THE COMPREHENSIVE RENEWABLE ENERGY PLAN (CREP) REPORT PREPARED FOR THE COUNTY OF SAN DIEGO

PREPARED BY
EMPOWER DEVICES AND ASSOCIATES
ECONOMIC AND HUMAN DIMENSIONS RESEARCH ASSOCIATES
COLORADO ENERGY GROUP, INC

REVISED DRAFT REPORT
JULY 14, 2015

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What is purpose of this report?

This report presents the first step or a Phase I review of a Comprehensive Renewable Energy Plan (CREP) for San Diego County. It presents the evidence behind the changing regional energy system over roughly the next 35 years, or through 2050. It highlights the mix of renewable energy and energy efficiency scenarios that are most likely to enhance the economic well being of the regional economy. It also highlights the scale of the investment that is required and the mix of policies, programs, and best practices that are most likely to ensure the hardy development of a renewable energy market and the robust and sustained development of the regional economy. It also underscores reasons why the County, its businesses, and residents might choose to develop and support these opportunities.

What is the scope?

The report sets out evidence on the future of energy costs and their impact on the San Diego County economy. The intention is to provide the evidence base from which San Diego County officials and constituents can develop an approach to a comprehensive renewable energy market in the region – one that will support the development of a more productive, robust, and sustainable energy market and local economy.

What geographies does the report cover?

The report broadly covers the residential, commercial, and industrial sectors of San Diego County, with a particular focus on the unincorporated areas within the County. There are cases where the authors rely upon data from the State of California, and the United States as a whole, but the economic assessment and recommendations are confined to a County-level perspective.

Who is it for?

The report is intended primarily for County officials and business leaders in particular. It provides insights into how that community might engage with public and private sector stakeholders to create a more energy-efficient and more robust economy over the period 2015 through 2050. The report will also be of interest to the energy sector, other government and business partners, as well as the current 3.2 million residents of the County.

What methodology was used?

Three forms of evidence were used in this report. First, the assessment draws on a county-specific energy and economic policy modeling system to present the major trends and the likely costs and benefits of both the regional energy market and a series of four Energy Innovation Scenarios that represent possible investment paths for the County to follow. Second, the assessment draws on a review of possible financial mechanisms to enable a more robust and sustainable economy. Finally, it draws upon a wide range of interviews, analytical critiques, and literature reviews conducted during the period June 2014 to April 2015.

Who are the authors?

The underlying research, analysis, and writing of the report were carried out by a team pulled together by EMpower Devices and Associates (Empower) (now Empower Efficiency, LLC) specifically for this assessment. The overall management of the project was carried out by Kat A. Donnelly and Erin Brandt. The economic modeling and assessment was undertaken by John A. "Skip" Laitner of Economic and Human Dimensions Research Associates (EHDRA). The review of financial mechanisms was provided by Matthew T. McDonnell (also EHDRA). The review of programs, policies, and best practices was written by George Burmeister from Colorado Energy Group, Inc. (CEG). Key additional research was provided by Ryan Keller (EHDRA), Eric Sikkema (CEG), and Clara Suh and Deborah Gunn (Empower).

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Executive Summary

To Be Completed.

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"If you are not prepared for the change, you're too late."

- James Avery, SDG&E

1. Introduction

On any given day, an office worker in San Diego County might "telecommute" from home rather than drive to the office. At the same time, a farmer may power up a tractor to begin the harvesting of crops, while a truck driver may be on the way to deliver a replacement part that will allow a manufacturer to resume production. These separate work events all share three critical elements. The first is that someone undertakes an activity to get the job done. This element is typically referred to as labor, or perhaps skilled employment. The second is the use of machinery or some type of equipment that enables the production of goods and services. This item is the result of annual investments made each and every year in that equipment, or perhaps in supporting infrastructure that enables the other equipment to be used. Buildings, roads, bridges, pipelines, power plants, and new solar technologies are all examples of supporting infrastructure. The combined investments in all of that equipment and infrastructure, as they accumulate over time, are often referred to as capital.

The third element is the high-quality flow of energy – electricity, natural gas, or gasoline, whether they are provided by conventional energy or by renewable energy resources. It is energy in the form of food that animates labor, and in the form of electricity or natural gas that enables capital to carry out the desired set of tasks. Depending on the mix and productive uses of resources put to work, the local economy is able to deliver the desired mix of goods and services to meet the needs of area businesses and the local residents. This so-called work is typically measured as personal income or gross regional product (GRP).

In most economic development assessments, labor and capital are often thought to be the main elements that drive economic activity; but it is energy – the third, and the most often overlooked component of the economic process – that may prove the most critical driver of economic and social well-being. To extend our example above, a software engineer cannot develop code without electricity to power the computer. The truck driver cannot deliver a replacement part without the diesel fuel to power the truck engine. When optimally sourced and efficiently used, energy can amplify local economic development, and it can enhance a more robust and resilient economy. But, the wrong mix of those resources, coupled with the inefficient use of the resulting energy flows, can appreciably constrain the vigor of a local economy.

The San Diego County region has one of the largest population centers in the United States, with over 3 million people covering 4,200 square miles. In 2015, an estimated 1.9 million people in San Diego County will regularly go to work each day of the year. Consumers and businesses, together with the variety of municipal government operations at work in the county, will spend an estimated $10 billion dollars to meet their combined energy needs. The many payments made each day or each month will enable them to cool and light their homes, to drive to work, to listen to music or watch TV, and to power the county's many commercial enterprises. Electricity purchases, for example, will further enable access to the Internet, as well as filter and purify the water that is delivered to local homes, schools, and businesses every day.

Although San Diego County derives many important benefits as they pay their various bills, there also may be a very big opportunity to save money – perhaps as much as $3 billion dollars more per year – even as the use of that energy also releases massive amounts of pollutants into the air. The current mix of energy resources used to support economic activity within San Diego County will also produce and release into the atmosphere 2,700 tons of sulfur dioxide (SO_2), 11,400 tons of particulate matter, 56,000 tons of nitrogen oxide (NO_x), and 56,000 tons of volatile organic compounds (VOC). These and other pollutants are expected to add $3-$7 billion to the county's

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annual health care costs, ranging from the costs associated with 500 or more premature deaths, 16,000 cases of upper respiratory symptoms, and 80,000 lost worker days (Ayres and Warr 2009, Abt Associates 2013).[1]

The impact of the county's requirements extends well beyond immediate health care costs. In addition to the SO_2 and NO_X pollutants, the various energy sources will also be pumping an estimated 26 million metric tons of carbon dioxide (CO_2) emissions into the earth's atmosphere (Gordon, Silva-Send et al. 2013). Both scientists and insurance companies increasingly recognize that this annual discharge of CO_2 contributes to global climate change whose effects are increasingly noticed around the world. Recent statements by members of the insurance industry attest to this concern (McHale and Leurig 2012). Furthermore, as the authors disclose later in this assessment, the inefficient use of energy may also cost the County an average of 35,000 jobs over the period 2015-2050 and as many as 100,000 jobs by 2050. This also means an estimated $2-$5 billion annually in lost wages (in 2012 dollars).

There is little question that the production and use of energy holds great economic value for both San Diego County and the United States. In fact, many renewable energy industries are growing exponentially. According to the recent Solar Foundation's Solar Job Census, one out of every 78 new jobs created in the U.S. in 2014 was created by the solar industry - representing 1.3 percent of all new jobs (Luecke, 2014). Renewables alone will not meet the County's energy needs, but it remains a potential economic gold mine for the region. County officials are to be congratulated on identifying this economic opportunity, and beginning the important research on it through this Phase I report that will help strengthen future policy and investment decisions.

As then President George W. Bush emphasized in 2006, there is a critical need for greater emphasis on energy efficiency and a more diversified energy portfolio. A recent report by the International Energy Agency (IEA) noted that the inefficient conversion of energy can create a large array of problems which can weaken or constrain the development of a more robust economy (Campbell, Ryan et al. 2014). German physicist Reiner Kümmel and his colleagues studied the economic process and noted that the economic weight of energy is significantly larger than its cost share (Kümmel 2013). Research by economist Robert Ayres and his colleague and then PhD student Benjamin Warr (2005) documented that improvements in both the quality and efficiency of delivered energy services may be the critical factor in the growth of an economy. Indeed, they suggested that greater levels of energy efficiency is one of the primary drivers that support meaningful technological progress, and that sustained technological progress may come only with extensive upgrades in a region's overall energy efficiency.[2]

For very similar reasons, the economy of San Diego County may also be at a crossroads. As detailed in a recent study published by the American Council for an Energy-Efficient Economy (ACEEE), it turns out that the U.S. economy is only 14 percent energy-efficient. That is to say, of all the energy consumed within the economic process, more than 85 percent of it is wasted. The authors see a lot of that waste in the form of air pollution and carbon dioxide emissions. With an inefficient use of energy and also with the over-reliance on fossil fuel resources, the County may face serious economic and competitive challenges should it continue the current pattern of energy production and consumption.

As the authors suggest in this assessment, productive investments in renewable energy systems and system upgrades in energy-efficient technologies can provide all of San Diego County's energy needs by 2050. While there

[1] The various pollutants and health impacts are author-derived estimates based on San Diego County emission scenarios for 2017 given the various health effects identified by the Environmental Protection Agency's Co-Benefits Risk Assessment (COBRA) model.

[2] For more background and a deeper discussion on the critical link between the productive conversion of high quality energy and a robust economy, see Ayres and Warr (2010), Rifkin (2011), and Laitner (2014).

are substantial upgrades that must be made to the region's telecommunication and electricity grid before large-scale improvements can be made, it is both technically and economically feasible.[3] In short, a significant portion of the billions of dollars already spent each year for energy consumption can be used in other ways to more productively strengthen the County's larger economy – provided local business leaders and policy makers choose to make those smarter and more productive investments.

This report explores future economic development opportunities available to San Diego County. More specifically, the authors examine the possible economic benefits within the unincorporated areas of the County if household and businesses were to shift away from current investment patterns to pursue a more productive and cleaner energy future. The authors investigate the benefits that renewable energy and energy efficiency resources can deliver to the local economy as the basis for a revitalized economic development and look at what scale of investment will be necessary to drive those improvements. Also included is an evaluation of the value to County residents of fewer harmful pollutants in the air. Lastly, the report determines how a shift in spending toward clean energy could strengthen the region's ability to support more incomes and jobs.

With that backdrop, Section II of this assessment provides the larger context and overall background that reinforces the analysis found in this report. Section III explores the current patterns of economic activity and energy consumption – especially as the authors look to the evidence of previous inquiries and investigations that might inform the assessment here. It also includes an overview of the methodology the authors use to estimate the economic impacts of the greater diversity in the use of energy resources and, in particular, the greater level of renewable energy and energy efficiency improvements. Section IV explores the variety of financial mechanisms that will enable the County to build those opportunities, while Section V offers a review of best practices among the many policies and programs that are likely to enable that positive outcome. Finally, Section VI summarizes the major results of this inquiry and highlights the next critical steps to ensure a more robust, resilient, and sustainable economy within the County. In addition, Appendix A-1 offers further details about the economic model used to complete this assessment for the County.

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[3] In a very thoughtful interview, San Diego Gas & Electric Senior Vice-President of Power Supply, James Avery highlighted some of the emerging problems now associated with the rapid adoption of photovoltaic energy systems (essentially devices which convert sunlight directly into electricity). At the same time he noted: "The authors haven't begun to think of the technologies that will evolve" out of the digitalization of the grid, he said. "The wealth of opportunities far exceeds the programs and applications that exist today." See, http://www.utilitydive.com/news/sdge-if-youre-not-prepared-for-the-change-its-too-late/366979/

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2. Report Context

2.1. General Context and Report Background

In April 2013, the San Diego County Board of Supervisors requested that San Diego County identify options for developing a Comprehensive Renewable Energy Plan (CREP). The work plan that resulted from this request calls for developing a CREP in phases to establish a path for transforming the County's renewable energy and energy efficiency markets for the benefit of the region. The goal is to develop a CREP that will build stakeholder consensus and start the process of renewable energy market transformation. For Phase One, San Diego County staff are tasked with identifying key economic and business information to formulate recommendations that can inform, inspire, and motivate decision makers.

This report is intended to inform the Phase One decision-making process and serve as a roadmap for how energy, economic, and environmental goals can be met through the expansion of renewable energy and energy efficiency in San Diego County's unincorporated areas. Given the intentionally comprehensive nature of the CREP, this report not only outlines several paths for renewables, but also shows how energy efficiency fits into these paths.

To date, San Diego County has developed numerous policies and programs that directly or indirectly shape how the County and its constituents pursue renewable energy. However, these actions often happen in silos. This report outlines these existing energy-related actions, as well as presents how future policies and programs can be developed using a comprehensive, multi-sector approach to renewable energy development in the county.

This report proposes scenarios of what could be possible for renewable energy, and outlines what resources and actions are necessary for such scenarios to be realized. It does not look at renewable energy in isolation, but rather how it is directly linked to sustainability, energy efficiency, and the local economy.

2.2. Energy Context

Research shows that California counties are only recently starting to address the streamlining of renewable energy development within the planning process, with most activity occurring since 2010 (CEG 2014). When considering the implementation of Best Practices within the CREP, the County of San Diego must consider a number of complex energy-related requirements or initiatives already underway at the Federal, State, regional, and local levels. The interplay between these moving parts needs to be understood as much as possible when considering any new programs or policies. Ideally, the mix of programs and policies ultimately selected for implementation by the County for the CREP will help meet many of these existing and upcoming requirements set at the State and Federal levels.

2.2.1 Federal Energy Context

Federal energy policy, or the lack thereof, has a major impact on the County. For example, the lack of Federal action on the price of carbon generally puts more pressure and responsibility on the County and other jurisdictions in this area. At the Federal level, the U.S. Environmental Protection Agency (EPA) is proposing to reduce carbon dioxide emissions from the nation's fleet of power plants by a total of 30 percent from 2005 levels by the year 2030 as part of the implementation of Section 111 (D) of the Clean Air Act. The EPA is doing this by developing separate carbon pollution-reduction frameworks for new and existing power plants. Increasing the use of renewables and making energy efficiency improvements are two of the four major strategies suggested by the EPA for states and their constituents to use to meet these national emission standards. As such, the actions that come out of the CREP will be critical in helping to meet these new Federal standards.

Another regional plan that will critically influence the development of renewable energy in San Diego County is the Desert Renewable Energy Conservation Plan (DRECP). The DRECP was initiated in 2008 by a California Executive Order (S-14-08), but it will impact existing Federal agencies. The area covered by the DRECP includes 22.6 million acres across seven California counties, with the eastern portion of San Diego County included in the impact area. The general purpose of the DRECP is to expedite siting and construction of renewable energy power facilities and transmission lines through streamlined environmental review and permitting, while conserving and managing plant and wildlife communities in the desert regions. This desert conservation and renewable energy and transmission focus will be covered through three separate components of the DRECP: A U.S. Bureau of Land Management (BLM) Land Use Plan Amendment; a U.S. Fish and Wildlife Service (FWS) General Conservation Plan; and a California Department of Fish and Wildlife (CDFW) Natural Communities Conservation Plan. Proponents of the DRECP are looking for a comprehensive, landscape approach that considers an entire region for development versus the project-by-project approach that tends to dominate planning efforts in many California counties today. The DRECP was driven early in part by the intent to meet the State's 33 percent by 2020 Renewable Portfolio Standards (RPS). DRECP proponents plan to develop 20,000 Megawatts of renewable energy power over the next 25 years, which is no small feat. With habitat issues dominating the San Diego region, participation in the DRECP will be increasingly important in the next two years as public opinion is sought on policy alternatives.

In addition to the extensive Federal government activity underway in the renewable energy area, electric and gas utilities across the country are wrestling with new business models that include starting new renewable energy divisions, and partnerships with companies involved in the renewable energy field. The dramatic reduction in the costs of solar, an 80 percent drop since 2008, and new financing options has opened up new markets, and has many utility executives worried about losing market share and control of energy supply as solar penetration rates move from less than 1 percent to perhaps 10 percent. As the cost of solar continues to plummet and reach parity with energy efficiency and traditional fossil fuel plants, new, riskier, investor-driven merchant solar projects that do not already have a buyer in-hand, per decades of traditional utility regulation, are starting to pop up and gain attention.

2.2.2. State and Regional Energy Context

California's Renewables Portfolio Standard (RPS) is one of the most ambitious renewable energy standards in the country. The California RPS program requires investor-owned utilities (IOUs), electric service providers, and community choice aggregators to increase procurement from eligible renewable energy resources to 33 percent of total procurement by 2020. In his January 5, 2015, inaugural address, Governor Jerry Brown proposed that by 2030 the RPS be increased from one-third to 50 percent of the State's electricity resources.[4]

California Environmental Quality Act (CEQA) issues are prominent in San Diego County. CEQA has been used legitimately, and some say inappropriately, to stop renewable energy development in the County of San Diego and other California counties. As a result, developers, County officials, and an active group of environmental stakeholders are interested in designing a "habitat-friendly" CREP that allows developers to adhere to CEQA while also speeding up the CEQA-related permitting process.

While utilities are busy trying to figure out how to make money on solar, they are also knee-deep in electric vehicle (EV) infrastructure development. EVs continue to gain market share. California accounts for about 40 percent of all plug-in cars sold in the U.S., with over 100,000 cars sold through August 2014 (Bloomberg News, September 9, 2014). Governor Brown issued an executive order in March 2012 that established the goal of getting 1.5 million zero-emission vehicles (ZEVs) on California roads by 2025. Environment California announced in October of 2014

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[4] For the full set of Governor Brown's recommendations for California energy policy, see his complete transcript at: http://www.latimes.com/local/political/la-me-pc-brown-speech-text-20150105-story.html#page=1.

that California had more than 100,000 EVs on the road, and 20,000 of these vehicles are in San Diego County. Battery manufacturers are teaming with utilities and state governments in an attempt to lower the cost of batteries and create viable storage technologies, long considered the "holy grail" for renewable energy, since the energy produced by solar, wind, and other renewables can be generated, stored, and released when it is the most profitable to do so.

Complicating the CREP planning scenarios further is the fact that the County and its local governments are currently looking at participation in a new (one County) San Diego-area Regional Energy Network (REN), likely managed through the San Diego Association of Governments (SANDAG). This third REN would complement work performed by the other two RENs, one in the Bay area (the BayREN), and one in Los Angeles (the SoCalREN). The proposal to start a REN in this region has been around for years; only recently have the discussions seemed to pick up momentum with State and Public Utilities Commission (PUC) staff. How the REN is structured has huge consequences for the County. With active County involvement and leadership, and a commitment to implementing some of the recommendations contained in this report, the REN could be a valuable, worthwhile entity that could help the county increase renewable program involvement by a factor of 10 or more.

Community Choice Aggregation (CCA) refers to the opportunity for the County of San Diego to purchase electricity on behalf of its residential and commercial constituents. Numerous California counties are involved in CCA now. The potential benefits associated with CCA, a reduction in electricity costs and more renewables, are discussed in more detail in a separate section of this report. The County already benefits from electricity purchased via Direct Access, another option that allows the County to purchase electricity directly from competitive electricity service providers (ESPs). Direct Access has not been available to new residential customers since the program was suspended in 2001 during the energy crisis.

The County of San Diego is to be congratulated for its plans to create a regional energy plan (the CREP) focused on renewable energy. Most comprehensive energy plans are statewide, or confined within a local government territory. Comprehensive regional energy planning involving multiple local governments, aside from transportation plans required for federal funding, is a relatively new phenomenon. There are very few examples of regional energy plans. The first official regional energy plan occurred when 12 counties in Ohio worked on a plan in 2012, through the National Association of Regional Councils and Colorado Energy Group, Inc. Their focus was on moving their counties toward using more renewables and natural gas, and away from traditional coal power supplies. The County of San Diego has the opportunity to engage adjacent counties in the CREP, especially the eastern portion of the county where so much renewable energy development and associated new transmission line planning are occurring. Air quality and the associated regulations managed through the County of San Diego's Air Pollution Control District can be positively impacted and influenced by increased renewable energy in the region.

Many local governments are looking to regional energy plans to help address the fact that energy outages do not neatly follow geographic boundaries or transmission line routes. California local governments are designing and implementing new Energy Assurance Plans (EAPs) and Energy Resilience Plans (ERPs) that identify and prioritize key assets and services provided by government, and "harden" the power sources associated with these assets and services making them more resilient. The City of Chula Vista was one of only three California local governments of the first 43 local governments to design and implement an EAP since 2009 with the help of federal funding (the other two were Visalia and San Jose).[5] The County of San Diego Office of Emergency Services is currently preparing an Energy Resilience Plan (ERP). Using solar photovoltaics (PV) as back-up or primary power to key assets within the framework of an ERP, can bolster the CREP.

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[5] CEC, CaLEAP, September 2014.

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Generally, most of the innovation with renewable energy programs comes from local governments. They have more flexibility, and are able to act more quickly than their Federal and State counterparts. The City of Lancaster, California, aspires to be the "Solar Capital of the World," and has set-up a business division within the City to both sell renewable energy to other cities, and also provide technical assistance to cities that want to generate electricity through solar. Lancaster also requires that all new residential construction incorporate solar power, an aggressive and rare policy. Dozens of similar policies are highlighted in the Best Practices chapter.

2.2.2.1 The Local Energy Context in San Diego County

Current County resources directed to renewable energy, and energy in general, are divided among multiple departments. The County participates in multiple energy collaboratives across the region and participation is dictated by the subject area. As of early 2015, there is no centralized coordination of efforts in the County when it comes to energy.

The County currently participates in San Diego Gas and Electric Company's (SDG&E) Local Governement Partnership Program. The LGP provides funding for energy efficiency program implementation across three departments: Planning and Development Services (PDS), Department of Parks and Recreation (DPR), and Department of General Services (DGS) (SDG&E and County of San Diego, 2015).

The County participates in the San Diego Association of Governments (SANDAG) Energy Working Group,which provides input and feedback on issues related to the Regional Energy Strategy and tasks of the Regional Energy Planning Program . The County also participates in the Regional Planning Technical Working Group, a key forum for decisions related to SANDAG's Regional Transportation Plan and implementation of its projects and programs. In addition, the County plays a role in the Bicycle Pedestrian Working Group, which establishes grant criteria and oversees the dispensing of grants for active transportation projects (County of San Diego 2013).

The County has an effective Strategic Energy Plan (SEP) in place that is primarily focused on the internal actions of the County. The SEP is currently based on a three-year cycle, and the next cycle will likely be a five-year cycle, with updated plans developed to address regulatory, technical, economic, and societal changes. The main priorities for the next update are to: minimize utility (water and energy) consumption/costs and to ensure sustainability practices are assimilated into the organization.

The County will be developing a new Climate Action Plan (CAP). The purpose of the CAP will be to address issues related to growth and climate change, and to safeguard the environment for residents and visitors. Approval and implementation of the CAP will result in emission reductions.

The County has several notable achievements in the renewable energy and energy efficiency areas. As of December 2012, the County permitted more than 45.25 megawatts of renewable energy in the unincorporated area, which generates the equivalent of enough annual power for approximately 45,000 single-family homes. From fiscal years 2010 to 2013, there was an average of 1,588 photovoltaic permits issued each year in the unincorporated area of San Diego County, with a 138 percent increase from 2010 and 2011 to 2012 and 2013 (County of San Diego 2013).

The County has offered permit fee waivers for residential solar PV electrical system permits since 2001, and permit fee waivers for residential small wind turbine electrical systems since 2008. Amendments to the Zoning Ordinance were adopted in 2010 that codify the use of on-premise energy systems, which include height and setback exceptions for solar PV systems, and an administrative permit process for smaller (<10-acre) PV distribution facilities. A Wind Energy Ordinance was approved that provides an updated set of definitions, procedures, and standards for review and permitting of small turbines. The County also encourages developers of new affordable housing developments to include solar PV systems, where cost effective.

Power Purchase Agreements (PPAs) are used by the County for renewable energy installations on County facilities. The County has installed solar PV at 16 different County facilities with an estimated annual output of 1.2 million kWh. More than 62 percent of that capacity comes from installations at nine facilities since 2010. Financing for these projects came from a mixture of California Energy Commission (CEC) loans, Federal grants, and County funds. With respect to the impact of solar PV incentives, the County's official goal was, "…generation of 5 percent of existing residential electricity and 8 percent of existing commercial electricity with alternative energy systems" (E.Sikemma, County SEP). Available data show that approximately 6.7 percent of residential consumption is now being generated by alternative systems (most likely all solar PV) and only 0.2 percent of commercial consumption is being generated by commercial solar PV (E. Sikemma).

The number of permits issued for residential PV has increased exponentially since 2000. The County processed 1,935 PV permits, which were issued between July and October of 2014. The estimated cumulative annual electricity produced by residential solar PV systems increased from 608,261 kWh to 92 million kWh between 2007 and 2013. By comparison, the estimated annual kWh output from residential installations is more than 27 times that generated by County facilities. Permit activity has been much lower on the commercial side. Estimated cumulative annual production over the same period of time is 1.7 million kWh, less than 2 percent of electricity from solar PV from homes.

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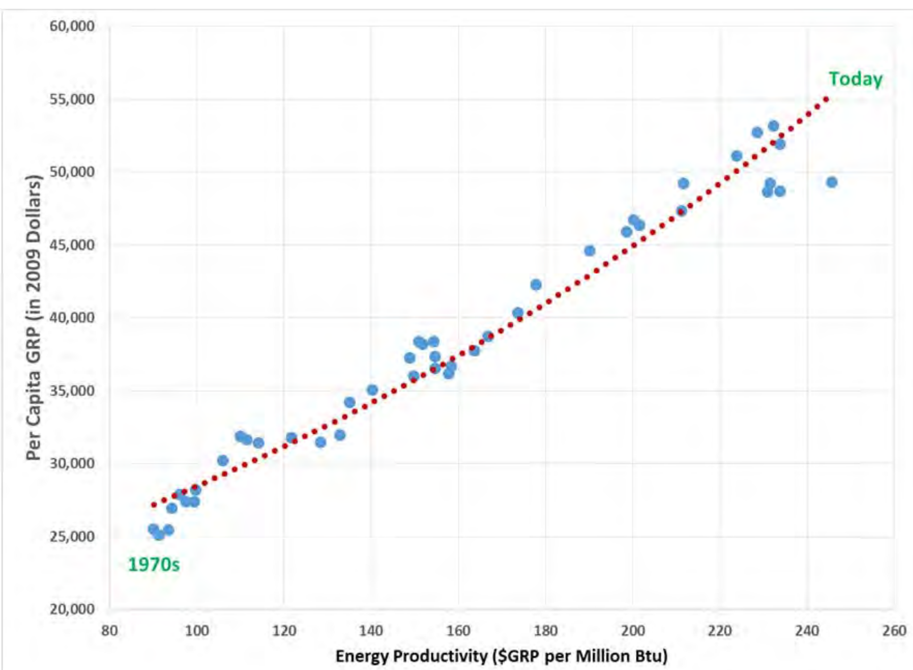
3. How Energy Impacts San Diego County's Economy

3.1. Overview

Within its 4,200 square miles of land, San Diego County is home to 18 incorporated cities and numerous other charming neighborhoods and communities. It is renowned for its idyllic climate; music, arts, and culture; and 70 miles of pristine beaches. Whether strolling the City's cultural heart of Balboa Park or hiking East County's Anza-Borrego Desert State Park, the region is truly a remarkable place. Moreover, San Diego County is a bright spot in the U.S. economy. Its job growth and retail sales are projected to slightly outpace overall levels within the nation as a whole. At the same time, there are worrisome elements emerging on the horizon. While there are signs of potential weaknesses within the San Diego economy, there is good news. There are significant opportunities not only to offset those prospective weaknesses, but also increase the vitality of the area's economy as well as social and environmental well-being.

Before examining the long-term state of the County's emerging economy, and especially the unincorporated regions of the County, this Section will first step back to look at the connection between energy and regional economic activity. Notably, recent historical trends of California's economy as it is positively affected by increased energy productivity will be examined. Further examination includes a possibly weaker job creation process in the United States, in California, and especially San Diego County. By taking a longer historical view, one can begin to see some bothersome tendencies that are shaping a less positive outcome for the County. More broadly, in fact, the U.S. economy appears to have been slowly weakening over the last half-century – and this weakening trend is projected to continue over the next several decades.

FIGURE 3-1. The Link between California Energy Productivity and Per Capita GRP



Source: Author calculations using Woods and Poole economic data (2014) and Energy Information Administration primary energy data (2014), both for the State of California.

What is the general cause of this worrisome trend? In short, the trend of a slumping U.S. economy is strongly connected to a decrease in the rate of high quality energy converted into actual work, where work is the ability to transform matter into the desired level of goods and services (Laitner 2014). In other words, the rate at which more goods and services are obtained for every unit of energy used within the economic process has not improved sufficiently to ensure a more vigorous level of economic activity. In the period 1950 to 1980, for example, the rate of converting high quality energy into work improved about 1.4 percent per year. Over the subsequent 30-year period, 1980 to 2010, that rate of improvement declined to only 0.4 percent. As the rate of economy-wide improvement declines, so too does the rate of improved economy-wide productivity (Laitner 2014). A small decrease in the rate of improved economic productivity, in turn, results in a lagging growth in economic activity as measured by the nation's Gross Domestic Product, or GDP, or within San Diego County, what is referred to as Gross Regional Product, or GRP. With a slightly lower magnitude of GRP, fewer jobs can be expected and generally a less dynamic material standard of living.[6]

Fortunately, these weakening trends can be mitigated or entirely reversed with smarter energy investments. Explained more in depth below, the County's CREP provides a critical opportunity to diversify the region's energy portfolio by increasing investment in renewable energy systems and energy efficiency. These investments will increase the rate at which the region converts energy into goods and services. This increase in goods and services (output) from each unit of energy (input) is otherwise known as the energy conversion rate. Should the County increase renewables and efficiency as a percentage of its total energy needs, its energy conversion rate will increase, and so too will the region's economic productivity. Consequently, an increasing rate of economic productivity will result in a higher Gross Regional Product (GRP), creating more jobs and a higher standard of living for the region even as the environmental impacts and climate burdens are greatly diminished.

3.2. A Closer Look at the Evidence

A useful way to begin examining the link between energy and the San Diego economy is to examine three immediate sets of data: (i) the link between per capita GRP and energy productivity; (ii) projections of future per capital GRP, which is an economy-wide measure of overall economic productivity; and finally, (iii) the expected rate of future job expansion within the County. These are discussed, in turn, beginning with FIGURE 3-1, below, which highlights the upward trend in California's per capita GRP as it has been enabled by greater levels of energy productivity. The data covers the historical period 1970 through 2012. The blue dots show the historical data while the dashed red line highlights the overall trend. The bottom line is that the economic well being as measured by per capita economic activity (per capita GRP valued in constant 2009 dollars to eliminate the impact of inflation) very closely tracks the rising level of energy productivity over time.

Several comments are worth noting at this point. First, California-wide data is used because the energy data for San Diego County isn't collected in the same way or as consistently. Yet, the same pattern as shown in the figure above (FIGURE 3-1) appears for both the U.S. as a whole, and for other countries for which comparisons have been drawn. And that pattern also shows for other assessed states, whether Texas, Ohio, Arizona, Maine, Hawaii, or elsewhere. So there is a high degree of confidence that this same linkage would hold for San Diego County, even if it differs in some aspect or magnitude.

A second point is that while there is some variability in the relationship, a rising energy productivity – measured here as the number of GRP dollars that might be supported for every unit of energy – is absolutely critical to drive up greater per capita GRP. The reason may not be immediately obvious, but greater energy productivity means less wasted energy which, in turn, reduces a large number of costs that enables the economy to move ahead more briskly (Campbell, Ryan et al. 2014). Thus, if San Diego County wants to move its economy forward, policies, programs, and practices will all need to be directed toward greater and greater energy and resource efficiency at all

[6] This, admittedly, is a highly technical analysis, but it is also one that is vital to understanding how a more vital level of economic activity might be better promoted within San Diego County. In short, for a more productive economy, policies and investments should promote a more productive use of materials, water, and especially energy resources at all levels of activity. For a deeper background in these more technical details, see Ayres and Warr (2009) and Kümmel (2011), in addition to Laitner (2014).

levels within the economic process. The bottom line is that if residents and businesses within San Diego County want to ensure a sustained and more vigorous level of economic activity, the County would do well to focus on greater energy and resource productivity. Indeed, it is very likely that increased per capita income will be supported only by greater energy productivity.[7]

TABLE 3-1 (below) offers a first look at three different economic variables specifically for San Diego County. These include population growth trends (column A), the growth in per capita Gross Regional Product (column B), and the total growth in the County's GRP (column C). As shown in the earlier FIGURE 3-1, the latter two variables are again valued in 2009 constant dollars. Here, the County's historical record in the years 1970 to 2014 (row 1) are reviewed jointly with future projections from 2014 to the year 2040 (Woods and Poole 2015).[8] Population in San Diego County has grown about 2 percent per year since 1970. This is about twice as fast for the U.S. as a whole. Economy-wide productivity (again, measured as per capita GRP) grew at 1.9 percent annually which is about one-tenth of a percent faster than the U.S. Total GRP (found by multiplying per capita GRP by the population increase) and grew by a very healthy 4.0 percent average annual rate. On the other hand, it is the projections through 2040 that provide some cause for concern – especially the lagging productivity metric.

TABLE 3-1. Population, Productivity and GRP Growth Rates in San Diego County

Compound Average Growth Rate	(A) Population	(B) Per Capita GRP	(C) Real GRP
(1) From 1970 to 2014	2.0%	1.9%	4.0%
(2) From 2014 to 2040	1.1%	1.4%	2.6%

Source: Author calculations using Woods and Poole 2015 data.

Less worrisome is the drop in the population growth rate from 2 percent to 1.1 percent. What should be of immediate concern, though, is the apparent slump in the County's economic productivity (per capita GDP) (shown in column B of Table 3-1), and the impact it will have on the County's overall economy (column C). Although a difference of one-half percent doesn't seem especially large, the following thought experiment illustrates the size of the potential impact on the regional economy. Population growth will be held to the projected 1.1 percent through 2040 (row 2, column A), while per capita GRP will be at the 1.9 percent historical rate shown in the period 1970 to 2014 (row 1, column B), **instead** of the currently projected rate of 1.4 percent. Holding these assumptions to be true, by the year 2040, the San Diego economy would be an estimated $47 billion smaller (again, in constant 2009 dollars) than might otherwise be possible. Based on the current economic profile for San Diego County (IMPLAN 2014), a smaller or less robust economy many also mean an average $5 billion fewer resources for some

[7] In fact, there are two primary forms of energy productivity. First, there is the productivity in producing energy resources or generating electricity power. This happens in the combustion of fossil fuels to generate electricity, for instance. As one example, a modern coal-fired electric generation station may require a total of three units of energy for each unit of electricity that is created and sent over transmission and distribution lines to San Diego homes and businesses. New combined-cycle natural gas power plants may need three-fourths of that total energy. Combined heat and power plants (previously called cogeneration plants) require just half that amount while renewable energy technologies convert sunlight into electricity closer to a one-to-one basis. This is a significant improvement in production efficiency -- even if the solar panels fail to capture all of the light that falls on those panels. Second, there are also greater end-use efficiencies, such as the use of solid-state lighting to provide area illumination rather than the century-old incandescent or Edison lamps. The former, known as light-emitting diodes (or LEDs), require just one-tenth the energy (or less) to provide the same amount of lighting as incandescent bulbs. Both large-scale energy production and energy end-use efficiencies will be needed if San Diego County is to drive a more robust and more sustainable economy over time.

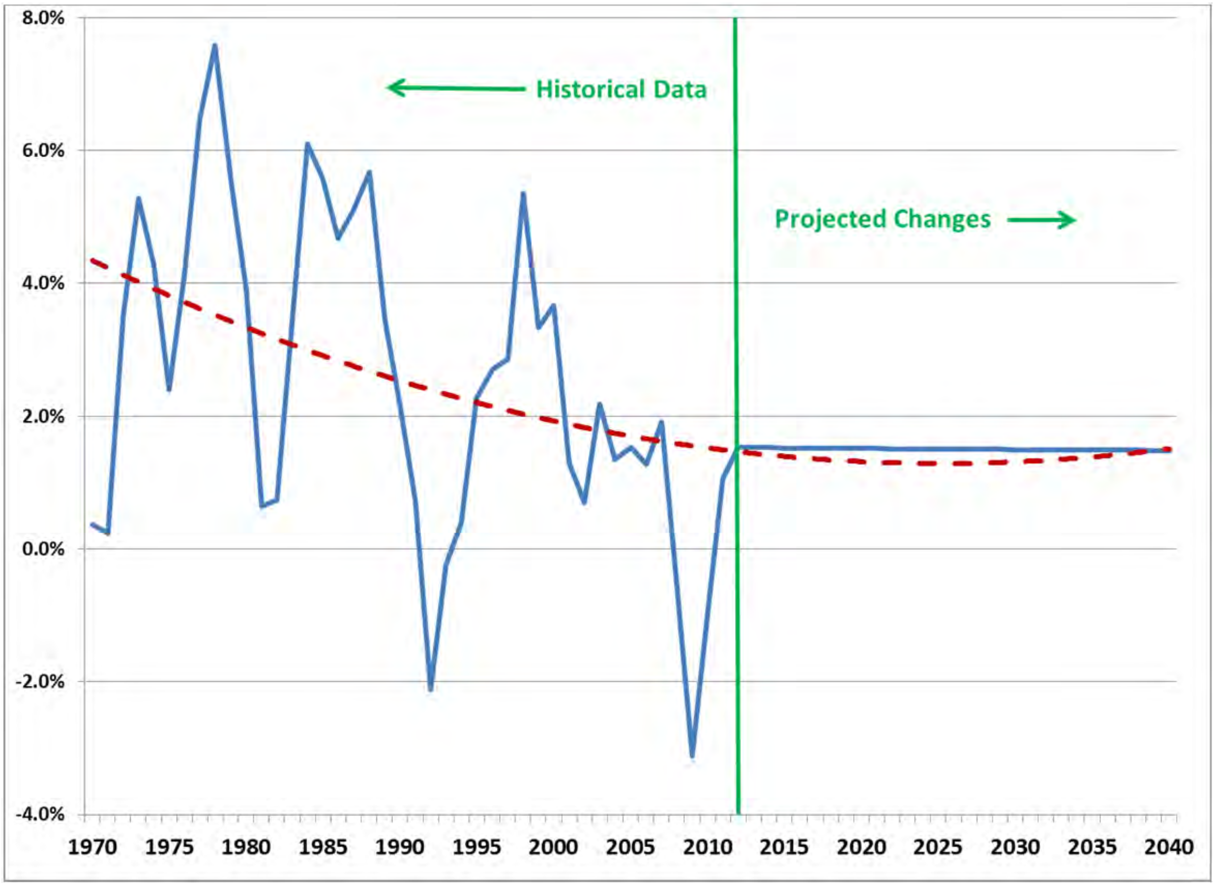
[8] Woods and Poole Economics is an experienced independent firm that specializes in long-term county economic and demographic projections. Their updated annual county projections have been available since 1983. Our team has relied on their data for well over a decade. But, to ensure credible estimates the authors also compared the Woods and Poole projections with comparable data made available from Moody's Analytics (2015). Interestingly, Moody's suggests a slightly more pessimistic outcome.

combination of investment and state and local government revenues. This means fewer dollars available for infrastructure upgrades, and fewer revenues to fund educational, social, arts and cultural programs, for example.

The critical question is this: what is the general cause or causes of the fading rates of economic progress? The answer, in part, is provided by the discussion related to FIGURE 3-1. The deceleration of improvements in the conversion of energy to actual "useful work" is a critical constraint on economic activity. Indeed, the current energy system in the United States is not particularly efficient at converting energy into goods and services. Of the total high quality energy consumed to support U.S. economic activity in 2010, only 14 percent was converted into useful work. In other words, the American economy wasted 86 percent of all the energy used that year in the production of goods and services. And that magnitude of waste imposes a larger array of costs that further limits both economic activity and the job creation process (Laitner 2014).

FIGURE 3-2 provides a further look into the emerging economic prospects for San Diego County. In this case, trends in job growth are reviewed over the same historical period, from 1970 to 2014, as that compares to the projected increase in jobs out to the year 2040. The solid blue line shows the historical and the projected data while the red line highlights the overall trend. One quickly notes two things in the graph: (i) the historically volatile job creation process over time, gaining 4 percent to 7 percent new jobs in some years and losing more than 2 percent of the jobs in other years; and (ii) the generally downward sloping trend from the 1970s with future advances hovering below 2 percent per year. Indeed, the average annual job growth was 2.5 percent over the historical period 1970 to 2014 while the future expansion of jobs may average just 1.5 percent through the year 2040. The difference between the historical rate of improvement and the population-adjusted growth rate (reflecting a smaller gain in population as shown in TABLE 3-1) means that San Diego County may produce between 125,000 and 175,000 fewer jobs on average in the period 2014 to 2040. By the year 2040 it may be between 280,000 and 380,000 fewer new jobs compared to historical rate of development.

FIGURE 3-2. San Diego County Historical and Projected Average Job Growth Rates



Source: Author calculations using Woods and Poole 2015 data

Like the United States, San Diego County maintains a reasonably flourishing yet slowly weakening economy. Economist, international lecturer, and best-selling author Jeremy Rifkin suggests that there are diminishing returns on the current generation of the mostly 20th century technologies now at work in the economy (Rifkin 2011). This perspective is supported by an examination of how energy productivity drives material and economic prosperity (Ayres and Warr 2009) that points to a lagging rate of improvement in the use of materials, water, and especially energy resources (Laitner 2014); see also, (Kümmel 2011). Also at play is an infrastructure that suffers the effects of deterioration and that is in need of improvement and expansion to survive growing demands from County residents and businesses (ASCE San Diego Section 2012). A working memo, based on assessments of the quality of infrastructure in both the United States and California (American Society of Civil Engineers 2012, American Society of Civil Engineers 2013), indicates that San Diego may have between $16 billion and $26 billion in unfunded infrastructure upgrades (Laitner and Keller 2015). All of this points to the need to invest in the larger energy productivity of the San Diego regional economy – especially within the unincorporated areas of the County. The next section will place energy expenditures in context, followed by review of a series of four "Energy Innovation" scenarios to build a more positive economic momentum for the County.

3.3. A DEEPER Look at San Diego County's unincorporated areas

3.3.1. Energy Expenditures in Context

With an estimated 505,000 residents, the unincorporated areas are about 15.5 percent of San Diego County's total population, but they appear to pay about 17.4 percent of the cost of total County energy expenditures. Energy-related data for San Diego County is not collected in the same detail as it is tracked for either in the U.S. or the State of California. Yet, a number of data sources can be pulled to generate a reasonable profile of aggregate electricity, natural gas, and gasoline consumption. TABLE 3-2 provides this first look at energy expenditures for the entire County and for the unincorporated areas of the County as well.

TABLE 3-2. Summary of Energy Expenditures (in millions of 2012 dollars)

	Population (thousands)	Natural Gas	Electricity	Transportation	Total Energy
San Diego County	3,253	389	3,141	5,485	9,014
Unincorporated areas	505	40	504	1,025	1,569
Percent of County	15.5%	10.3%	16.0%	18.7%	17.4%

Source: Author calculations based on a variety of data and publications for San Diego County.

The energy expenditure data shown in the table above are for the year 2012, which is the base year of the economic model used to highlight the economic impacts of different patterns of spending (see Section 3.3.2 below for a detailed description of the modeling assessment). The County as a whole spends an estimated $9 billion dollars for energy while the unincorporated areas spend just short of $1.6 billion. There are two comments that should be noted here, however.

- The estimates do not include a number of major fuel types as the data are not easily obtained at the County level. These include industrial use of coal, propane, compressed natural gas, and marine fuels, among other sources. If those resources in San Diego County scale at roughly the same magnitude as at the State level, then it is likely that that the region spends 25 percent to 30 percent more than is highlighted in TABLE 3-2. At the same time, the focus of the CREP shall be the use of electricity and natural gas resources – primarily sold through San Diego Gas & Electric Company (SDG&E). Hence, there is reasonable confidence that the data provide a solid working profile to suggest different ways the County can shape future energy production and consumption to boost a more vigorous economy.

- Natural gas and electricity account for 35 percent and 39 percent of the expenditure listed in TABLE 3-2 for the unincorporated areas and the entire County, respectively. Said differently, transportation expenditures are 60 percent or more of the total energy costs highlighted in Table 3-2. This suggests that a future element of a truly comprehensive energy plan should include a strong transportation component. This is especially true given the significant trend toward the use of electric vehicles both in the County and across the State of California more generally; and especially as this new generation of cars and trucks may be powered by a variety of renewable energy resources.

3.3.2. Economic Assessment

A major question of this analysis is whether there is a more optimal mix of energy investments and expenditures to benefit the County and its unincorporated areas. This section seeks to address this question through the use of different economic scenarios that provide insights into different patterns of energy use. By evaluating those "innovation scenarios" within an economic mode, the costs and benefits can be compared and contrasted for their potential impact on the larger economy. In short, an investigation of how a change in investments and technologies might benefit jobs, incomes, and net gains in overall economic activity is possible. To tackle this assessment, the future "reference case" must first be laid out to see what the economy might look like assuming no further changes in the region's energy and economic recipe (i.e., business-as-usual). A set of four scenarios (described more fully below) is highlighted to provide different insights into future energy production and consumption patterns. While there are many new emerging technologies that will undoubtedly shape future energy markets (see the related box insert on the follow page which highlights four such technologies), the following innovation scenarios only explore the known and more established set of renewable energy and energy efficiency technologies.

Analysis of the four scenarios uses the DEEPER Modeling System to determine the net economic benefits of the different investment patterns. The Dynamic Energy Efficiency Policy Evaluation Routine (DEEPER) is a proprietary analytical tool first developed by John A. "Skip" Laitner in 1990 and continuously updated for numerous economic modeling activities over the years. It has been used for a wide variety of national, state, and local policy initiatives. It is a compact 15-sector quasi-dynamic input-output model of a given regional economy modified specifically for these economic assessments for the County of San Diego.

3.3.2.1 The Reference Case and Innovation Scenarios

The likely reference case projection for both the economy and the anticipated set of energy expenditures will be made over the period 2015 through 2050. The assumption is that the unincorporated areas of the County will generally follow the trends of the County as a whole, given the starting profile of the County shown in 2012 (the base year of the DEEPER Modeling System) and moving forward over the longer time horizon.

As projected by the County-level data made available by Woods and Poole (2015), but also corroborated by other projections from Moody's Analytics (2015), and the California Energy Commission (Kavalec, Fugate et al. 2014, Kavalec, Fugate et al. 2014), among other resources, the regional population, employment, and overall economy are projected to grow annually at about 1.1 percent, 1.5 percent, and 2.6 percent, respectively (see also TABLE A-1 in APPENDIX A-1 to this assessment). The good news is that there will be normal improvements in the overall efficient use of energy resources. Hence, consumption of energy will increase more slowly than the economy will grow. Electricity use is projected to grow about 1.4 percent annually over the period 2012 through 2050. Natural gas consumption is projected to grow more slowly at about 0.5 percent per year in that same period of time.

On the other hand, the real costs of energy are anticipated to escalate 1.3 percent and 3.2 percent for electricity and natural gas, in that order. This means that the combined energy expenditures will expand at an average 2.8 percent per year, or about 0.2 percent faster than the economy as a whole. An additional assumption is that the State's Renewable Portfolio Standard will continue to require that 33 percent of all electricity sales be provided with renewable technologies through 2050. It is against this complete energy and economic backdrop that the four Energy Innovation Scenarios are evaluated.

Innovation Scenario I. This first scenario slowly begins to introduce a set of changes to better explore how departures from the Reference Case might impact the unincorporated areas of the San Diego County economy. The assumption, here, is that some combination of renewable-generated electricity will continue to meet 33 percent of the required electricity generation, but that efficiency of electricity usage will increase to 20 percent above the normal rate of improvement by 2050. Natural gas consumption will increase to 15 percent of Reference Case consumption. The assumptions that underpin these details are more fully explained in APPENDIX A-1.

Innovation Scenario II. In his January 5, 2015, inaugural address, Governor Jerry Brown proposed that by 2030 the Renewable Portfolio Standard be increased from one-third to 50 percent of the state's electricity resources.[9] This scenario reflects that proposed change in the RPS with the further assumption that energy efficiency will reach 25 percent of total electricity consumption by 2050. Natural gas efficiency is assumed to remain at 15 percent of that usage.

Innovation Scenario III. Building on the previous scenario, this next step highlights an RPS that rises from 50 percent in 2030 so that it then rises to a full 80 percent electricity by 2050. Again, energy efficiency is assumed to increase to 25 percent and 15 percent for electricity and natural gas, respectively, also by the year 2050.

Innovation Scenario IV. Building on increments found in Innovation Scenario III, this scenario explores the prospect of an RPS that climbs from 50 percent in 2030 to a full 100 percent by 2050. Again, energy efficiency is assumed to increase to 25 percent and 15 percent for electricity and natural gas, respectively, also by the year 2050.

Given these assumptions for each of the innovation scenarios, the authors use the DEEPER modeling system to isolate the key economic impacts within the unincorporated areas of San Diego County – including net costs and savings, as well as the impact on jobs, income, and carbon dioxide emissions. APPENDIX A-1 includes more of the specifics of the modeling assumptions. The next subsection below summarizes the key results of each Innovation Scenario.

[9] For the full set of Governor Brown's recommendations for State energy policy, see his complete transcript at: http://www.latimes.com/local/political/la-me-pc-brown-speech-text-20150105-story.html#page=1.

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BOX 1. Emerging Market Technologies

The emerging energy technology market may well be more dynamic than even those working in the energy industry now realize. Certainly, while there is much attention targeting new opportunities for energy efficiency and the explosive growth of photovoltaic systems and battery storage, there are an amazing variety of new technologies already grabbing a foothold in the energy market. Four new innovations are described below. Whether these technologies fulfill their intended resource potential is secondary to the importance of closely monitoring and examining emerging trends that could potentially benefit the San Diego County economy.

Energy Harvesting—Though low in quality, ambient energy can provide a surprisingly large electricity supply. Ideally, energy harvesting is used to power/charge low-voltage devices like watches, switches, sensors, and light-emitting diodes (LEDs). However, interest and investments in this process are expected to spike over the next decade, which can take the technology to much larger levels. Whether focused on clothing, plastic and metal housings, and frames, or as heat crystals, there are three methods of harvesting energy that are being extensively researched today. They are Piezoelectric (energy from motion), Thermoelectric (energy from heat), and Photovoltaic (energy from sunlight) generation. Photovoltaic (PV) is the easiest of the three, and has been in use since the 1970's in the form of solar panels. Piezoelectric and Thermoelectric are relatively new concepts with respect to electricity generation, although both have concepts and different applications that date back to the late 19th century. Recent estimates for energy harvesting suggest a $4.2-$5 billion market by 2022 (Keller and Laitner 2015).

Solar Roadways—This technology is a recent adaptation of more conventional photovoltaic (PV) panels that use the nation's roads and parking lots to collect and convert sunlight into electricity. The hexagonal panels are encased in textured tempered glass that prevents them from shattering, as well as providing extra traction support over 250,000 pounds of force (enough to support an 18-wheeler hauling heavy equipment). They are also fitted with LEDs to provide lane markers and real-time traffic information, as well as sensors to alert the Highway Department to possible disruptions, accidents, or the immediate need for replacement of individual panels. Their surface texture enables safe stopping at the required 40 mph and 80 mph distances. The current life span of the panels is rated at a minimum of 20 years and maximum of 30 years (Keller and Laitner 2014).

Photon-Enhanced Thermionic Emission (PETE)—Hybrid technologies may be a wave of the future. In this case, the technology begins with a normal PV solar panel, but one that harnesses both the light and heat of the sun to generate electricity. It increases the efficiency of solar power production by more than twice the current levels. Such devices work best in parabolic dish collectors. The electrons are collected by an anode at a cooler temperature that then creates additional direct current electricity. The additional heat energy given off is used to power a steam turbine that produces additional useable energy, which is the thermal part of the technology (Keller and Laitner 2014).

Pumped heat electricity storage (PHES) —For very understandable reasons, batteries are receiving a lot of attention as energy storage devices. Pumped Heat Electricity Storage, in contrast, uses a simple design of two holding tanks, pistons, gravel, and a non-volatile gas (such as argon) to transfer heat back and forth from the electric grid when needed. When electricity is at excess, it flows from the grid into the pumped heat sink. When the electricity is needed again, the process can be switched in seconds. Powered by the heat from the

3.3.2.2 Net Economic Impacts

The most immediate impact that can be explored is the change in overall energy bill expenditures as they are affected by the assumptions in each of the four Innovation Scenarios. TABLE 3-3 offers that set of comparisons for the years 2015, 2025, 2040, and 2050. The expenditures are valued in millions of 2012 dollars which reflects the base year of the DEEPER Modeling System.

TABLE 3-3. Energy Bill Expenditures in the unincorporated areas (2015-2050)

Energy Expenditures (Million 2012 Dollars)	2015	2025	2040	2050
Reference Case	622	821	1,200	1,547
Innovation Scenario I	622	801	1,106	1,294
Innovation Scenario II	622	797	1,031	1,132
Innovation Scenario III	622	796	967	922
Innovation Scenario IV	622	796	934	797

Source: Impacts evaluated by the DEEPER Modeling System for San Diego County.

Innovation Scenario I shows a 16 percent reduction in energy expenditures by 2050 compared to the Reference Case. In effect, the combination of program activities as well as their associated costs and payment for the investments that drive the larger set of improvements all lead to a smaller savings than the assumed 20 percent energy efficiency gain. Both TABLE 3-4 and the Innovation Scenario I graphic illustration suggest, however, that the combination of incremental investments and the lesser costs of renewable energy and energy efficiency technologies drive an average net savings of $53 million over the period 2015 to 2050. That activity, in turn, supports an average annual net gain of 600 jobs for the County (compared to the Reference Case). At the same time, the detailed table of results for Scenario I show that more efficient use of resources increases employment demands from just a few jobs in 2015 to a highly positive net gain of over 1,900 jobs by 2050 (Note that TABLE 3-4 results are averages/year).

TABLE 3-4. Summary of Innovation Scenario Impacts (Average/Year 2015-2050)

	I	II	III	IV
Benefit-Cost Ratio	5.3	2.3	1.9	1.9
Financial Impacts (Million 2012 Dollars)				
Program/Policy Costs	2	5	9	11
Technology Investments (EE/RE)	17	45	84	103
Energy Bill Savings	71	120	167	192
Net Energy Savings	53	99	137	161
Net Job Creation	600	1,000	1,500	1,800
GHG Emissions (% 2050 Reference Case)	75%	61%	35%	19%

Source: Impacts evaluated by the DEEPER Modeling System for San Diego County.

Following a similar logic, Innovation Scenario II increases the net energy bill savings to 27 percent while Scenario III provides a 40 percent net savings in overall energy expenditures. Employment benefits similarly expand as

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investments increase an even larger energy bill savings that mount over time. Scenario II shows an average annual net gain of 1,000 jobs over the 2015-2050 time horizon with Scenario III stimulating an average net gain of 1,500 net jobs. Again looking at the detailed results table for Scenarios II and III, the net employment benefit in 2050 increases to 2,900 and 4,500 jobs, respectively. Finally Innovation Scenario IV jumps to a 48 percent net energy bill savings. This drives an average annual increase of 1,800 net jobs over the study time horizon that jumps up to as many as 5,300 net jobs by the year 2050.

In some ways, the employment impacts may seem rather small compared to the more than 1.9 million now employed in San Diego County. This contrast underscores the difficulty in supporting the job creation process more broadly. Yet, remember from Table 3-2 that the innovation scenarios mapped out in this exercise reflect just 17.4 percent of the total energy needs (essentially discounting all energy uses within transportation services) which are used by the 15.5 percent of the population living within the unincorporated areas of the county. Correcting for scope (that is, including all energy uses) and scale (or the full population of the County), and assuming a similar investment and savings pattern as reflected in Innovation Scenario IV, then the 1,800 average annual jobs might grow to 10,000 net jobs per year; and the 5,300 jobs in year 2050 might jump up to nearly 30,000 net jobs for the County as a whole. Adding other non-energy productivity benefits, as well as lower and more stable energy costs, might easily double these totals once again. In short, the economic benefits from a more productive investment in the entire County's energy infrastructure can generate a very large return for the County even as environmental quality is also greatly improved.

FIGURE 3-3. Innovation Scenario I

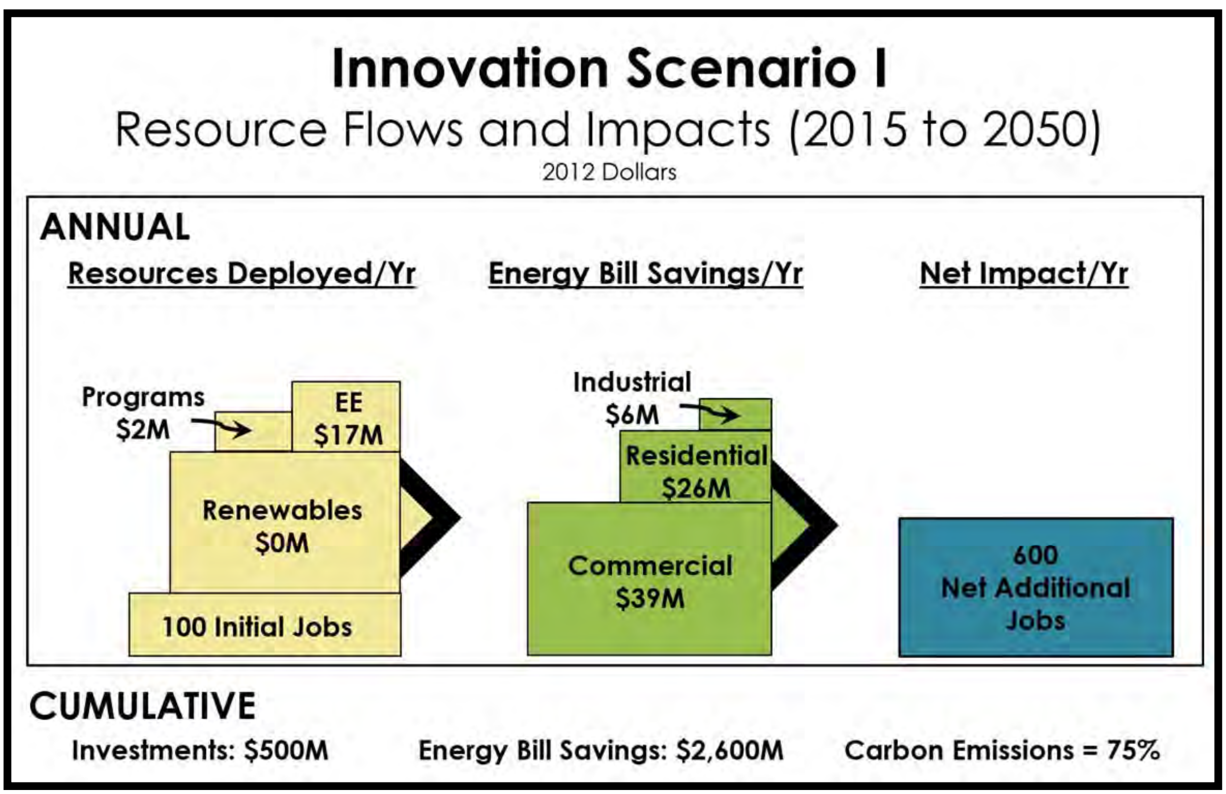

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FIGURE 3-4. Innovation Scenario II

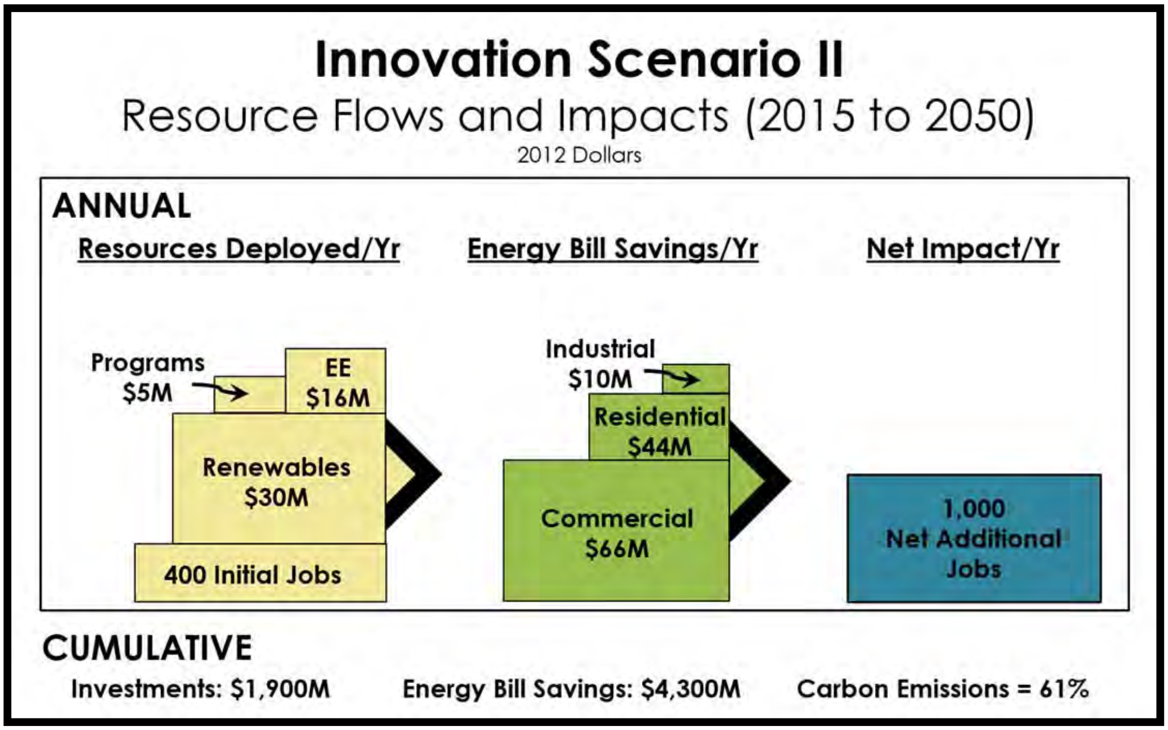


FIGURE 3-5. Innovation Scenario III

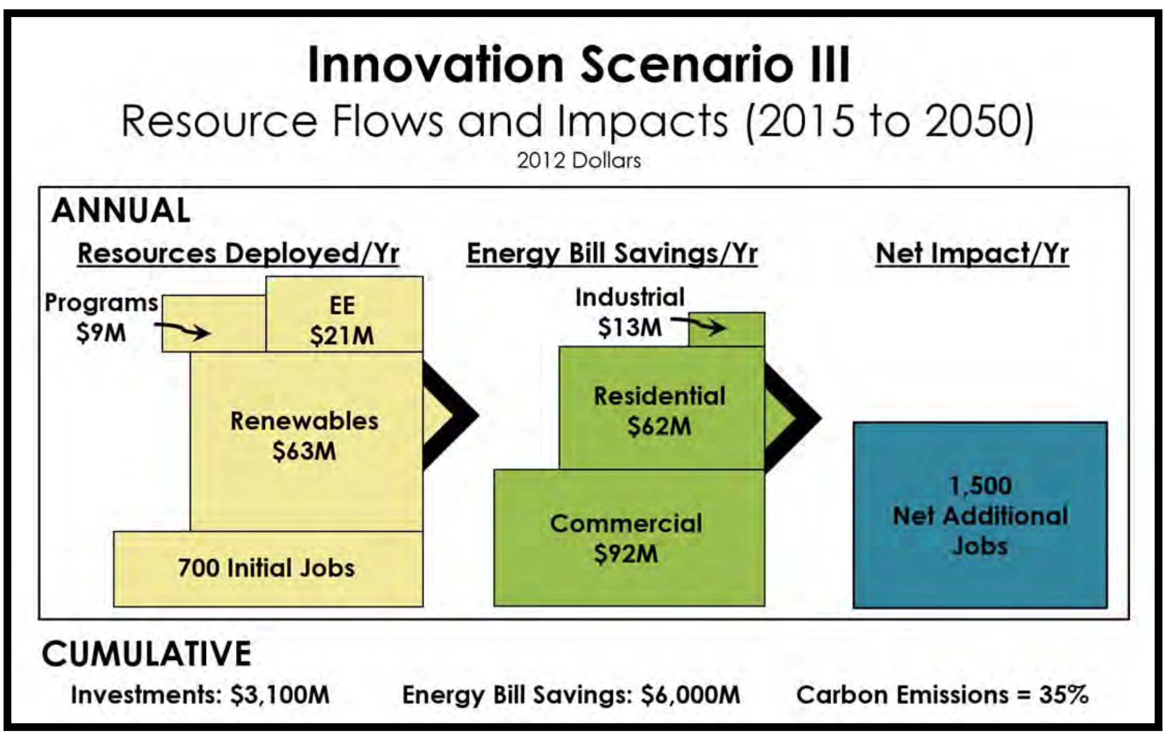
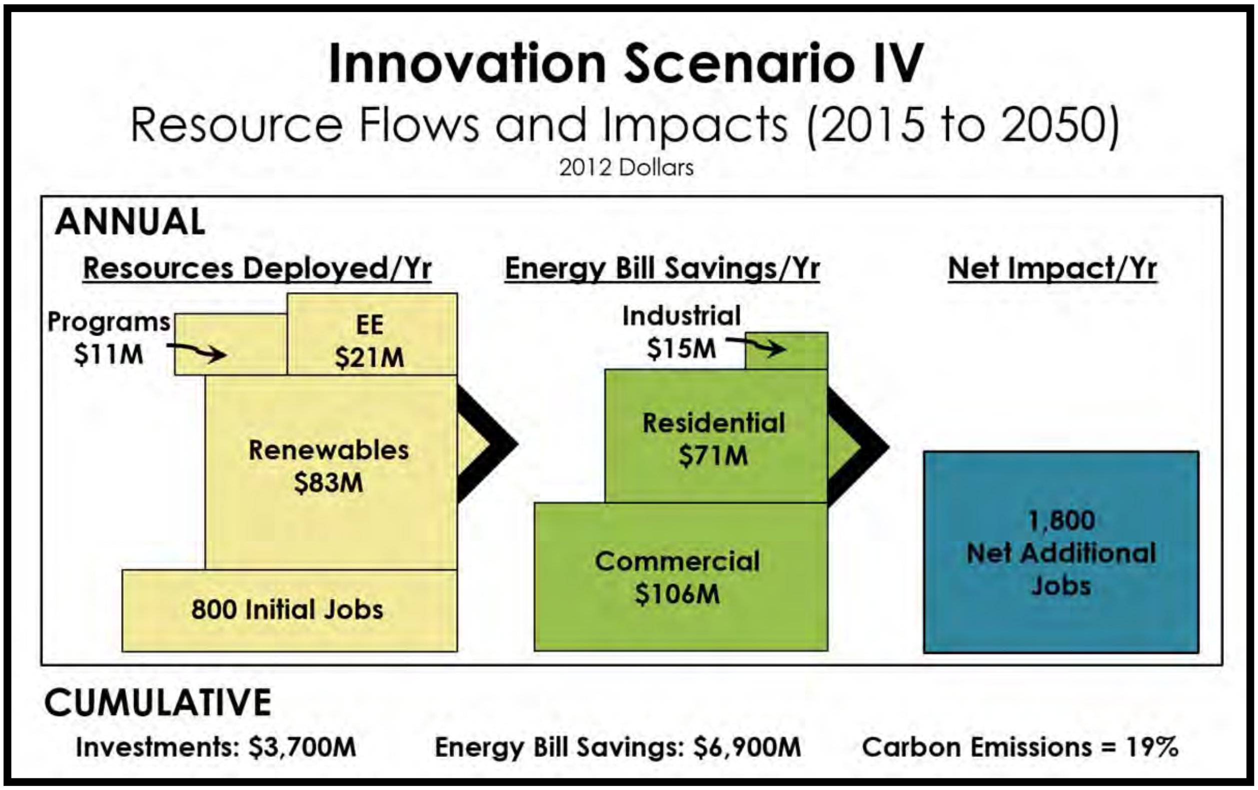


FIGURE 3-6. Innovation Scenario IV



3.3.2.3 Environmental Gains and Benefits

The inefficient conversion of energy leads to a large fraction of excess heat and other wastes, including fly ash and air pollutants, such as sulfur dioxide, nitrogen oxide, and volatile organic compounds that do not contribute to the economy and create health problems and other impacts including the costs of disposal (Ayres and Warr 2009). By definition then, reducing energy waste—whether in the production of electricity or the use of energy in homes and businesses—should create additional economic benefits in addition to the job and income opportunities that were previously described. This section explores several of these elements as indicated by TABLE 3-6, below.

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TABLE 3-5. Average Annual Environmental Benefits by Scenario

	I	II	III	IV
Avoided Adult Mortality				0.6 to 1.4
Avoided Lost Work Days				97
Total Health Effects (Low – Millions of Dollars)				$4.6
Total Health Effects (High – Millions of Dollars)				$10.5
CO_2 Emissions as Percent of 2050 Reference Case	75%	61%	35%	19%

Source: EPA Cobra Model (Abt 2013) and the DEEPER Modeling System for San Diego County.

The good news is that San Diego County already has a relatively clean set of emissions from its energy supply largely comprised of natural gas and renewable energy resources. Furthermore, both California and the County are already more energy-efficient than the U.S. as a whole. Finally, the Innovation Scenarios examine possible transitions from only electricity and nature gas energy usage, making up 17 percent of the total energy used within the unincorporated areas of the County. For these reasons, environmental benefits explored here—looking only at the net health impacts and the reduction in carbon dioxide emissions which might be obtained—are small but still significant.

Looking first at the prospective health benefits from Innovation Scenario IV (the only scenario for which this particular assessment was done), TABLE 3-5 notes only very small impacts from the very limited slice of total energy uses in the unincorporated areas of the County. At the same time, if the impacts were extended to the full population of the County rather than merely the unincorporated areas, the health benefits might grow from between $4.6 and $10.5 million, to as much as $67 million per year. Avoided mortalities might expand to 4 to 9 avoided deaths annually while avoided lost work worker days might increase to more than 600 per year. Moreover, since these scenarios extend to just 17 percent of the total energy resources consumed within the County, extending the Innovation Scenarios to all uses of energy, the health impacts might be further amplified by a factor of five or more.

The DEEPER Model provides more year-to-year detail with respect to carbon dioxide (CO_2) emissions. For the 2012 base year, it appears that total CO_2 emissions—including transportation, waste, and water-related greenhouse gases in addition to electricity and natural gas uses—amounted to 4.4 million tonnes of CO_2 emissions equivalent in the unincorporated areas only (Gordon, Silva-Send et al. 2013). The DEEPER model suggests that electricity and natural gas uses contributed approximately 1.15 million tonnes equivalent, or about 26 percent of total greenhouse gases discharged in that year. Innovation Scenario I, as reflected in TABLE 3-5, provides the smallest reduction of just 0.45 million tonnes by 2050. This means that the combination of renewable energy and energy efficiency technologies will bring emissions down to 75 percent of the 2050 reference case. Innovation Scenario IV, on the other hand, reduces emissions by 1.34 million tonnes which is about 19 percent of the 2050 reference case projections. If the County wants to think in terms of an 80 percent reduction in carbon dioxide emissions, then it will be compelled to look closely at a scenario approximating Innovation Scenario IV.

3.4. Further Insights and Conclusions

The Box II insert on the following page uses Innovation Scenario IV to illustrate one plausible pattern of how the transition to a more productive economy might look in terms of the possible deployment of both renewable energy and energy efficiency technologies. Using all four of the Innovation Scenarios as a benchmark, the modeling assessment indicates that both the unincorporated areas of the County and San Diego County as a whole, are underperforming, as follows:

- Businesses and residents may be paying more than necessary for the various uses of electricity and natural gas.
- Redirecting program expenditures and investments away from the spending on conventional energy infrastructure can increase both employment and income opportunities for the economy as a whole.
- While the environmental benefits are relatively small compared to the more typical economic impacts, this is because of an already more energy-efficient economy that is mostly powered by a cleaner set of generation resources. Yet, the impacts remain significant.

As previously noted, if the scenarios were expanded to include all uses of energy and also examined the impact across all economic sectors and geographic regions within the County, one can quickly see the many important benefits of a more productive pattern of investments in the region's energy infrastructure. What may not be immediately apparent, but recalling the discussion surrounding FIGURES 3-1 and 3-2, is that these same investments can provide a critical hedge against a slowly weakening economy that may erode over time without accelerating the pace of the more productive use of materials, water, and especially clean energy resources. Indeed, if the County is to achieve anything close to an 80 percent reduction in total greenhouse gas emissions, it will need to begin with Innovation Scenario IV as it might apply to all energy uses within the economy.

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FIGURE 3-7. Comparing Upside and Downside Risks

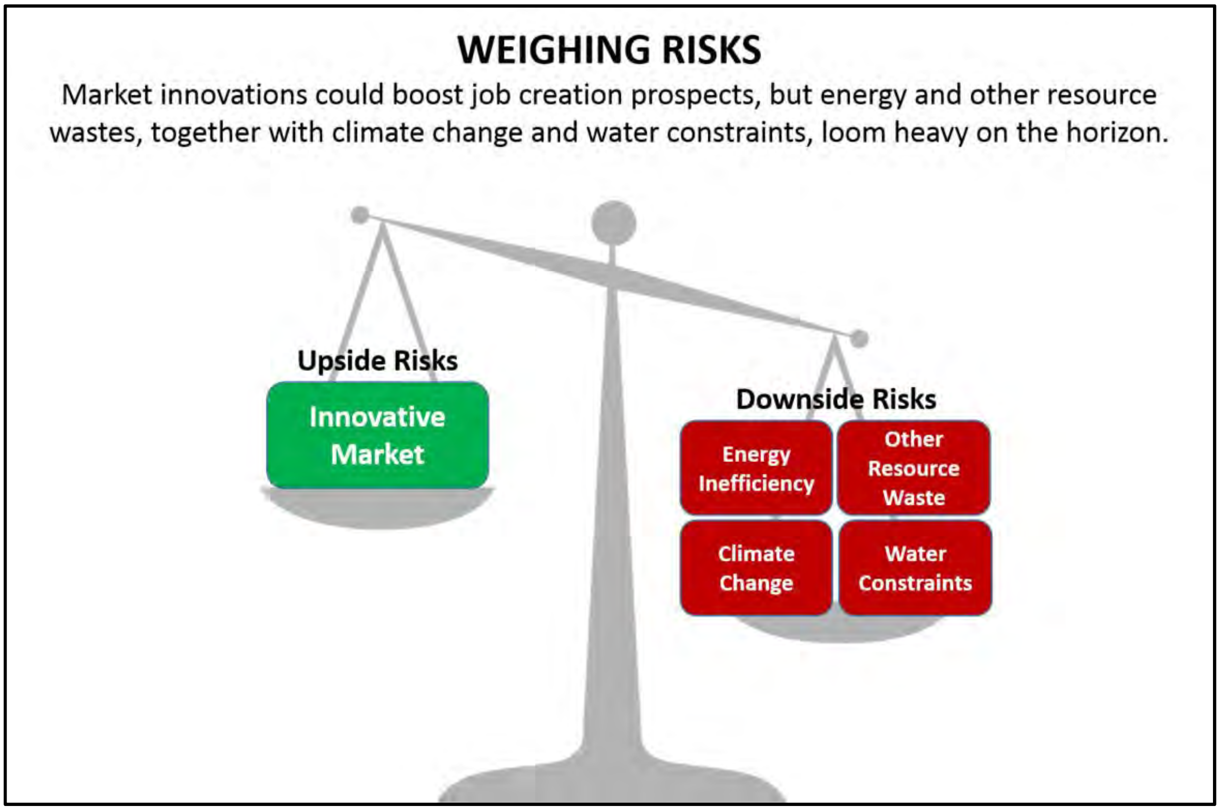

FIGURE 3-7 provides another look at the long-term energy problem confronting San Diego County. Yes, as suggested in Section 5 on best practices, there appear to be some good programming efforts already in place, and an innovative spirit that guides the overall direction of the County's climate and energy plans. But what are the downside risks? And how might they weaken overall economic activity? More critically, how might the different Innovation Scenarios point to a more pre-emptive effort? And how might the County embrace both the financial capacity characterized in Section 4 that follows, and the set of best practices that are reviewed in Section 5, to offset the possible downside risks—indeed, to catalyze a more robust and sustainable economy over the decades to come?

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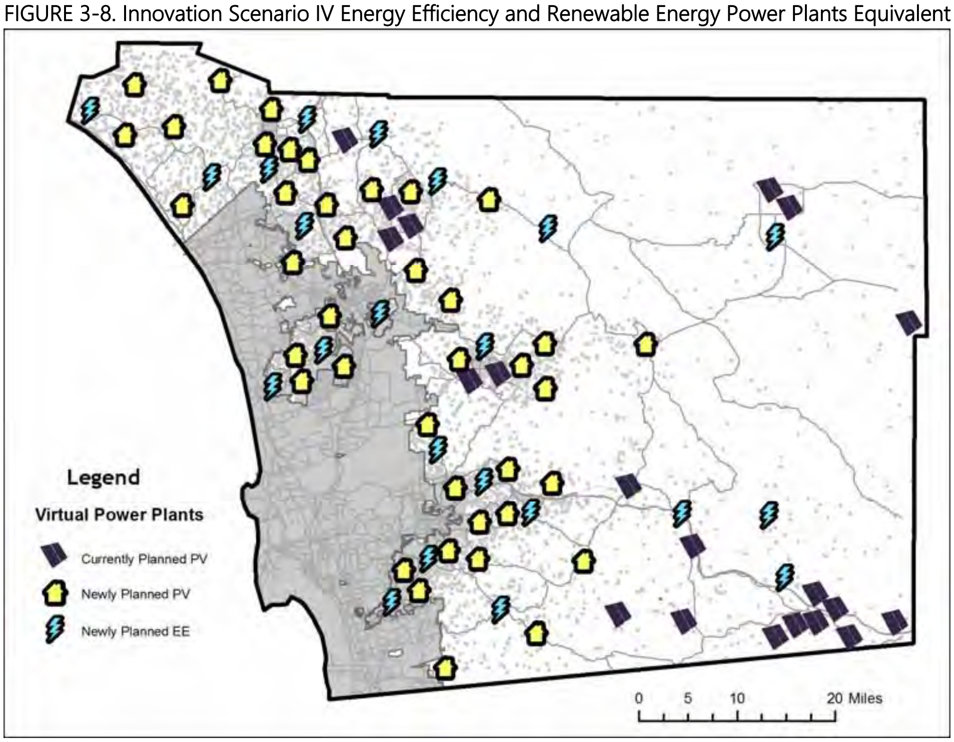
BOX II. Scale of Renewable Energy and Energy Efficiency Power Plant Equivalents

To provide a more concrete sense of how the deployment of energy efficiency and renewable energy technologies might look within the unincorporated areas of San Diego County, the map below provides markers to highlight three categories of 40 Megawatt Virtual Power Plants (VPPs). In effect, each power plant equivalent would provide the electricity corresponding to 70 million kWh—whether electricity that is produced, or that is reduced from more efficient use. Within Innovation Scenario IV, and as shown in both the legend and also on the map itself, there are an estimated 20 currently planned VPPs that would meet Governor Brown's proposed target of 50 percent of total electricity needs being provided by renewable energy by 2030, and through the year 2050. Those are shown in the darker, panel-like icons. Innovation Scenario IV also requires an equivalent of 40 newly planned VPPs to meet 100 percent of all electricity needs by 2050. These are shown as light yellow residential building icons. Finally the 24 blue electricity bolts represent the VPPs associated with energy efficiency improvements made throughout all sectors of the unincorporated areas.

FIGURE 3-8. Innovation Scenario IV Energy Efficiency and Renewable Energy Power Plants Equivalent



*Each Virtual Power Plant represents a 40 Megawatt unit equivalent

There are several important caveats that should be noted. First, this is not intended as a siting map; the only purpose is to help visualize the scale of the virtual power plants that might be at work within San Diego County. The locations are driven by population concentrations (with each dot representing 50 people) rather than ideal locations. Second, the 40 MW size was chosen as it represents a reasonable industrial-scale unit that might otherwise be developed or deployed. At the same time, the assumption was that each unit would run at about 20 percent capacity, reflecting the availability and conversion of

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TABLE 3-6. DETAILED RESULTS FROM INNOVATION SCENARIO I

Results from DEEPER Policy Run for Key Benchmark Years – Assuming 20% Energy Efficiency and 33% Renewables

	2015	2020	2025	2030	2035	2040	2045	2050	Average 2015-2050
Financial Impacts (Million 2012 Dollars)									
Program Cost	1.6	0.4	0.5	0.8	1.2	1.9	3.0	5.2	1.6
Investments	0.0	2.7	4.3	7.0	11.5	19.5	34.4	65.0	16.6
Annual Payments	0.0	2.6	4.1	6.6	7.9	13.1	22.2	39.6	10.9
Energy Bill Savings	0.0	11.6	19.5	32.6	56.6	93.8	154.7	253.0	71.3
Net Savings with Non-Energy Benefits	-1.6	8.6	14.8	25.2	47.5	78.8	129.4	208.2	58.8
Macroeconomic Impacts									
Employment (actual)	7	131	203	314	523	805	1,245	1,944	612
Percent from RefCase	0.00%	0.01%	0.01%	0.01%	0.02%	0.03%	0.04%	0.06%	0.03%
Wages (Million 2012 dollars)	1	5	9	15	27	45	75	126	35
Percent from RefCase	0.00%	0.00%	0.01%	0.01%	0.01%	0.02%	0.03%	0.04%	0.02%
Gross Regional Product (Million 2012 dollars)	0	5	9	15	29	48	54	139	38
Percent from RefCase	0.000%	0.002%	0.003%	0.005%	0.009%	0.013%	0.013%	0.029%	0.01%

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TABLE 3-7. DETAILED RESULTS FROM INNOVATION SCENARIO II

Results from DEEPER Policy Run for Key Benchmark Years -- Assuming 20% Energy Efficiency and 50% Renewables

	2015	2020	2025	2030	2035	2040	2045	2050	Average 2015-2050
Financial Impacts (Million 2012 Dollars)									
Program Cost	1.6	9.0	9.5	9.9	2.0	2.4	3.2	4.9	5.3
Investments	0.0	64.4	74.4	85.3	19.2	25.2	36.7	61.6	45.3
Annual Payments	0.0	22.4	51.9	85.8	70.8	50.7	30.0	43.5	46.7
Energy Bill Savings	0.0	9.8	23.4	55.2	90.8	169.2	275.6	415.0	120.2
Net Savings with Non-Energy Benefits	-1.6	-21.6	-37.9	-40.5	18.0	116.1	242.3	366.5	68.2
Macroeconomic Impacts									
Employment (actual)	7	674	641	751	430	1,175	2,048	2,913	1,018
Percent from RefCase	0.00%	0.03%	0.03%	0.03%	0.02%	0.04%	0.07%	0.09%	0.04%
Wages (Million 2012 dollars)	1	35	31	33	11	59	122	188	54
Percent from RefCase	0.00%	0.03%	0.02%	0.02%	0.01%	0.03%	0.05%	0.06%	0.03%
Gross Regional Product (Million 2012 dollars)	0	47	35	26	-10	51	65	203	53
Percent from RefCase	0.000%	0.021%	0.013%	0.009%	-0.003%	0.013%	0.015%	0.042%	0.02%

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TABLE 3-8. DETAILED RESULTS FROM INNOVATION SCENARIO III

Results from DEEPER Policy Run for Key Benchmark Years -- Assuming 25% Energy Efficiency and 80% Renewables

	2015	2020	2025	2030	2035	2040	2045	2050	Average 2015-2050
Financial Impacts (Million 2012 Dollars)									
Program Cost	1.6	9.0	9.5	10.0	8.6	9.0	9.8	12.0	9.0
Investments	0.0	64.6	74.8	85.9	81.6	93.9	112.2	149.5	84.4
Annual Payments	0.0	22.5	52.1	86.2	96.1	103.7	113.2	136.0	76.8
Energy Bill Savings	0.0	10.0	24.5	57.8	115.4	233.7	400.7	625.2	166.9
Net Savings with Non-Energy Benefits	-1.6	-21.5	-37.1	-38.3	10.6	120.9	277.7	477.2	81.1
Macroeconomic Impacts									
Employment (actual)	7	679	654	777	1,092	1,979	3,099	4,489	1,531
Percent from RefCase	0.00%	0.03%	0.03%	0.03%	0.04%	0.07%	0.10%	0.14%	0.06%
Wages (Million 2012 dollars)	1	36	32	34	49	102	178	282	83
Percent from RefCase	0.00%	0.03%	0.02%	0.02%	0.02%	0.04%	0.07%	0.09%	0.04%
Gross Regional Product (Million 2012 dollars)	0	48	35	28	39	96	111	294	84
Percent from RefCase	0.000%	0.021%	0.014%	0.009%	0.012%	0.026%	0.026%	0.061%	0.02%

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TABLE 3-9. Detailed Results from Innovation Scenario IV

Results from DEEPER Policy Run for Key Benchmark Years -- Assuming 25% Energy Efficiency and 100% Renewables

	2015	2020	2025	2030	2035	2040	2045	2050	Average 2015-2050
Financial Impacts (Million 2012 Dollars)									
Program Cost	1.6	9.0	9.5	10.0	11.8	12.4	13.1	14.9	10.8
Investments	0.0	64.6	74.8	85.9	111.9	128.4	149.4	186.2	103.2
Annual Payments	0.0	22.5	52.1	86.2	108.1	129.4	154.1	180.6	91.4
Energy Bill Savings	0.0	10.0	24.5	57.8	126.0	266.6	470.9	749.9	192.3
Net Savings with Non-Energy Benefits	-1.6	-21.5	-37.1	-38.3	6.1	124.8	303.7	554.4	90.1
Macroeconomic Impacts									
Employment (actual)	7	679	654	777	1,405	2,392	3,676	5,346	1,796
Percent from RefCase	0.00%	0.03%	0.03%	0.03%	0.05%	0.08%	0.12%	0.16%	0.07%
Wages (Million 2012 dollars)	1	36	32	34	67	124	209	333	98
Percent from RefCase	0.00%	0.03%	0.02%	0.02%	0.03%	0.05%	0.08%	0.11%	0.05%
Gross Regional Product (Million 2012 dollars)	0	48	35	28	62	120	135	342	99
Percent from RefCase	0.000%	0.021%	0.014%	0.009%	0.019%	0.032%	0.032%	0.071%	0.03%

1 - 72

4. Institutional Arrangements and Financing Mechanisms

4.1. Introduction

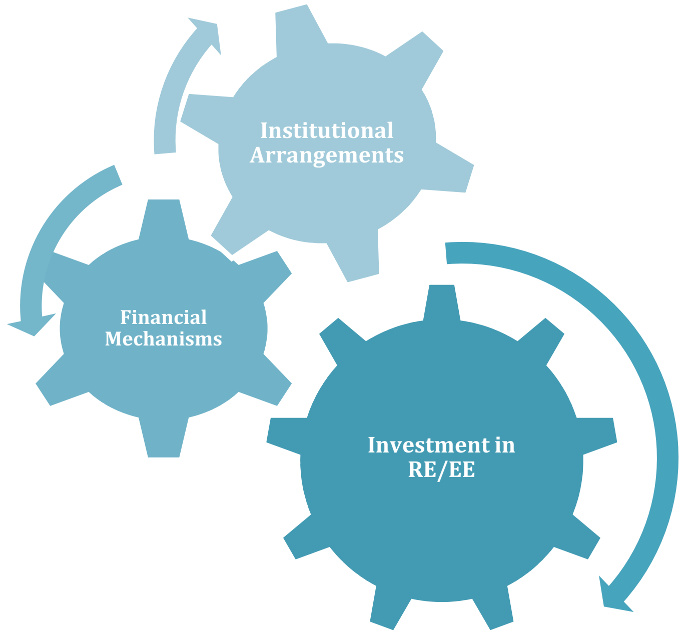
Having explored the economic assessment and the attendant benefits in Section 3, this next section examines how various institutional arrangements and/or financial mechanisms might help the County achieve these Innovation Scenario results. There are a wide array of institutional arrangements and financial mechanisms that the County may harness to drive greater investments in renewable energy and energy efficiency (RE/EE). Section 4 is by no means an exhaustive list, but a high level overview of some of the tools at the County's disposal.

In this context, institutional arrangements can be thought of as the organizational and/or administrative entities that help foster investment in RE/EE. The three institutional arrangements explored in this section are: (i) community choice aggregation (CCA); (ii) direct access; and, (iii) sustainable energy utility. Institutional arrangements may themselves be able to house one or more different financial mechanisms, which may allow for synergies across multiple financial mechanisms and greater efficacy overall.

A financial mechanism, on the other hand, is a tool for directing capital for investment and subsequent deployment of energy efficiency and renewable energy systems. The financial mechanisms explored herein are: (i) Property Assessed Clean Energy (PACE) financing; (ii) bonds; and, (iii) crowdfunding.

As illustrated below in Figure 1, increased investment in RE/EE can be driven by institutional arrangements that help direct and deploy the capital raised through various financial mechanisms. This section concludes with a qualitative assessment comparing the various institutional arrangements and financial mechanisms outlined above by their ability to help drive greater levels of investment in RE/EE.

FIGURE 4-1. Relationship between Institutional Arrangements, Financing Mechanisms, and Investment in Renewables/Energy Efficiency



Box III. The Return on Borrowing Money to Fund a Project

Many businesses and agencies assume that if they cannot attract zero percent financing to launch an energy upgrade, then a project may not be worth pursuing. But, they may also be very wrong. Financing (or borrowing) is what typically enables a project to get underway. The benefits can be highly positive even if financed over a period of time. The same is true for either public or private investments. To explore this idea, let's review a prospective energy efficiency upgrade that might cost a small business $10,000. The proprietor can pay cash for the whole project, or he or she can borrow the funds from a local bank or cooperative.

After an Energy Service Company (ESCo) completes an audit for the business operation, the owner might learn that, over a 15-year period, the energy savings will run about $1,400 per year (about a 7-year payback). In this case, he or she may decide the business can afford to pay 20 percent of the total cost either from retained earnings or from cash on hand. In other words, the business will have to borrow $8,000 to fund the entire project. The authors can see how cost-effective the project may be if the funds are borrowed for either 5 years, or for the expected 15-year life of the technology upgrade. The authors might also explore how cost-effective the project may be if the funds are borrowed at different interest rates – in this case 3, 5, or 7 percent. The table below lays out these options and shows four different ways to evaluate the net benefits. The first is net project savings. This is the cumulative savings over the 15-year project lifetime after the cash outlay has been recouped – either the total $10,000 investment if there is no borrowing, or the $2,000 out-of-pocket cost. The authors can also see what the net present value (NPV) of the project might be as the authors compare the out-of-pocket cash with the cumulative annual savings. In this case, the authors assume a 5 percent discount rate to see how the costs and the returns appear over time. The internal rate of return (IRR) and the Savings to Investment Ratio (SIR) also provide useful insights.

TABLE 3-10. Net Savings Benefits by Payment Plan

Payment Plan	Net Savings	NPV	IRR	SIR
Cash Outlay of $10,000	$11,429	$4,598	11%	2.14
Borrow $8,000 at 3% for 5 Years	$10,694	$5,014	17%	6.35
Borrow $8,000 at 5% for 5 Years	$10,190	$4,598	16%	6.09
Borrow $8,000 at 7% for 5 Years	$9,673	$4,172	14%	5.84
Borrow $8,000 at 3% for 15 Years	$9,377	$5,593	38%	5.69
Borrow $8,000 at 5% for 15 Years	$7,867	$4,598	32%	4.93
Borrow $8,000 at 7% for 15 Years	$6,253	$3,534	27%	4.13

The readers can see that the financial returns are both solid and highly positive, whether the business owner pays for the entire project out of retained earnings, or whether 80 percent of the funds are borrowed. This is true for each of the six payment plans—whether funds are borrowed for 5 years or 15 years, and despite the interest rate. The net savings range from $6,253 to $11,429. Even if the authors assume a 5 percent discount rate, suggesting an opportunity to otherwise earn 5 percent per year on an alternative investment, the net present value (NPV) still ranges positively from $3,534 to $4,598. More interesting is that the internal rate of return (IRR) actually increases if funds are borrowed. This is because the business owner is investing only $2,000 of the total costs. In that case, the net savings become an even larger benefit compared to paying for the project entirely out of cash. The best deal is borrowing the $8,000 at 3 percent for 15 years. This shows a very high 38 percent rate of return.

Even if the funds are borrowed at 7 percent, the return on the business owner's investment continues to be more favorable compared to the full cash outlay—27 percent compared to 11 percent. It should be noted, however, that even an 11 percent return

4.2. Community Choice Aggregation

Communities across California are increasingly exploring ways to have more and precise control over their electricity use—both as a means to address the impacts of climate change and to enhance their local economies. Community Choice Aggregation (CCA) is one possible vehicle for achieving these objectives. CCA allows city and county governments to aggregate or pool electricity customers to purchase and develop power, as well as to administer energy programs on behalf of their residents and businesses. This institutional arrangement allows the local community to shape the CCA program to prioritize desired benefits, including but not limited to, increased investment in renewable energy sources and energy efficiency, economic development, carbon reduction strategies, and workforce development efforts. Note that only the electricity generation portion of electricity service can be provided by the CCA entity.

To date, CCA has been established by law in six states and is under consideration in at least four others (Figure 4-2).[10] CCA is an energy supply model that works in partnership with the region's existing utility, which continues to deliver power, maintain the grid, and provide consolidated billing and other customer services. As illustrated in Figure 4-3, CCA can be described as a hybrid-approach to the provision of energy services—sitting somewhere between an investor-owned utility and a municipal public utility.

FIGURE 4-2. Nationwide Context

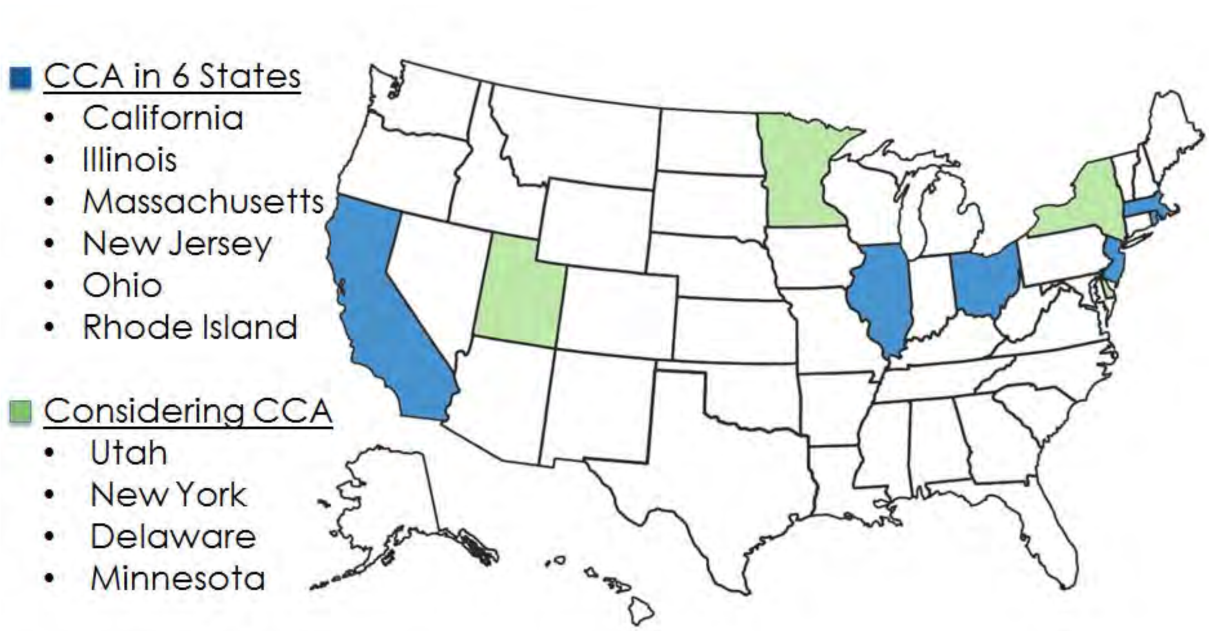
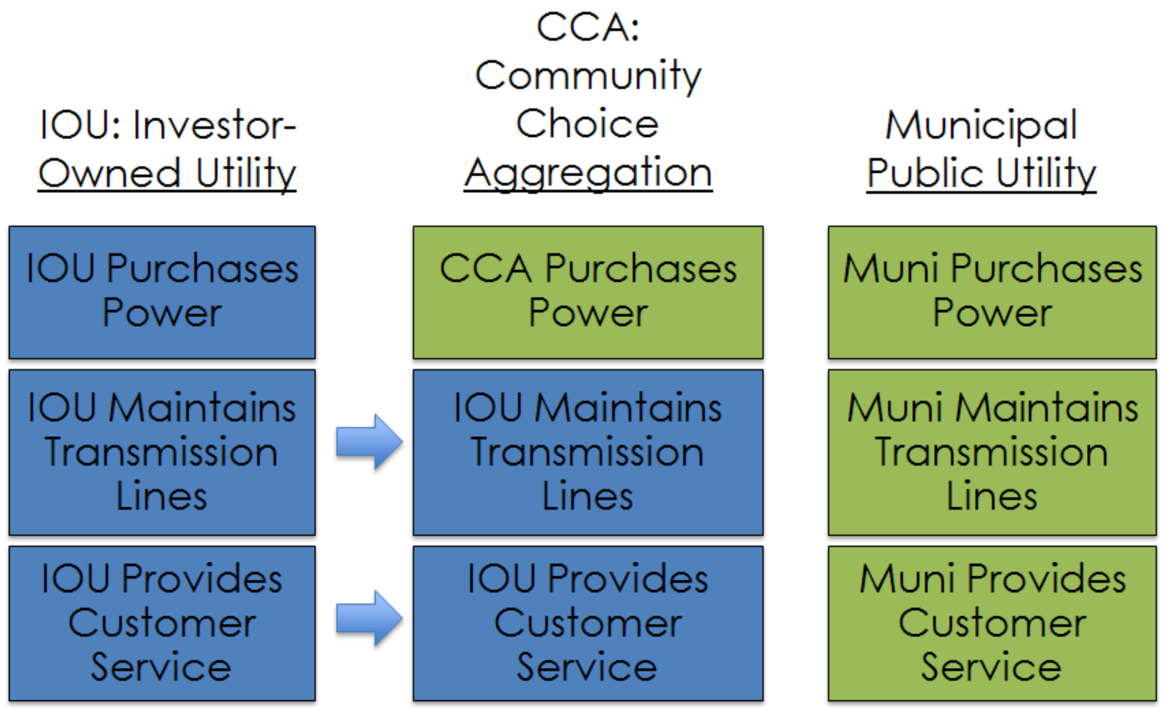


FIGURE 4-3. CCA: A Hybrid Approach to Providing Energy Service

[10] CCA is statutorily enabled in California, Illinois, Ohio, Massachusetts, New Jersey, and Rhode Island. Utah, New York, Delaware, and Minnesota are considering statutory enablement of CCA.



Source: LEAN Energy US (2002)

By establishing a CCA program, cities and counties can take increased ownership and control over their electricity generation and consumption. More than just buying and selling electricity, a CCA provides a platform for managing the community's energy resource through the administration of energy efficiency programs, as well as through the development of local renewables. Indeed, some local communities have been motivated to form community choice programs as a means to achieve greater levels of renewable energy generation, encourage local investment in energy resource development, reduce greenhouse gas emissions, amplify the community's level of energy efficiency, and catalyze electricity grid modernizations efforts (Gordon 2014).

4.2.1. California Community Choice Aggregation Background

In 2002, the California Legislature, through Assembly Bill 117, enacted legislation permitting the creation of CCA programs (2002). Under the legislation, codified as Public Utilities Code §366.2, a city, county, or Joint Powers Authority (JPA), comprised of two or more cities and counties, may implement a CCA program. Governor Jerry Brown signed California Senate Bill 790 in October 2011, which also allowed a CCA to be formed by the Kings River Conservation District, the Sonoma County Water Agency, and any California public agency possessing authority to generate and deliver electricity at retail within its designated jurisdiction (2011). In January 2012, the authority to form a CCA was furthered expanded when Governor Brown signed California Senate Bill 4 into law, providing that special districts may also become community choice aggregators.

Once formed, customers within the CCA service area are automatically enrolled, but may opt out of the CCA and continue to receive bundled electricity service from the investor-owned utility (IOU). Customers that do not opt out will have their electricity supplied by the CCA entity. The IOU continues to provide and bill CCA customers for electricity transmission and distribution, as well as other services, such as meter reading, billing, efficiency incentives, and such. Only the electricity generation portion of electricity service can be provided by the CCA entity. Customers of a CCA continue to pay the same charges for the delivery of the power—transmission and distribution—as customers that remain with the IOU. The CCA entity must pay the IOU for other services provided to the CCA (e.g., billing services).

As noted, customers within a CCA jurisdiction may choose to opt out of the CCA program and continue to receive electricity from the IOU. The CCA entity is required to send at least four notices to customers informing them of their ability to opt out of the CCA program. The requisite notice schedule is as follows: two notices before CCA service starts, and two more in the first two billing cycles after CCA service starts. Customers not opting out of the CCA program at the outset of the program nevertheless retain the ability to opt out later and return to receiving electricity from the IOU. In the case of a later opt-out by a customer, the CCA program can impose a surcharge to recover any stranded costs of obtaining electricity supplies or generation capacity for that customer.

Since authorization in 2003, a number of CCA programs have been proposed but not implemented, including programs in San Francisco (CleanPowerSF), the East Bay (Oakland, Berkeley, and Emeryville), and the San Joaquin Valley (San Joaquin Valley Power Authority). The first CCA program to operate in California, Marin Clean Energy, was formed in Marin County and began serving customers in May 2010. Most recently, Sonoma County launched Sonoma Clean Power in 2014 and the City of Lancaster, through Lancaster Choice Energy, began offering service to select customers in May 2015, with broad public enrollment in late 2015.[11]

4.2.2. Community Choice Aggregation in San Diego

In 2005, San Diego County participated in the Community Choice Aggregation Demonstration Project, which was commissioned by the California Energy Commission and the United States Department of Energy to assist local governments in evaluating and implementing CCA. Navigant Consulting was tasked with developing a report to study the feasibility of the County forming a CCA program (Navigant 2005). The report contained detailed economic feasibility analyses and recommendations to help the community evaluate the costs and benefits afforded by CCA and move towards development of an Implementation Plan.

The detailed analysis performed by Navigant for the County suggested that by forming a CCA program, backed by investments in generation resources, the County could obtain the following benefits:

- Achieve nominal electricity cost savings averaging approximately $25.3 million per year over the next 20 years, equivalent to approximately 5 percent of total electricity bills;
- Increase renewable energy utilization to 40 percent by 2017, more than doubling the renewable energy content that SDG&E is required to provide over the same time period;
- Obtain control over the electric generation costs to provide a higher level of rate stability for local residents and businesses; and
- Improve statewide and local reliability by increasing capital investment in generation plants.

Under Navigant's base-case assumptions, ratepayer benefits would have begun to accrue in the fifth year of program operations, assuming a 2006 implementation date and no changes in the rate designs of SDG&E. During the first four years of program operations, it was estimated that the program costs would likely exceed the equivalent rates charged by SDG&E due to the requirement that CCA customers pay a separate surcharge (cost responsibility surcharge) to SDG&E. If the County initiated a CCA program in 2006, Navigant's analysis suggested that it would

[11] Since research for this report began in Summer 2014, many communities in California, including the City of Davis, have begun exploring CCA opportunities, including starting their own CCA and joining existing CCAs.

likely have to charge slightly higher rates (1 percent to 2 percent) in the initial years of the program, or it would need to finance approximately $34 million of accumulated losses during the four-year start-up period.

Navigant issued the following recommendations: (1) communicate final study results through community workshops and identify next steps in proceeding toward Implementation Plan filing; (2) consider whether natural alliances exist among neighboring communities, and explore partnering arrangements to optimize supply-side alternatives and regional CCA implementation; (3) monitor the outcome of SDG&E's Rate Design Window proceeding; (4) make a decision whether to proceed with development of an Implementation Plan. Following the feasibility study, the County did not develop an Implementation Plan.

In the ten years since that study was completed, however, much has changed in California related to energy and climate concerns. Although established in 2002 under Senate Bill 1078, California's Renewable Portfolio Standard was accelerated under Senate Bill 107 and expanded in 2011 under Senate Bill 2. More recently, Governor Jerry Brown, in his 2015 inaugural address, proposed to accelerate California's RPS further to 50 percent renewables by 2030 (Cart 2015).

Furthermore, one month after the feasibility study was published, in June 2005, then Governor Arnold Schwarzenegger signed Executive Order S-3-05, which established greenhouse gas (GHG) emission reductions to year 2000 levels by 2010, to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050. Assembly Bill 32, or the Global Warming Solutions Act of 2006 soon followed. Municipalities across California have begun developing Climate Action Plans to meet these GHG emission goals.

Not surprisingly, developments in California over the last decade have also impacted CCA programs. As noted above, Marin County formed the State's first CCA program in 2010—with Sonoma County and the City of Lancaster also launching their programs in 2014 and 2015, respectively. After numerous years in the planning stages, San Francisco seems poised to launch a CCA program of its own (Sabatini 2015). Moreover, the City of San Diego, in its September 2014 draft Climate Action Plan, has proposed establishing a CCA program to achieve 100 percent renewable energy on the city-wide grid by 2035 (2014). The City has authorized a feasibility study to further explore a CCA program. The feasibility study is ongoing at the time of this writing (Golding 2014).

For all of the reasons noted above, it is important for the County to revisit the CCA landscape. The County's June 2014 Climate Action Plan underscores this point, as it calls for electricity in the region to be derived from increased levels of energy efficiency and renewable energy. A CCA program is one potential tool the County might utilize to achieve such a goal.

Prior to studying what a CCA program in the County might look like, this report first explores the potential advantages and disadvantages of CCA programs, the statutory requirements for formation, and the pros and cons of a County-led versus a regional approach. Next, the report explores existing (or soon-to-be existing) CCA programs in California. For each, the program's product offerings and energy-related programs are examined.

4.2.3 Potential Benefits of a CCA Program

While offering consumers a choice where none exists for residential customers today, a CCA can be more than a simple purveyor of retail electricity. Rather, a CCA program can serve as a community's energy integrator—enabling public-private partnerships, administering energy programs, leveraging public and private sector investments, and creating local opportunities for economic development and job creation.

The revenues received from customers, based on the electricity they consume, finance a CCA program. This can allow a community to create a dynamic institutional platform that has the ability to address the community's electricity needs in a comprehensive manner without using any tax dollars or public funds. Depending on the goals of a particular community program, a CCA can potentially catalyze a faster switch to more renewable electricity supply and provide significant GHG reductions.

There are a number of potential benefits a public CCA entity can offer a community:

4.2.3.1. Local Control

A CCA program can enable a community to determine the source(s) of its electricity and to control how electricity dollars are spent. Indeed, a CCA program redirects substantial revenue streams previously under IOU control and places them under the direction of a community, with an increased level of public accountability. Whereas the operations and priorities of an IOU are determined by its shareholders, its management, and the California Public Utilities Commission (CPUC), a CCA entity, in contrast, is governed by a Board of Directors comprised of local elected officials. Such a governance structure may allow communities to determine program goals, operational structure, and resource procurement. A CCA program's surplus revenues can be reinvested into the community through targeted investments in energy efficiency or renewable energy development. In this manner, citizens may be able to participate in shaping the program to address local community needs.

A May 2013 CPUC report recently highlighted the importance of an entity structure that aligns resource planning and operational protocol with local ratepayer interests. In a review of Southern California IOUs' demand response (DR) programs[12] from 2012, the CPUC determined that SCE and SDG&E used their DR programs fewer times and hours than the programs' limits (each program is limited to a certain number of hours or events). Rather than maximizing demand response, the IOUs dispatched their peaker power plants far more frequently in 2012 in comparison to 2006 through 2011 historical averages[13]. (Bruce Kaneshiro 2013)

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[12] DR allows energy users of all kinds to act as "virtual power plants," adding stability to the grid by voluntarily lowering their demand for electricity. Participants in DR programs get paid for providing DR capacity. Demand response providers like EnerNOC work with commercial, institutional, and industrial businesses to identify ways for facilities to participate in demand response programs without affecting business operations, comfort, or product quality. Demand response energy reduction measures are customized for each facility and can include turning off lighting, air conditioning, pumps, and other non-essential equipment. In some regions, facilities may participate in demand response by switching to backup generation, thereby reducing demand on the grid. Depending on the type of program, participants may be dispatched just once or twice a year for a few hours, or up to 100 hours per year. The more frequently dispatched programs typically offer higher payouts.

[13] For example SDG&E's Miramar Energy Facility ran 4,805 hours of 5,000 hours of emission allowance. In contrast, its Critical Peak Pricing with the most triggered hours was dispatched 49 hours out of 126 hours of annual limit.

empower devices

These results raise questions related to why SCE and SDG&E did not use their respective DR programs to full capacity and whether financial disincentives to DR program use (despite the benefits to ratepayers) influenced the result.

4.2.3.2. Local Economic Benefits

Provided a CCA program aims to increase renewable energy and energy efficiency as a percentage of the total resource mix compared to the incumbent IOU, the entity could enjoy significant economic benefits. Such benefits are explored in detail throughout this report's economic assessment, as shown in Section 3. The economic benefits are generally derived from savings due to (i) the reduction in electricity consumption, and (ii) a resource mix that drives a lower cost per unit of electricity and per unit of electricity service. These savings, as shown in the economic assessment of this report, are likely to result in job creation for the region.

In addition, to the extent a CCA program chooses to develop demand reduction resources, as well as solar, wind, and other renewable resources in or near its service area, these investments can create additional benefits and job growth.

Because CCA entities can finance projects with tax-exempt revenue bonds[14] (which incur lower financing costs than private financing) and do not have to pay dividends to shareholders, it is possible that more net revenues from a local development program would stay within the local community. The community, in turn, may be able to decide how these proceeds are spent, such as investment in new local resources, or to otherwise lower electricity or borrowing rates.

Moreover, local economic benefits may accrue to local businesses and property owners from both electricity savings and on-site generation encouraged by CCA-administered programs. For many commercial building owners, renewable energy development can lead to increased revenues, from either direct investment or by offering leasing rights to project developers.

4.2.3.3. Increased Consumer Choice

A CCA program increases consumer choice by giving customers an option to receive electricity from the CCA entity or remain with the IOU.[15] Under the current IOU model, the vast majority of customers can only buy power from one company, with little input as to how the electricity is generated or how the revenues are spent. As such, customers unhappy with their IOU have little recourse beyond reaching out to the CPUC.

4.2.3.4. Local Energy Program Development

A community choice energy agency might be able to provide an institutional platform for the development of new, locally-focused energy efficiency and renewables programs. This insight forms the heart of the Energy Innovation Scenarios characterized in Section III. A CCA program can provide businesses and homeowners alike with a single point of contact for all of their energy service needs. A customized assessment could provide a commercial or residential customer with information related to a wide array of potential program offerings including measures to: enhance energy efficiency, install distributed generation,

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[14] Revenue bonds are repaid through revenues, or in this case, savings, generated by public investments rather than through increased taxes.

[15] Direct Access is another program that offers nonresidential customers some choice, however, the ability to participate in the program is limited.

conserve water, incorporate demand response, and, perhaps most importantly, provide the financing for getting it all done. Through public-private partnerships, a CCA agency can leverage private capital and coordinate the efforts of third-party programs to give customers one-stop shopping for community energy services.

Indeed, a CCA can develop ambitious energy efficiency and demand response programs that go above and beyond those administered by the incumbent IOU. Such programs can be designed specifically to meet the needs of the local community. In addition, such a program can incentivize local renewable electricity generation through well-designed net-metering and feed-in tariff programs along with other ways of aggregating, sharing, and financing new energy sources.

For instance, as examined in more detail in Section 4.2.7, Marin Clean Energy (MCE) offers a net-metering policy that pays participating customers premium rates for electricity, crediting customers at an extra $0.01/kWh. MCE's net energy metering program catalyzes build-out of PV systems and encourages the deployment of larger systems. MCE also offers a Feed-In Tariff program (FIT), which is designed to provide competitive, predictable energy prices for local small-scale renewable energy developers over a 20-year contract term.

Similar to MCE, Sonoma Clean Power offers NetGreen—its net energy metering program—that pays participating customers full retail value plus an additional $0.01/kWh for excess electricity.

4.2.3.5. Greenhouse Gas Reductions

By reducing demand and procuring more electricity from renewable sources, a CCA program has the potential to substantially reduce greenhouse gas (GHG) emissions associated with electricity consumption. Numerous municipalities, through their Climate Action Plans, have identified electricity generation from conventional sources as a major contributor to their GHG emissions.

4.2.3.6. Rate Stability

By increasing the amount of power obtained from long-term contracts or self-owned generation facilities, a CCA program may be able to lock-in electricity prices and provide improved stability to its customers. Commercial customers in particular tend to value predictability in their energy costs to aid in business planning. Rate stability can help make the region more attractive to business and can enhance economic resilience.

4.2.3.7. Lower Financing Costs

Because public entities are able to finance electrical generation facilities with tax-exempt bonds and do not pay dividends to shareholders, a CCA program may, in the long run, be able to provide electricity at a lower cost than an IOU would be able to provide it. Instead of a 5 percent interest rate, for example, a CCA might find a 3.25 percent to 4.0 percent rate (or some other number). This could result in a $100,000 savings or more on interest payments over a 15-year period, for example (see Box III for a simplified example).

4.2.4 Potential Risks of a CCA Program

Despite the many potential advantages a community may enjoy, there are significant risks associated with CCA program development. The risks of forming a CCA program evolve as the process moves from implementation planning to commencement of program operations. Accordingly, these risk factors generally fall into three categories: pre-formation (planning/implementation), post-formation (operational), and regulatory oversight risks. A short discussion about mitigating against some of the risks is included below.

4.2.4.1. Pre-formation Risks

Establishing a CCA program requires various political, engineering, legal, and financial steps, not the least of which is developing a detailed implementation plan that must be submitted to and certified by the California Public Utilities Commission (CPUC). Consultants will be needed to develop a technical feasibility study and assist with the preparation of the implementation plan. Based upon the experiences of Marin Clean Energy, Sonoma Clean Power, and Lancaster Choice Power, estimated total start-up costs should range between $1 to $3 million. Although some start-up costs are recoverable through CCA rates, funds expended for a technical feasibility study and other preliminary efforts may not be recoverable.

One cautionary tale on risks associated with CCA formation is that of CleanPowerSF—although its final chapter has yet to be written. In 2004, San Francisco began exploring a CCA program and has spent more than $4.1 million throughout various planning stages. It is unclear, however, whether the program will be realized. In August 2014, the San Francisco Public Utilities Commission rejected the proposed maximum rates for customers. Had the rates been approved, the CleanPowerSF program would have began enrolling its first customers. The San Francisco Board of Supervisors has set aside $19.5 million for the program, but Mayor Ed Lee has proposed using those funds for additional streetlights and subsidies for solar panels on homes and businesses (Lagos 2014). In January 2015, Mayor Ed Lee announced his support for CleanPowerSF after having previously opposed it. Supporters are pushing to begin phase one of enrollment as early as September 2015 (Sabatini 2015).

4.2.4.2. Post-formation Risks

Once in operation, the primary risks inherent in the operation of a CCA program are that unanticipated events cause the CCA's costs to increase or the IOU's rates to decrease. As noted, the CCA statute permits customers to opt out of the CCA program at any time. If the difference between the cost of electricity provided by the CCA entity and the cost of electricity provided by the IOU increases, customers may opt out of the CCA and return to IOU service. If this occurs, there is a risk that the CCA entity will have contracted for more electricity than it can sell to residents, and have to sell that excess electricity to a third party, potentially at a loss. In the worst-case scenario, this loss of customers could theoretically result in a situation where higher cost resources built or under long-term contract to the CCA entity are spread over an increasingly smaller number of customers until the CCA entity is forced to dissolve. This worst-case scenario should only occur if utility rates became much lower than CCA rates, however. Given that a CCA program relying on its own generation resources should be less subject to electricity market volatility, the risk of a drastic cost-shifting scenario is likely small.

Appropriate program rules that impose exit fees to compensate remaining program customers for commitments made on behalf of the departing customers (not unlike the cost responsibility surcharge imposed by the IOU) should help mitigate the risk of losing customers. However, if customers find themselves obligated to a program with higher rates than those offered by the IOU (or other competitors), their dissatisfaction may be directed at those administering the CCA program.

The predominate cost of service variables and risks that might impact the CCA's operational costs are:

- The cost responsibility surcharge (CRS) will vary year-to-year. The CRS is inversely related to the prevailing market price of electricity such that if market prices fall, the CRS will increase. To the extent the CRS increases and the CCA program has locked in electricity prices through long-term electricity or fuel contracts, the CCA customers' total rates will increase.

- The CCA entity could improperly hedge its exposure to electricity and/or natural gas price volatility, and adverse price movements could cause rate increases for its customers. Similarly, the CCA program could over-rely on long-term contracts with fixed prices and find itself holding a high-cost portfolio if market prices subsequently fall.
- The CCA program could fail to properly secure its customer base, making debt financing via capital markets impossible to obtain and exposing the CCA program to stranded costs if customers opt-out of the CCA program. Even with appropriate switching rules, large customers may go out of business or leave the area and leave behind costs that must be paid by remaining program customers.
- The CCA program's energy suppliers could default on supply contracts (credit risk) at times when energy spot markets are high, forcing the CCA entity to purchase energy at excessively high prices. Customers could fail to pay the CCA program's charges, and the CCA program's credit policies and customer deposits may be insufficient to recover the uncollectible bills.
- IOU rate designs could change to reduce the cost of generation services and increase the costs of delivery services or shift the costs among customer classes in a manner that disadvantages the customer mix served by the CCA program.
- Other regulatory risks associated with changes in the rules and tariffs administered by the CPUC or in the wholesale markets regulated by the Federal Energy Regulatory Commission (FERC) could increase the CCA program's cost of providing service. For example, a requirement to use geographic-specific load profiles for electricity procurement could advantage coastal communities to the detriment of those located in hotter, inland climates.

Although each of these risks can be mitigated, they cannot be eliminated. Ultimately, the major operational risks are under the control of the program's management. Disciplined, professional management is key to managing the risks inherent in offering retail electric services. The CCA program will be able to contract for services from a variety of large, experienced energy suppliers that have excellent operational capabilities. It should be noted that municipal utilities have been managing commodity, credit, and operational risks for many decades, even during times of high commodity prices and supply shortages.

Finally, if the CCA program were operated by a Joint Powers Authority (JPA), as examined in more detail below, the general funds of the cities and counties participating in the CCA program could be immunized from any contractual liabilities resulting from the CCA program. Thus, although the risks above could affect the finances of the CCA program itself (and its ratepayers), those risks would not result in liabilities payable from the general funds of participating cities and counties.

4.2.4.3. Regulatory Oversight

Another potential risk to the County and its residents related to CCA program operation is one of regulatory oversight. In contrast to the high-degree of regulatory oversight that IOUs face, the CPUC has limited oversight of CCA programs. The CPUC's role is predominately focused on the relationship between the CCA and the IOU, rather than between the CCA and its customers (Stoner 2007).

Customers of a CCA program will not have rate increases and integrated resource planning decided under the rigors of a CPUC proceeding. Rather, a Board of Directors will be responsible for overseeing the CCA program. It is critical that the Board be made up of knowledgeable professionals that will conduct CCA-related matters in an open and transparent process, and in a way that accounts for the interests of all relevant stakeholders.

4.2.5. Organization and Governance

An effective San Diego County CCA program would likely require the participation of separate jurisdictions (e.g., the County and the cities choosing to participate in the program). Collective participation can be accomplished through the creation of a Joint Powers Authority (JPA). The participating jurisdictions can create a separate authority to operate the CCA program (as was done in Marin County for its CCA program). As noted above, this method has the additional advantage of allowing the participating jurisdictions to protect their general funds from any contractual liability or debt incurred by the JPA in connection with the CCA program.

A number of issues must be resolved in connection with the formation of a JPA, including determining the respective monetary contributions of the jurisdictions to offset start-up costs. The composition of the governing board of the JPA will also require negotiation, with consideration given both to the composition of the CCA ratepayer base (i.e., assuring relatively equal representation for ratepayers regardless of jurisdiction) and to the need for each participating jurisdiction to have sufficient representation on the governing board. Resolution of these issues is necessary prior to the formation of a JPA to operate the CCA program.

4.2.6. Statutory Requirements for Formation

Section 366.2 of the Public Utilities Code sets out the requirements for formation of a CCA program. The formation process begins with the adoption of an ordinance by the entity proposing the CCA program (e.g., city, county, or JPA), followed by the preparation of an implementation plan, which must contain certain elements required by statute. Specifically, the implementation plan shall include: (i) an organizational structure of the program, its operations, and its funding; (ii) rate setting and other costs to participants; (iii) provisions for disclosure and due process in setting rates and allocating costs among participants; (iv) the methods for entering and terminating agreements with other entities; (v) the rights and responsibilities of program participants, including, but not limited to, consumer protection procedures, credit issues, and shutoff procedures; (vi) termination of program; (vii) a description of the third parties that will be supplying electricity under the program, including, but not limited to, consumer protection procedures, credit issues, and shutoff procedures. The implementation plan must also contain a statement of intent by the public entity proposing the CCA program, stating its intention to provide universal access, reliability, equitable treatment of all classes of customers, and to meet any other requirements established by state law or by the California Public Utilities Commission (CPUC).

The implementation plan must be submitted to the CPUC for review. The entity proposing the CCA program must also provide to the CPUC any information necessary to allow the CPUC to determine the cost responsibility surcharge (CRS) applicable to CCA customers. The CRS reimburses unavoidable utility electricity procurement costs resulting from the loss of customers to the CCA to protect a utility's remaining bundled customers from bearing these costs through rate increases. Within 90 days, the CPUC must review and certify the implementation plan and inform the CCA program of the CRS applicable to it.

The CCA program must also register with the CPUC, and include with the registration an executed copy of a services agreement between the CCA entity and the utility governing the services to be provided by the utility under the CCA program. The CCA entity must also submit evidence of insurance, self-insurance, or post a bond that will cover such costs as potential re-entry fees, penalties for failing to meet operational deadlines, and errors in forecasting. Once the CCA entity has registered with the CPUC and signed the services agreement with the utility, the CCA entity must give the utility 30-days' notice of the commencement of CCA service.

4.2.7. Case Studies

4.2.7.1. Marin Clean Energy

Marin Energy Authority, a JPA comprised of the County of Marin and the cities of Belvedere, Benicia, Corte Madera, Fairfax, Larkspur, Mill Valley, Novato, Ross, San Anselmo, San Rafael, Sausalito, Tiburon, Richmond, and San Pablo, operates Marin Clean Energy (MCE). Nearby jurisdictions have increasingly expressed interest in joining MCE, with the City of Benicia recently joining the program and unincorporated Napa County businesses and residents having the opportunity to purchase electricity through MCE beginning February 2015.

MCE launched in May 2010 and was introduced in phases. The first phase included about 8,000 Marin accounts, made up of residential, commercial, and municipal customers. In August 2011, MCE enrolled another 5,500 Marin accounts, the majority of which were residential, with a small number of commercial accounts. MCE completed Marin customer enrollments in July 2012 and began offering electric service to Richmond customers in July 2013. MCE will begin service to unincorporated Napa County and San Pablo in 2015.

MCE offers its customers three different product offerings: Light Green, Deep Green, and Local Sol. Customers in MCE service territory are automatically enrolled in Light Green, which provides customers with 50 percent renewable energy from sources such as solar, wind, bioenergy, geothermal, and small hydro. MCE also offers a Deep Green 100 percent Renewable Energy option. The Deep Green product costs customers $0.01 per kWh more than Light Green and, in 2013, was comprised of Green-e Energy® Certified wind energy from Cassia County and Twin Falls, Idaho, as well as Klickitat County, Washington. Part of the Deep Green energy mix included renewable energy certificates (RECs).[16] MCE directs half of the revenue from the Deep Green premium to a local renewable energy development fund. Deep Green customer revenues have helped fund MCE first program-owned 2-5 megawatt solar project at the Richmond Port. The project is expected to be online by August 2016. Local Sol, MCE's newest product, offers MCE customers the option to purchase 100 percent solar energy from a local solar farm sited in the MCE service territory. Although currently limited to approximately 200 participants, Local Sol customers enjoy guaranteed, long-term electricity rates because the product's cost--about 30 percent more than Deep Green--is directly tied to the rates paid through MCE's Feed-In Tariff program: $0.142 per kWh ($0.138 + $0.004 for administrative costs).

In addition to the three product offerings, MCE also serves as a platform for several local energy programs that encourage the development of distributed energy resources, including net energy metering program, feed-in-tariff, and on-bill financing programs.

4.2.7.1.1. Net Energy Metering

MCE's Net Energy Metering (NEM) program allows customers to power their own homes and businesses from renewable generating systems, usually on their rooftops, connected to their meters. NEM is a billing arrangement that provides credit to customers with solar PV systems for the full retail value of the electricity their system generates. Under NEM, the customer's electric meter keeps track of how much electricity is consumed by the customer and how much excess electricity is generated by the system and sent back into the electric utility grid. Over a 12-month period, the customer has to pay only for the net amount of electricity used from the utility over-and-above the amount of electricity generated by their

[16] For more information on RECs, see Section 4.2.8.3.6.

solar system (in addition to monthly customer transmission, distribution, and meter service charges they incur) (California 2015). MCE pays its customers a $0.01/kWh premium over the retail rate paid by the local IOU, PG&E.

4.2.7.1.2. Feed-In Tariff

In contrast to NEM, MCE's Feed-in Tariff (FIT) program is a wholesale renewable energy purchase program designed to provide competitive, predictable energy prices for local small-scale renewable energy developers over a 20-year contract term. The standard agreement offered by MCE can provide the basis for securing project financing, and should also provide a high level of certainty with respect to the revenue stream generated by the project. FIT renewable energy suppliers do not have to be MCE customers. By utilizing a standard form contract for 20-year power purchase agreements, a FIT can virtually eliminate the need for contract negotiations and keep transaction costs low.

Currently, MCE's FIT is limited to projects up to 1 megawatt in size located within the MCE service territory. MCE will only approve a FIT application after the project has received an executed interconnection agreement from PG&E. Once a project owner or developer enters into a FIT contract arrangement with MCE it must interconnect to PG&E's distribution system, or "grid," and must follow PG&E's prescribed small generator interconnection procedures.

MCE's first FIT-supported project was executed in October 2012 with the San Rafael Airport. The 972 kilowatt rooftop solar project demonstrated that a CCA-administered FIT program can facilitate the deployment of local distributed energy as well as create local economic benefits. Synapse Electric, which built the project, hired 20 workers specifically for the project through the Marin City Community Development Corporation and CLP Resources. Synapse also hired three new locally-based full-time employees. San Rafael-based company, REP Energy, designed the installation, and the REC Group manufactured 85 percent of the solar panels, which are American-made. Power-One supplied all of the inverters, which are also American-made. The project was financed locally by the Bank of Marin and businessman Joe Shekou.

4.2.7.1.3. Other Local Projects

A CCA program can reinvest ratepayer dollars back into the local community, as evidenced by MCE's pipeline of forthcoming local energy projects. MCE has partnered with a nonprofit organization in Novato to build a 1-megawatt, solar-shaded parking structure. The structure will be built on an existing employee parking lot and is expected to be completed by August 2015. In addition, a land lease is expected to be finalized with the City of Richmond to add solar to an existing parking structure at the Richmond Port. Initially planned to be built at 1 megawatt, the project could grow to 3 megawatts in future construction phases. The first phase of the Richmond Port project is expected to be completed by December 2015. Another land-lease deal with the City of Richmond may yield a 1-3 MW ground mount solar project on a brownfield site in Richmond. Lastly, MCE is negotiating a power purchase agreement with the Novato Landfill to capture methane gas from the landfill and turn it into renewable energy. The expected completion date for the project is April 2016.

4.2.7.1.4. Energy Efficiency Programs

Further demonstrating a CCA program's ability to operate as an energy integrator, MCE manages energy efficiency programs for residential and commercial customers. The customer-oriented programs integrate diverse program offerings under one umbrella. The programs are designed to maximize investments in a property, reducing energy use, water use, and greenhouse gas emissions. MCE's programs provide participants with a single point of contact to serve as facilitator and participant advocate, helping guide the customer through the process from initial contact to project completion. In addition to offering financing and rebates to help overcome the cost barrier to efficiency investments, the MCE programs also provide high-consuming customers with information about how they use energy and advice for how to further reduce consumption.

4.2.7.1.5. Workforce Development

MCE will support the success of its energy efficiency programs with complimentary and critical workforce development training. Contractors and workers must have the skills necessary to support program success, and a trained workforce is essential to accomplishing market transformation. MCE engages community partners to ensure the inclusion of workers from disadvantaged communities in pursuing careers in the energy sector, and to build on existing successes, fill gaps in service, and focus on meaningful local workforce opportunities.

MCE's workforce development programs help support the local economy. Stackable credential programs provide workers with a broad spectrum of transferable skills qualifying them for a variety of green jobs. Marketing, education, and outreach activities help increase demand for skilled labor in the region. MCE also works with local experts to align, leverage, and influence existing training programs and markets in the MCE service territory.

Workforce programs contribute to energy efficiency program success. Skilled workers ensure efficiency gains are met, and health and safety issues are addressed. The program will ensure ratepayer dollars provide meaningful opportunities, contributing to MCE's mission of reducing greenhouse gas emissions. An increase in skilled labor spills over to benefit all ratepayers and not just program participants.

Industry Workshops & Trainings

- Contractors, Architects, Builders
- Engineers Continuing Education
- Marketing, Outreach & Sales
- Building Maintenance and Operations
- Energy Management
- Housing Authorities/Asset Managers

Youth Workshops & Trainings

- Green Jobs Schools Program
- Internships for high school students

Policy & Procedures

- Develop standards for contractors
- Develop health and safety protocols
- Implement local hire agreements
- Code Compliance, Health & Safety

Partnerships

- Workforce Investment Boards
- Economic Development Agencies
- Workforce Intermediaries
- Trade Unions
- Community Colleges/Adult Schools
- Community-based Organizations
- Contractors/Contractor Associations
- Municipalities
- IOUs

Workforce Topic Areas

- Energy Efficiency
- Zero Net Energy
- Energy Management
- Building Operations/Management
- Measure Specific Trainings

4.2.7.2. Sonoma Clean Power

In 2011, at the urging of local residents and businesses, the Sonoma County Water Agency began seriously exploring the formation of a community power program. A steering committee was formed, comprised of city council members, city managers and staff, business people, activists and other interested parties. Following more than two years of research, public opinion polling, and a detailed technical feasibility study, Sonoma County elected to move forward with its efforts to establish a CCA.

Sonoma County Water Agency drafted a detailed implementation plan in 2012—updated in 2013—that outlined the core program of increasing the region's share of electricity generated from renewable sources. To complement the implementation plan, a series of educational meetings was held in the cities who were invited to participate in the CCA. The outreach and educational tour was followed by city council votes to determine which cities would elect to participate in the Sonoma Clean Power (SCP) program. Thus far, participants include the cities of Windsor, Cotati, Sebastopol, Santa Rosa, Sonoma, Cloverdale, and the unincorporated area of Sonoma County. The newest members of SCP, Rohnert Park and Petaluma, voted to join the CCA program in November 2014 and December 2014, respectively (Brown 2014; Dunn 2014).

SCP has begun adding customers in a phased enrollment approach. In May 2014, service began for 20,000 commercial customers. The program then rolled out to 200,000 residential customers in December 2014. To date, SCP has experienced far fewer customers opting-out than anticipated with an 89 percent retention rate (Marshall 2014).

SCP offers two product offerings to its customers: CleanStart and EverGreen. CleanStart is SCP's default service and boasts 33 percent renewable power from sources such as geothermal, solar, and wind. EverGreen is 100 percent local renewable energy initially comprised of geothermal power sourced from

Calpine Geysers facilities in northeastern Sonoma County. SCP has entered into a 10-year contract that provides steadily rising volumes of geothermal power reaching 50 MW in 2018. By then, the total energy coming from that source will amount to 23 percent of SCP's resource portfolio. SCP has also contracted for 20 years of solar power from Recurrent Energy, adding 40 MW to the agency's previous purchase of 30 MW for a total of 70 MW (Dunn 2014).

Because SCP has only been in operation for less than a year, it has yet to mature into a complete energy integrator for the community. That said, however, SCP offers two programs to catalyze development of local energy projects: NetGreen and ProFIT.

NetGreen is a net energy metering program that is structured similar to that of MCE's NEM program. Customers are credited at the full retail rate, plus an additional $0.01/kwh bonus for excess electricity generated from their rooftop PV system. If a customer uses more energy than the system produced, accrued credits are applied to offset any charges to the account. If the credits do not offset the charges completely, the customer is only charged for the remaining balance. At SCP's annual account cash-out in April, any unused credits will be rolled over into the next billing cycle to help offset costs in the following year. If an account has credits in excess of $100, a check from SCP will be sent to customers for the full value of those credits up to $5,000 (2015).

ProFIT is SCP's feed-in tariff, a renewable energy purchasing program which sets the rules and price for SCP to purchase electricity from small-scale wholesale renewable electricity projects within SCP's service territory. ProFIT directly promotes the development of small-scale renewable generation installations within the SCP service territory by creating a standard-offer transaction with a fixed price of $95/MWh. Contracts are offered at 10 years for baseload generating facilities or 20 years for other generating facilities. Projects that meet the bonus eligibility criteria may qualify for up to $130/MWh for the initial 5 or 10 years of the contract term (2015).

4.2.7.3. Lancaster Choice Energy

Lancaster Choice Energy (LCE) is the latest CCA program in California with a launch date of May 7, 2015. Phase one of the program roll-out encompassed more than 850 accounts including all municipal accounts as well as residents and businesses that have elected to enroll early in the program. Phase two should begin in November 2015 with small commercial accounts joining the program, with the remaining customers enrolling in Early Spring 2016. Lancaster's City Council will oversee the program and be responsible for various elements of the program, including rate setting.

The City of Lancaster is still finalizing the details of its program and will be submitting a revised implementation plan for CPUC approval. Lancaster anticipates, however, that it will offer its customers several different product offerings along the lines of those offered by MCE and SCP. Similarly, LCE will, in all likelihood, also offer a net energy meeting program as well as a feed-in tariff program.

4.2.8. Functions of a Community Choice Aggregation Program

A CCA program can serve as a comprehensive energy service provider, integrating energy supply with reduced demand in a manner that provides the community many of the benefits outlined above. Properly constructed, a CCA program can effectively manage community energy resources (both demand reduction and electricity generation) to meet community objectives. A CCA program performs the following functions:

- Energy Procurement and Integrated Resource Planning
- Rate Setting

- New Program Development
- Regulatory Compliance
- Public Relations and Customer Service

The authors examine each of these functions in turn.

4.2.8.1. Energy Procurement and Integrated Resource Planning

The most critical function of a CCA program is to meet the electricity demand of its customers, and to do so reliably and in a cost-effective manner. This function can be achieved by integrating generation services with demand reduction, as energy saved typically the least-cost resource. From a generation perspective, a San Diego County CCA program would likely prioritize increased investments in renewables and energy efficiency in order to capture the attendant reductions in GHG emissions. As such, emphasis should be given to energy resources that are compatible with reaching these institutional priorities.

Integrated resource planning for a prospective CCA program would include load forecasting and power supply planning on a long-term time horizon. The CCA program would need to develop integrated resource plans that maximize the cost-effective use of demand side efficiency, storage, and demand response programs, combined with traditional supply options and renewable energy resources. Special care should be given to the pursuit of a nimble, modular approach, such that the CCA program could adjust its resource portfolio to respond to emerging technologies and avoid locking itself into a suboptimal resource portfolio for the long term.

This report explores a potential high-level resource plan for San Diego County in Section 4.2.11.

4.2.8.2. Demand Reduction Services

One of the key components to optimizing the electricity system in the San Diego region involves reducing peak load periods so as to flatten electricity demand over time and over the region. Such an approach can help mitigate the need to utilize peaker power plants that ramp up quickly to match increasing demand—typically present in the evening hours. Peaking power is often a relatively expensive resource type. Flattening the load profile reduces the amount of generating capacity needed to satisfy peak demand and thereby reduces the overall cost of electricity. In particular, the amount of energy that has to be procured on the open market is reduced.

As an energy integrator, a San Diego County CCA program would be uniquely positioned to fund and administer energy efficiency programs that include a method for identifying and implementing the largest, most cost-effective savings across the local service territory, while complementing what SDG&E and other organizations are already doing under state programs directed by the CPUC.

Demand-response technologies should also be explored. A CCA program can offer customers financial incentives to reduce demand upon the CCA entity's request. This can be an extremely cost-effective way to shave load peaks. For example, utilities in some forward-thinking jurisdictions have begun utilizing customers' large-capacity hot water heaters to play a part in frequency regulation, as voltage needs to be smoothed out as demand varies. Load control devices shut down the heater during the day, but the extra capacity provides plenty of hot water. The water is heated from 11 p.m. to 7 a.m., off-peak at a lower generation rate than what consumers would pay for electricity usage during daylight hours. With enough participation, a CCA program could effectively store well over a GWh of electricity every night, utilizing the water heaters effectively as a giant, distributed battery (Opalka 2013).

For the CCA program, demand response is an effective alternative to procuring capacity that would otherwise be needed to comply with CPUC capacity requirements.

4.2.8.3. Power Procurement Services

CCA program staff would have a number of supply-side options at its disposal for procuring electricity:

4.2.8.3.1. Third-party Power Provider

The experience of Marin Clean Energy and Sonoma Clean Power demonstrates that, at the beginning, all electricity demand—including the renewable energy component—may be procured from large energy suppliers, while new local renewable resources are being funded and developed. A third party could contract for a high percentage of the program's supply at launch while the program develops an operational record and revenue stream needed to finance its own projects. The third party would ensure that the CCA program meets the state's Renewable Portfolio Standard requirements for renewable energy content.

4.2.8.3.2. New Generating Facilities/Power Purchase Agreements

A CCA program can also conduct an open bidding process to contract for renewable energy from new facilities. Independent power producers would submit proposals to be evaluated by staff. Firms with successful bids would then negotiate power purchase agreements. Under this approach, the CCA entity would not own the facility but simply purchase the electricity generated therefrom.

4.2.8.3.3. New Generating Facilities/Program-Owned

In the alternative, a CCA program could also build, own, and operate new generating facilities. Under such a model, the facility could be situated on public property or brownfield sites and built through a project developer hired by the CCA entity. This approach would likely make more sense after the CCA program

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has matured, with several years of operating experience and an established credit rating, so that low-interest loans or revenue bonds can be used to finance the projects.

4.2.8.3.4. New Generating Facilities/Feed-in Tariffs

A feed-in tariff (FIT) program establishes a standard offer contract for renewable generators looking to sell electricity to the CCA entity at a fixed price for up to 10, 15 or even 20 years. With their high level of certainty, FIT contracts give smaller-scale developers the ability to secure project financing more easily. Both Marin Clean Energy and Sonoma Clean Power have successfully implemented FIT programs.

4.2.8.3.5. Behind-the-Meter Resource Development

A CCA program can develop programs that encourage homeowners and businesses within its service territory to install energy efficiency and renewable energy generating resources behind the customer meter. Such programs can include a variety of technologies, such as combined heat and power facilities, residential and commercial PV systems, as well as district heating and cooling facilities.

As noted, Marin Clean Energy operates an energy efficiency program that offers rebates to customers as well as financing to facilitate the installation of efficiency measures in the home or workplace. In addition, both Marin Clean Energy and Sonoma Clean Power provide customers a net energy metering program, which encourages customers to install PV systems with excess capacity by compensating them at the full retail rate plus an additional penny per kWh for any excess electricity generated by the system.

4.2.8.3.6. Unbundled Renewable Energy Certificates (RECs)

A renewable energy credit (REC) represents the environmental and renewable attributes of renewable electricity. A REC can be sold either "bundled" with the underlying electricity or "unbundled," as a separate commodity from the electricity itself, into a separate REC trading market (Commission 2015). California law (Public Utilities Code § 399.12(f)) defines a REC as:

"[A] certificate of proof, issued through the accounting system established by the Energy Commission [WREGIS] . . . that one unit of electricity was generated and delivered by an eligible renewable energy resource."

Unbundled RECs are recognized and allowed under California's RPS, although the number of unbundled RECs that can be used for compliance is limited. Unbundled RECs could serve as a strong cost-containment option, and their utilization may give flexibility to a CCA program. A newly emerging CCA program might initially rely on RECs to some extent in order to meet RPS requirements at reasonable costs to customers. However, it is not clear that RECs result in new renewable energy development and therefore they likely would not provide a CCA program with the full array of environmental and economic benefits as other renewable energy procurement models.

4.2.8.4. Rate Setting

A CCA program is responsible for setting the rates customers pay for electricity. The program would adopt an initial rate structure following the establishment of the first year's operating budget and prior to launch of the program. The Board of Directors would approve all future rates at a public meeting with stakeholder input.

The rate structure would likely follow the experience of other CCA programs and include the following features:

4.2.8.4.1. Rate Sufficiency

At a minimum, rates must be sufficient to meet the program's annual budget requirements. This would include recovery of all expenses and any reserves or coverage requirements set forth in bond covenants or other debt-service requirements.

4.2.8.4.2. Rate Stability and Competitiveness

Rates would initially have a similar structure to SDG&E's rate system. The program would aim to have lower rates and greater rate stability as the share of locally developed renewable resources increases—with no variable fuel cost issues such as natural gas generation. Starting with a similar rate structure to SDG&E is designed to ensure the program rates are not altered drastically and helps customers more easily transition from bundled service to the CCA program. Competitive rates will be critical to attracting and retaining key customers.

4.2.8.5. Product Offerings

The CCA program could elect to offer customers a variety of product offerings, including a 100 percent renewable energy option at a premium price, based on the costs of a 100 percent renewable supply. As demonstrated by Marin Clean Energy and Sonoma Clean Power, a 100 percent renewable option can prove quite attractive to the community and the premium dollars can be tied directly to local renewables development.

4.2.8.6. Power Charge Indifference Adjustment (PCIA)

The PCIA is a CPUC-mandated fee collected by SDG&E. It is intended to ensure that customers who switch to a CCA program pay for the above-market cost of energy that SDG&E purchased on their behalf prior to the change in service. This, in turn, assures that costs incurred by SDG&E on behalf of customers transitioning to CCA service are not shifted to the rest of the SDG&E customer base. The PCIA is designed to decline to zero over a period of several years (Mieux 2014).

4.2.8.7. California Alternate Rates for Energy (CARE) Rates

Participating qualified low- or fixed-income households, such as those currently enrolled in California Alternate Rates for Energy (CARE) program, would continue to receive the same monthly discounts on their electricity bills.

4.2.8.8. New Program Development

One of the components that makes CCA programs such an effective tool for driving community investment in renewables and energy efficiency is the ability to develop energy programs. These may include new approaches to reducing energy demand as well as the building of new, local, renewable generating assets.

In addition to net energy metering and feed-in tariff programs, a CCA could administer a wide range of other programs including community solar projects, Property Assessed Clean Energy (PACE) programs, and on-bill financing arrangements.

4.2.9. Regulatory Compliance

CCA programs face far less regulation than IOUs, but as load-serving entities, they must comply with various compliance filings related to resource plans, resource adequacy, and California's RPS. The program should have at least one staff person dedicated to ensuring the organization maintains an active role at the CPUC, the California Energy Commission and, as necessary, the Federal Energy Regulatory Commission and the California legislature.

Some of the main regulatory components are as follows:

4.2.9.1. Certification of Implementation Plan

The CPUC must certify a CCA program's implementation plan before operation may commence.

4.2.9.2. Capacity Requirement

The CPUC's resource adequacy standards require a demonstration one year in advance that the CCA program has secured physical capacity for 90 percent of its projected peak loads for each of the five months of May through September, plus a minimum 15 percent reserve margin. On a month-ahead basis, the program must demonstrate 100 -percent of the peak load plus a minimum 15 percent reserve margin (Sonoma County Water Agency 2011).

4.2.9.3. Renewable Portfolio Standard (RPS)

State law requires that CCA programs, like IOUs and municipal utilities, provide a minimum amount of eligible renewables in their resource mix, according to the schedule presented in TABLE 4-1. The current standard mandates 33 percent renewable energy by 2020, however, Governor Brown has indicated a desire to accelerate the standard to 50 percent by 2030.

The RPS also divides renewable energy supply into three categories. Category 1 entails the use of renewable energy facilities located in the State of California or those outside the state that can meet strict scheduling procedures to ensure delivery into California. There is no limit to using Category 1 renewables for RPS compliance. The other two categories focus on renewable energy that might not be strictly delivered into the state as well as the purchase of unbundled RECs. These categories do have limits as to the percentage used for RPS compliance.

TABLE 4-1. Renewable Portfolio Standard

Year	Renewable Energy Portfolio Requirement (%)	Year	Renewable Energy Portfolio Requirement (%)
2015	23%	2018	25%
2016	23%	2019	25%
2017	25%	2020	33%

4.2.10. Establishing a CCA Program

This next section is a high-level overview of what steps would be required to set up a community choice program in San Diego County. As noted previously, any local government and some special districts in California can form a CCA program either by itself or with other jurisdictions. In Marin and Sonoma, the County governments took the lead—with the cities joining once the initiative was underway. To begin the process, the jurisdiction could pass an ordinance or resolution that states its intention to establish a CCA program and, on that basis, undertake a full feasibility study or businesses plan.

4.2.10.1. Feasibility Study

The CCA feasibility study is the basis upon which a government jurisdiction proceeds with the establishment of a CCA program. As in any other business, the study must be detailed enough to describe how the program is to meet its stated goals, while also demonstrating the economic feasibility of providing the benefits the program wishes to achieve.

The study would use SDG&E load data and renewable resource assessments to identify potential projects. It would assess the potential size of the program in terms of number of customers and electricity sales, develop an initial financial and cash-flow model, predict the overall return on investment, quantify the jobs created under various procurement scenarios, and outline how the start-up costs would be financed.

Depending on the scope of the study, it could also address how local development projects would be financed, clearly outline the functions of the program, and determine staffing requirements. The plan would also examine the risks associated with establishing a CCA program and how those risks should be mitigated. As a point of reference, the feasibility study in Sonoma County cost about $100,000. A fuller business plan, one that identifies particular demand side and renewable resources for development, would likely cost more depending upon the scope. In the case of Marin and Sonoma counties, they each chose to identify potential resources after creating the CCA agency.

4.2.10.2. Initial Start-Up Costs

Setting up a CCA program requires up-front investments. In addition to the costs involved in developing the feasibility study described above, there will also be necessary legal fees associated with setting up a Joint Powers Authority (JPA) should one be required. The cost for legal fees can be minimized somewhat relative to what Marin and Sonoma incurred because model JPA agreements now exist.

If a new administrative agency is also required, the initial staffing and creation of this agency could cost around $500,000. These costs can all be repaid relatively quickly once the CCA program is launched, but typically they are borne initially by the initial set of government jurisdictions, angel investors, or through short-term loans.

For example, funds for Marin Clean Energy's initial operations came primarily from two sources. The County of Marin loaned MCE a total of $540,000 without interest. MCE also issued promissory notes to three individuals for loans totaling $750,000, which it paid back within the first year of operations.

4.2.10.2.1. Agency Formation

Initially, the Board of Directors would be required to create a CCA agency under the direction of a Chief Executive Officer or Executive Director to be appointed by the Board.

Board of Directors

The Board of Directors would oversee and approve all important decisions, such as major power procurement contracts, raising capital for local energy development, and rate setting. The Board would provide overall policy direction to the CEO, who would have general responsibility for program operations.

The Board could also establish subcommittees that focus on particular areas of interest. Sonoma Clean Power, for example, has created a ratepayer advisory subcommittee to review and approve all electricity rates—a critical component. This SCP subcommittee includes citizens who represent the interests of the residential and commercial sectors.

Management Staff

The CEO will have management responsibilities over the following functional areas:

- Energy procurement and longer-term resource planning

- Rate setting
- New program development, including net energy metering and feed-in tariff programs
- Regulatory affairs
- Public relations and customer service

Staff would likely be hired to cover each of these areas, while, initially, some of these positions could be filled by third-party consultants or contractors.

4.2.10.3. Implementation Plan

The CPUC, which ultimately has to approve the CCA program, requires that the CCA entity submit an implementation plan that covers all aspects of the program's set-up and operation. However, the implementation plan need not describe the integrated resource plan, financial plan, or other aspects of the business plan.

Assembly Bill 117 and California Public Utilities Code §366.2 are clear about what needs to be included in the implementation plan to be certified by the CPUC:

- Process and consequences of aggregation
- Organizational structure of the program, its operations, and funding
- Rate setting and other costs to participants
- Disclosure and due process in setting rates and allocating costs among participants
- Methods for entering and terminating agreements with other entities
- Participant rights and responsibilities
- Termination of the program

Description of third parties that will be supplying electricity under the program, including information about financial, technical, and operational capabilities

The first item in the list above involves a plan for phasing in customers to the program. The phase-in schedule will depend, of course, on which cities (if any) join at the outset, but in any case, not every customer in the County can or should be signed up on the initial program launch. The implementation plan must also include a statement of intent indicating that the program shall provide universal access, reliability, and equitable treatment of all customer classes, and to meet any other requirements established by state law or by the CPUC.[17]

[17] Section 366.2 of the Public Utilities Code specifies that to form a CCA, there must be a local ordinance approved by the entity proposing the CCA, followed by the preparation of an implementation plan, which must contain specific elements outlined in the statute. After the implementation plan is approved, the CCA registers with the CPUC and provides an executed copy of the services agreement between the CCA and the utility that covers the services to be provided (e.g., billing).

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4.2.10.4. Program Roll-Out

Drawing from the experience of Marin and Sonoma counties, once all of the steps listed above are completed, the CCA agency will need to undertake a series of start-up related activities that will likely begin between six to twelve months prior to the first sale of electricity.

Such activities include, but are not limited to:

4.2.10.4.1. Hiring Staff

The CCA Board of Directors, after appointing a CEO or Executive Director, will hire a mix of direct staff and contractors to undertake the activities necessary to effectively launch the program. Given the size of unincorporated San Diego County, an initial staff of 21 people would likely be required, covering the following functions: regulatory affairs, media and community outreach, budget and finance, power procurement, energy forecasting, and local energy programs. Some of the more technical work, such as modeling demand, longer-range forecasting, and developing the proposed rate structure, can be done with the help of consulting firms. Marin Clean Energy, which covers a smaller population than the unincorporated area of San Diego County, currently has about 18 staff members.

4.2.10.4.2. Setting Initial Renewable Portfolio Goals

The Board of Directors would need to decide on a number of basic policy issues, such as how much renewable energy content should make up the program's initial resource mix and how it should be procured. Sonoma County decided that it wanted to start with a 33 percent renewable content, thus meeting the 2020 RPS target seven years early, and building up to a 50 percent renewable content within a few years. Such an approach would typically require the CCA agency to contract with a third party, at least initially, to purchase the requisite energy from eligible sources.

4.2.10.4.3. Satisfying Start-Up Capital Requirements

The start-up or rolling out of the program will incur costs in the 6 to 12 months prior to commencement of operations and the generation of revenue. In the case of other CCA programs, namely Marin and Sonoma, start-up costs were covered either through public funds or through short-term bank financing. These costs can be quickly recovered, however, once revenues to the program are generated.

One such start-up cost will be related to posting the CCA program bond. This is a CPUC requirement and is meant to cover the potential costs in case a program fails and the customers are returned to SDG&E bundled service. The estimated bond for Sonoma was approximately $100,000. It is unkown what a corresponding bond requirement will be for San Diego, but it is reasonable to expect a San Diego bond to be higher.

Also, working capital will be required to cover the costs—primarily purchasing electricity—that are incurred between the start of operation and the generation of revenues. Operating revenues from sales of electricity will be remitted to the CCA agency beginning approximately 60 days after the initial customer enrollments. This lag is due to the distribution utility's standard meter reading cycle of 30 days and a 30-day payment/collections cycle. Potential funding sources for these costs include short-term bank financing (likely a line of credit that can be drawn upon as needed to cover expenditures) or in-kind services provided by the third-party energy supplier (specifically, a delay in the first payments). The program would expect to recover the principal and interest costs associated with the start-up funding via retail sales.

In the case of Sonoma, First Community Bank provided startup financing for Sonoma Clean Power's operations in two separate tranches. The first tranche consisted of a $2.5 million line of credit, which was guaranteed by Sonoma County. Subsequently, First Community Bank extended a $7.5 million line of credit, for which it required no guaranty from Sonoma Clean Power or its member jurisdictions.

4.2.10.4.4. Setting Initial Rates

Once the initial budget with the power procurement costs are determined, the agency staff would develop an initial rate structure designed to (a) cover the program's costs; (b) be competitive with SDG&E; and (c) offer incentives designed to meet the program's goals, such as net metering and feed-in tariffs. This process will likely be assisted by contractors, as well as the experience gleaned from the Marin and Sonoma programs.

4.2.10.4.5. Informing Customers

Before any customers (residential, commercial, or industrial) are enrolled in the program, they will receive two written notices in the mail explaining the CCA's terms and conditions of service and how they can opt out of the program. All customers that do not opt out will be automatically enrolled. These notices will be sent at least three months prior to the commencement of service. After the first day of service, customers will receive an additional two notices (at least 30 days apart) allowing them the opportunity to opt out for no fee and return to SDG&E service. After that point, customers will still have the opportunity to return to SDG&E whenever they wish, but they might face a modest termination fee to cover the costs of switching the customer over.

4.2.11. Illustrative Resource Development Scenario

This section describes one of several possible resource development scenarios for a San Diego County CCA program. The scenario is meant to illustrate the potential of an ambitious program to deliver community investment, clean energy jobs, lower electricity bills, greenhouse gas reductions, and other benefits.

The resource development scenario presented below makes the following assumptions about program rollout and goals:

- The program would phase in customers over four years: 10 percent of the customer base in Year 1, increasing to 25 percent in Year 2, increasing again to 50 percent in Year 3, and then reaching 100 percent by the end of Year 4.
- Customer retention in the program would be about 80 percent, as evidenced by customer retention experienced by Marin Clean Energy and Sonoma Clean Power.
- The program's renewable energy content would start at 33 percent and rise to 80 percent by 2050.
- With respect to energy efficiency, the program reduces energy demand by 2.5 percent in 2015, increasing to a 25 percent reduction of what would otherwise be demanded in 2050.
- The program would develop new local renewable electricity generation, with the goal of 60 percent of total renewables in the portfolio from local sources by 2050.

Based on these assumptions, FIGURE 4-4 illustrates the resulting electricity resource development scenario.

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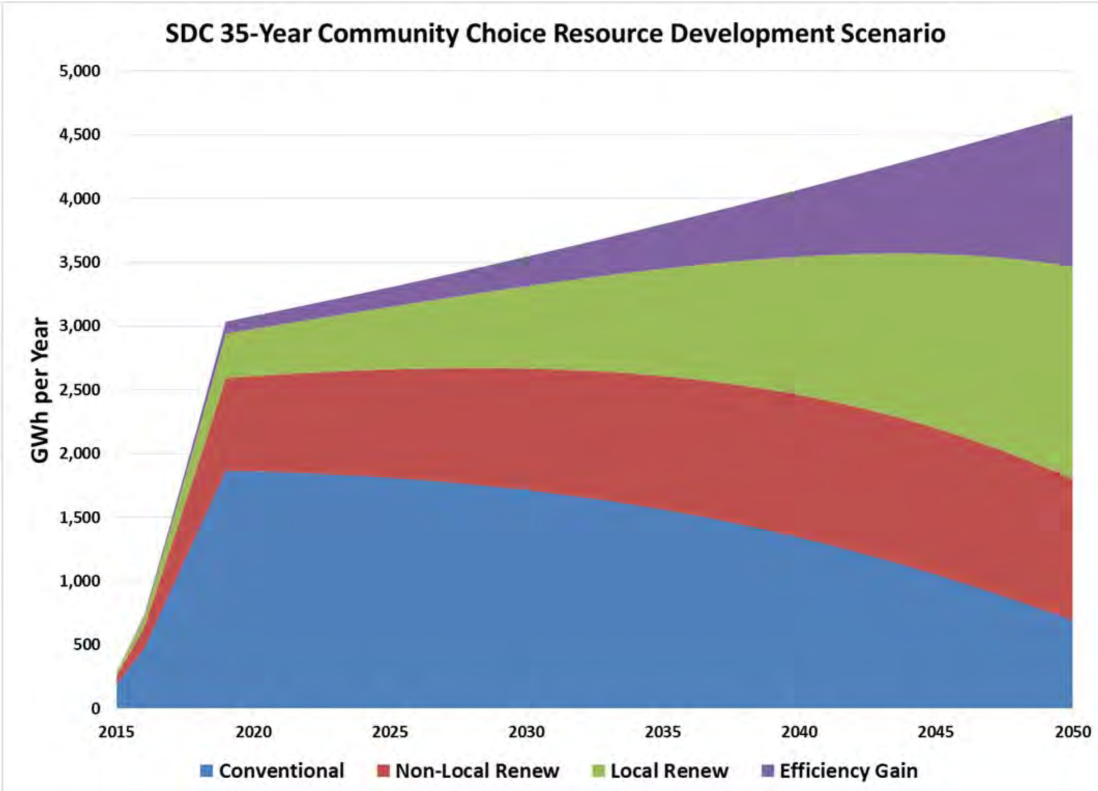
FIGURE 4-4. SDC 35-YEAR COMMUNITY CHOICE RESOURCE DEVELOPMENT SCENARIO.



As shown in the above graph, the program follows a phased-implementation approach, reaching full implementation by the year 2019. Our forecast indicates that by 2050, electricity service demand will grow to 5,579 GWh. Of this total demand, the illustrative CCA program described above would meet 80 percent or 4,464 GWh by 2050. Energy efficiency, shown in purple, would meet 1,116 GWh—or 25 percent—of the CCA program's share of electric service demand. As a result of increased investments in energy efficiency and distributed energy resources, the CCA program described above could avoid transmission and distribution losses totaling 201 GWh or 6 percent of the total energy efficiency gain. Locally sited renewable energy resources, denoted in green above, would grow to 1,703 GWh by 2050 or 48 percent of the CCA program's net electricity supply. Non-locally sited renewable resources, shown in red, amount to 1,136 GWh by 2050 or 32 percent of the CCA program's net electricity supply. Combined, these resources would meet 80 percent of the CCA program's net electricity supply by 2050. Conventional sources, shown in blue, decline over the period ending in 2050 and amount to 710 GWh or 20 percent of the CCA program's net electricity supply.

4.3. Direct Access[18]

4.3.1. Introduction

Under traditional, bundled service, California utilities provide electricity to homes and businesses by generating the electricity, transmitting it through major electricity lines, and then distributing it through smaller electricity lines. Through direct access (DA), eligible retail customers have the choice to purchase electric power directly from an independent electric service provider (ESP) rather than only through an investor-owned utility (IOU).

Similar to a CCA program, DA provides customers with a choice when it comes to their electricity generation needs. There are, however, some key differences between the two institutional arrangements. For one, DA is no longer available to residential customers. In addition, DA is very limited as a tool for the region to drive greater investment in renewable energy and energy efficiency. By law, enrollment in DA is limited to a set number of GWh each year. Furthermore, even setting the enrollment restrictions aside, the County has no ability to control the ESPs from which an individual customer will purchase its power. This, in turn, limits the County's ability to ensure that a DA program would actually deliver increased levels of renewables and energy efficiency, as well as decreased levels of GHG emissions to residential and commercial customers.

The sections that follow examine the history of DA in California as well as the current landscape in the San Diego region. Potential approaches toward DA the County may take in the future are also explored.

4.3.2. Background

DA was first instituted as an option for retail electric service in 1998, as part of an electric industry restructuring program to bring retail competition to California electricity markets. The electricity industry restructuring program was cut short, however, by the "electricity crisis" events of 2000 and 2001 that led to extraordinary wholesale electricity cost increases, threatening the solvency of California's major electric utilities and the reliability of electricity services.

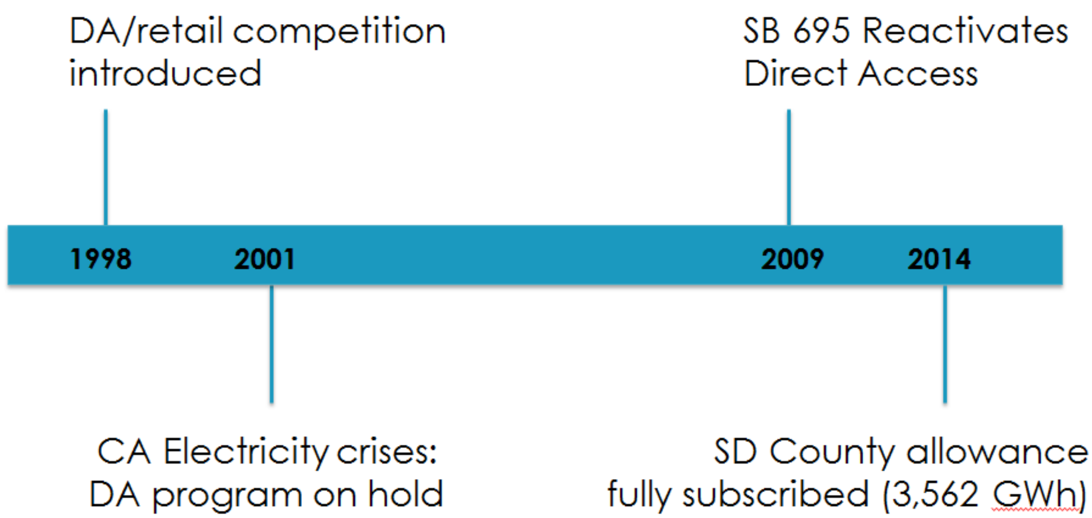
On October 11, 2009, Senate Bill (SB) 695 was signed into law as an urgency statute. SB 695 adds §365.1(b) to the Public Utilities Code, which states in relevant part:

The commission shall allow individual retail nonresidential end-use customers to acquire electric service from other providers in each electrical corporation's distribution service territory, up to a maximum allowable total kilowatt-hours annual limit.

Except for this express authorization for increased DA transactions under SB 695, the previously enacted suspension of DA transactions remains in effect until repealed by legislation, or until additional DA transactions are otherwise authorized.

[18] All analysis pertaining to Direct Access in this report deals with the current version of the law, as of June 2015. As indicated in this section, the California Senate, on June 3, 2015, passed SB 286, which, if made law, would substantially alter the current Direct Access program and, in turn, would substantially alter this analysis.

FIGURE 4-5. Direct Access Timeline



Initially, to get space under the cap in order to sign up for DA service, a nonresidential customer or the customer's agent had to submit the customer's eligible accounts into a first-come/first-served enrollment period. Each phase of the enrollments under the cap was filled within moments of the start of the first-come/first-served submission period. In December 2012, however, as requested by a coalition of interested stakeholders, including customers, ESPs, and the utility companies, the CPUC issued a decision that adopted new procedures to govern enrollment in DA when there is space under the current DA caps.

Beginning in 2013, nonresidential customers interested in taking DA service were required to submit to their utility a six-month notice to start service during a five business day submission period in the second week of April 2013. Each submission was assigned a random number, and the space under the cap was filled according to the random number assignments. Customers awarded space in the lottery were able to commence service in October 2013 (Domagalski 2014).

Submissions not accommodated under the cap were added to a wait list, which remained in effect until the next lottery was conducted in June 2014. On the last business day of each month, the utility determined whether there was any room under the overall load cap and notified the first customer on the wait list that the space was available. The nonresidential customer could then elect to activate DA service or remain on bundled utility service. The process continues until the room under the cap is filled (Domagalski 2014).

The switch to a lottery eliminated any need or incentive for nonresidential customers to make multiple submissions of accounts in the hopes that one of the submissions would get in early enough to get space. In fact, multiple submissions of the same accounts during the lottery window will be rejected so that each account or set of accounts that are submitted will get only one random number assignment (Domagalski 2014).

4.3.3. Direct Access in California and San Diego County

Given current restrictions, DA accounts for a relatively small portion of the electricity consumption in San Diego County and the State of California overall. As shown in FIGURE 4-6 below, as of December 31, 2014, the capped load allowance only permits ESPs to serve approximately 12.85 percent of the total IOU load in California.

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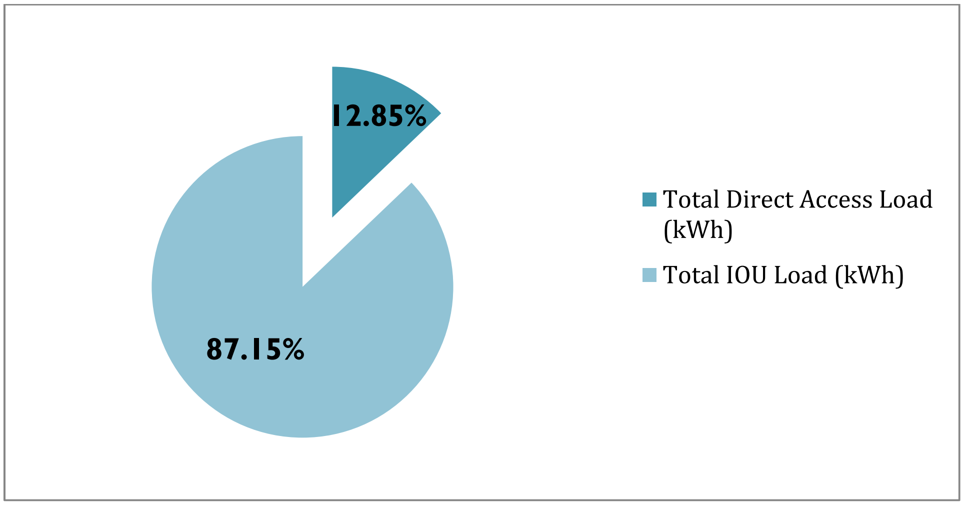
FIGURE 4-6. Direct Access Load as a Percentage of Total IOU Load in California



Source: CPUC (2014)

Indeed, looking at the share of direct access load as a percentage of total IOU load in California over the life of the DA program, it is clear that ESPs do not account for a very significant share of the total load in California. As the chart in FIGURE 4-7 demonstrates, at the height of the DA program, before the electricity crises in 2000 to 2001, ESPs accounted for no more than 15.9 percent of total IOU load. After the suspension of the program, participation dropped to as low as 2.18 percent.

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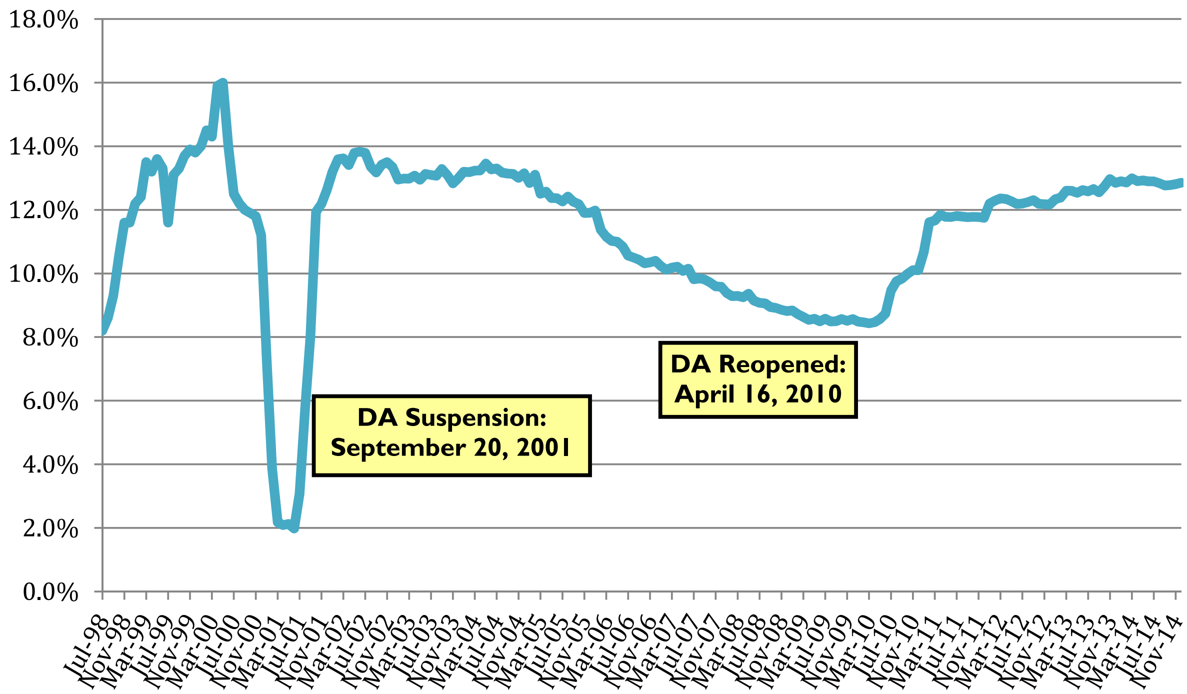
FIGURE 4-7. Statewide Direct Access Load Percentage



Source: CPUC (2014)

As noted above, the reauthorization of the DA program under SB 695 reopened access on a limited basis for all nonresidential customer classes. Of those customers participating in DA as of December 2014, industrial customers accounted for 60.92 percent of DA load, commercial customers accounted for 38.30 percent of DA load, and agricultural customers accounted for 0.47 percent of DA load. The remaining 0.31 percent is made up of holdover residential customers from the previous DA regime.

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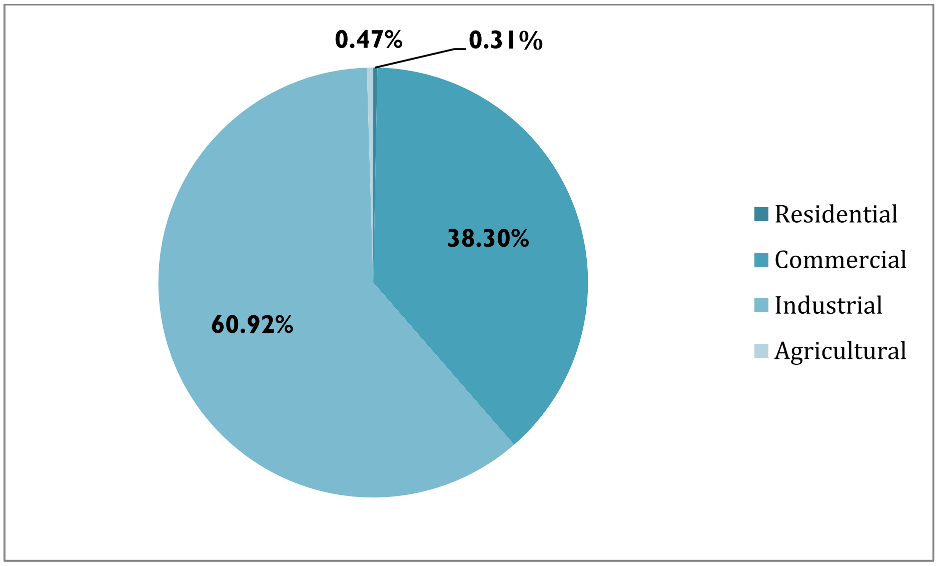
FIGURE 4-8. Percentage of DA Load by Customer Class



SDG&E began accepting Six-Month Notices to Transfer to Direct Access for any load that may become available for 2015 from June 9, 2014 to June 13, 2014 (SDG&E 2015).

As of February 2015, SDG&E was not accepting Six-Month Notices to Transfer to Direct Access. The SDG&E Total Load Allowance, 3,562 GWh, was fully subscribed.

All certified Six-Month Notices to Transfer to Direct Access Service (6-Month Notices) received during the June 2014 enrollment period have been placed on the 2015 Wait List, in order of the randomized lottery number assigned, for any load that may become available in 2015. The Wait List is in effect January 1, 2015 and expires December 31, 2015.

Pursuant to the DA rules outlined above, on the last business day of each month, SDG&E will determine if there is room under the Overall Load Cap and will notify the first customer on the Wait List that there is available space. SDG&E will provide additional information to the customer to complete the transfer to DA. Should a customer decline the space offered, the customer will be removed from the Wait List and remain on utility bundled service.

4.3.4. San Diego County Benefits

The County has taken advantage of DA as a tool to meet its own electricity consumption needs. Between 2009 and 2012, the County saved $3.7 million or approximately 9 percent average savings over bundled service from SDG&E using DA electricity procurement. The County has increased its total electrical load under DA (i.e., electricity commodity purchased from ESP) from 72 percent to 90 percent (County 2013).

4.3.5. Senate Bill 286D

Despite current restrictions, Direct Access may soon become a far more potent tool to deliver increased customer choice and renewably-generated electricity to nonresidential customers. On June 3, 2015, the California Senate approved SB 286. If the bill becomes law, beginning in January 2016, SB 286 would allow these large users to purchase 8,000 GWh annually of 100 percent renewable energy through California's Direct Access program. In the process, the state's greenhouse gas emissions would be reduced by about 1.7 million tons annually, the same as a 2 percent increase in the Renewable Portfolio Standard—all on a voluntary basis.

4.3.6. Conclusion

The DA program in California can provide eligible customers a choice when it comes to procuring electricity generation (i.e., nonresidential customers). And, as the County has demonstrated, participating customers may have an opportunity to realize real cost-savings by procuring electricity from an ESP instead of through bundled IOU service. However, under current DA caps, the ability for customers to participate is quite limited. Moreover, when viewed as a potential institutional arrangement for driving investment in renewables and energy efficiency, as currently constructed, DA has very limited ability to be impactful.

The County could consider lobbying both the CPUC and/or the state legislature to open up the DA cap beyond its current limits. Although an expanded DA program would likely result in increased choice for the County's eligible constituents, under previous iterations, there was no reason to believe such an expansion would help the County reach its GHG emission reduction targets. SB 286, however, would empower many large nonresidential customers to contract directly for 100 percent renewable energy.

4.4. Sustainable Energy Utility

4.4.1. Summary

A Sustainable Energy Utility (SEU) presents new options to finance, market, and deliver sustainable energy services to energy end users. Developed by Dr. John Byrne and his colleagues at the Center for Energy and Environmental Policy at the University of Delaware, the objective of an SEU is to provide renewable energy and energy efficiency services with the same simplicity that traditional energy is provided through the existing utility model. SEU's are created through legislation to establish an organization to administer financing programs, offer technical services, and coordinate the services of private Energy Service Companies (ESCOs) and financial institutions.

A typical SEU would capitalize a fund with relatively low-interest state or municipal bonds and use that capital to contract with private energy service companies to conduct energy audits and perform building energy efficiency and renewable energy upgrades. Once the project is completed, the energy customer would share the savings resulting from lower energy costs with the SEU to repay the bond and to fund the SEU's activities. Because it can aggregate a large amount of demand for ESCO services, the SEU can help lower costs further by standardizing offerings, negotiating bulk discounts, and otherwise streamlining the process of identifying and executing cost-effective energy efficiency and renewable energy upgrades.

Although a CCA program could provide a similar energy integrator role and financing opportunities, the County may wish to further explore how an SEU model can help it attain its climate goals, particularly if the County does not pursue the formation of a CCA program. The Sonoma County Efficiency Financing Program (SCEF) is a scaled-down version of an SEU model the County may wish to replicate.

4.4.2. Background

A sustainable energy utility (SEU) is an independent and financially self-sufficient entity responsible for delivering energy efficiency, energy conservation, and customer-sited renewable energy to end users. An SEU targets all sectors and fuels, including electricity, transportation, and heating. This approach is in stark contrast to traditional demand-side policies and supply-side approaches that tend to address only certain types of fuels (e.g., electricity, but not heating or transportation) or limited "silos" of end users (e.g., residential but not municipal consumers). An SEU streamlines customer-sited energy service delivery (Houck 2009).

A sustainable energy utility is the single point-of-contact for efficiency and self-generation in the same way that conventional utilities are the point of contact for energy supply. The most important feature of an SEU is that energy users throughout a city or state can build a relationship with a single organization whose direct interest is to help residents and businesses use less energy and generate their own clean energy. As a nonprofit umbrella entity at a city, county, or state level, an SEU relies on a third-party management model, competitive contracting, and performance incentives to deliver sustainable energy services across all sectors and customer classes. As such, an SEU is publicly accountable and can be financially self-sufficient. It also has access to a range of potential funding sources and revenue streams, and can achieve energy savings without raising taxes or utility rates (Houck 2009).

According to Houck, the core characteristics of an SEU are as follows (2009):

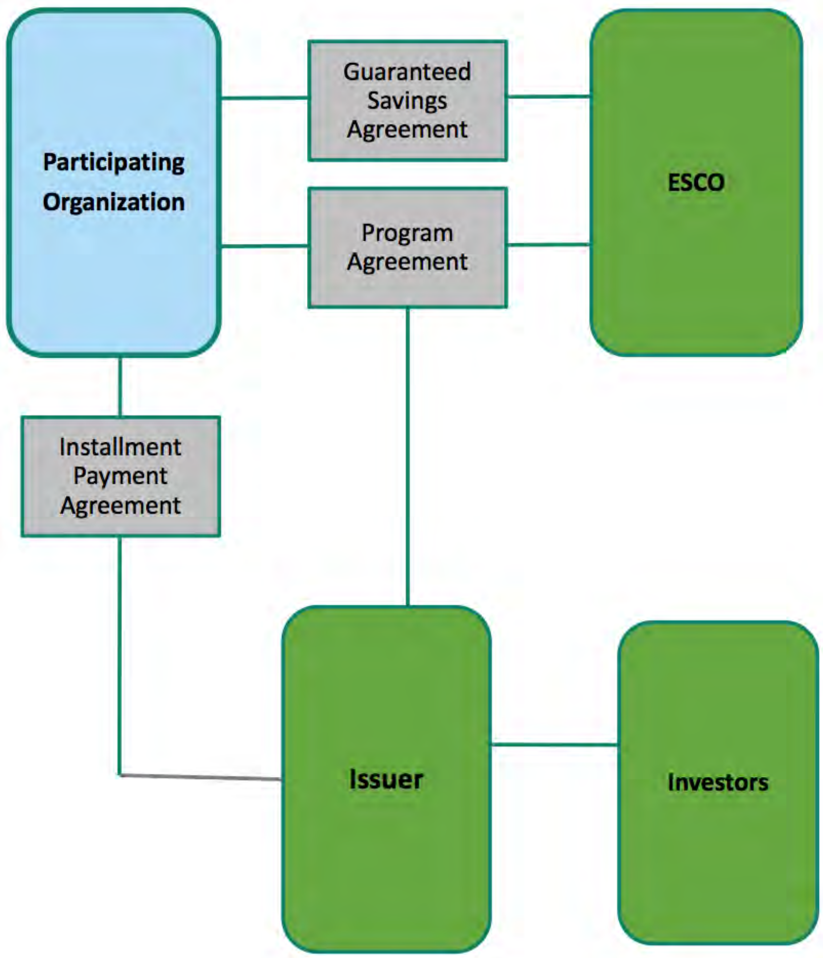
- Central coordination: sustainable energy services are coordinated by a single point of contact
- Comprehensive programs: Programs target efficiency, conservation, and renewable energy across all fuels (e.g., electricity, heating, transportation) and customer classes (e.g., low-income, government, industrial, commercial, residential, etc.), regardless of utility service territory.
- Flexible incentives: Sustainable energy services are not constrained by strict programmatic criteria that might exclude, or inadequately serve, certain customer groups.
- Financial self-sufficiency: A financing plan ensures long-term self-sufficiency by generating revenue through the supply of customer-sited sustainable energy services.
- Competitive procurement: A governance system is based on competitive contracting of independent management services.

Although these characteristics represent innovations over other existing administrative models, an SEU does not supplant other private-sector activities, but seeks to complement them by providing a focal point for energy efficiency, affordable energy and renewable energy, including information, incentives, and services.

The State of Delaware first adopted the SEU model and its unique bond financing structure in 2007 as an independent, non-profit organization to foster a sustainable energy future for the state. Development of the SEU model began in 2006.

In 2011, Delaware's SEU issued the groundbreaking Energy Efficiency Bond Series. This financing created over $145 million in guaranteed dollar savings to enable a host of state buildings and higher education facilities, including those at Delaware State University, to receive $73 million in energy efficiency improvements at an effective borrowing rate of 3.7 percent over the 20-year life of tax-exempt bonds rated AA+ by Standard and Poor's.

FIGURE 4-9. ILLUSTRATION OF EFFICIENCY FINANCING



4.4.3. Case Studies

4.4.3.1. Delaware SEU

The Delaware SEU is a non-profit organization unaffiliated with the state's electric or gas utilities, but it works with them, the business sector, other nonprofits and communities throughout the state to impact Delaware's energy profile. Its mission is to design and deliver comprehensive end user energy efficiency and customer-sited renewable energy service to Delaware's households and businesses.

As stated in its enabling statute, SB 18, Delaware "has an opportunity to create new markets for customer-sited renewable energy generation that will help build jobs in the State of Delaware, improve our national security, keep value within the local economy, improve energy reliability, and protect Delawareans from the damaging effects of recurrent energy price spikes." As a nonprofit agency, the SEU is governed by an Oversight Board and the Delaware Energy Office. The Oversight Board is intended to bring together a mix of public officials, energy experts, and citizens with general oversight, evaluation, and goal-setting responsibilities. Board members include the Secretary of the Department of Natural Resources and Environmental Control, the Delaware Public Advocate, seven members appointed by the Governor, and one appointee by both the President Pro Tempore of the Senate and the Speaker of the House of Representatives (Byrne 2009).

Through a competitive bid process, the Oversight Board selected an SEU Administrator with energy planning and management expertise for the day-to-day operations of the organization. This third-party management model relies on competitive contracting and performance incentives to meet the standards set forth by the Oversight Board. In this manner, the SEU is the point of contact for efficiency and self-generation in the same way that utilities are the point of contact for energy supply (Byrne 2009).

A critical element of the SEU is that individual energy users throughout the State can access energy services through a single organization that offers these services for the benefit of the energy user and the Delaware community. It combines Delaware's private and public sector assets in an energy organizational structure that is publicly accountable, financially self-reproducing, and entirely focused on energy and environmental sustainability. Moreover, the SEU has a mandate to develop innovative approaches using third-party financing, federal incentives, program revenues, and leveraging sustainable energy funds available through other public sector and philanthropic sources. The SEU has the authority to issue tax-exempt bonds to contribute to the financing of its program activities, and is designated as the administrator of existing public-purpose energy funds and the Regional Greenhouse Gas Initiative (RGGI) emissions auction proceeds (Byrne 2009).

The financing model allows the SEU to do two vital things for a 21st century energy utility: (1) it has the capacity to secure sufficient capital to invest in the infrastructure of sustainable energy (rather than simply a suite of programs); and (2) it is capable of taking the "long view," rather than having to mostly produce short-term benefits. It primarily utilizes the following funding sources: tax-exempt bonds and leases, revolving funds, and cooperative investments. The energy cost-savings created through the community investments made by the SEU are shared between the household, farm or business, on the one hand, and the SEU on the other.

Energize Delaware is an initiative of Delaware's SEU and it administers several programs for homes and businesses. For residential properties, Energize Delaware offers a discounted home energy audit as well as rebates for energy efficiency measures through its Green for Green Program. For businesses and nonprofits, the Energize Delaware Revolving Loan Fund is a revolving loan that offers businesses financing options to encourage the adoption and installation of end-user energy efficiency measures and customer-sited renewable generation and GHG measures.

4.4.3.2. Washington, D.C.

The District of Columbia SEU is administered by the Vermont Energy Investment Corporation and is funded primarily through a utility charge. It offers rebates for businesses to help offset the costs of energy efficient equipment. In addition, it offers cash incentives and financing packages to reduce the upfront costs of qualifying home energy upgrades.

4.4.3.3. State of Vermont

Established in 2000, Efficiency Vermont is the state's SEU. A charge on ratepayers' electric bills provides the funds for delivery of energy efficiency services. Vermont businesses and homeowners who have used Efficiency Vermont's services to make cost-effective efficiency investments have saved more than 660 million kWh in annual electric energy, and the cumulative lifetime economic value of efficiency investments in Vermont has totaled more than $643 million.

4.4.3.4. State of Wisconsin

Focus on Energy is Wisconsin utilities' statewide energy efficiency and renewable resource program. The program is funded by the state's investor-owned energy utilities and participating municipal and electric cooperative utilities, and has been operating since 2001. Focus on Energy works with eligible Wisconsin residents and businesses to install cost-effective energy efficiency and renewable energy projects. Focus on Energy provides information, resources, and financial incentives help to implement energy projects that otherwise would not be completed, or to complete projects sooner than scheduled.

4.4.3.5. Sonoma County, CA

The Sonoma County Water Agency has launched a program to finance energy efficiency and water conservation retrofits for public and nonprofit facilities. The Sonoma County Water Agency has partnered with the Foundation for Renewable Energy & Environment to develop the Sonoma County Efficiency Financing (SCEF) Program. Under the SCEF Program, participating organizations contract with an Energy Service Company (ESCO) to complete energy and water conservation measures. Improvements can include street lighting, building lighting, system controls, water pumps, HVAC systems, boilers, chillers, and others. The participating organizations receive substantial utility cost-savings, including a contractual guarantee sufficient to cover the full cost of all retrofit work. The Program uses tax-exempt bonds to finance the projects.

Financing details from the SCEF Program:

- No upfront capital costs required from participants. All projects costs are fully paid for through the savings guarantee.
- Because participants are sharing the cost of documenting the financing, the overall interest rate including transaction costs, should always be lower than what the participant can achieve in the marketplace.
- Financing is customized for each participating organization and each measure separately. No organization and no measure subsidizes any other.
- The financing is tax-exempt.
- Interest rate on the loan is likely to range from 1.5 percent to 4 percent, depending on credit rating, and the length of time it takes to pay for retrofits through utility bill savings.
- Guaranteed dollar savings.
- With this program, there is a minimum set of guarantees with savings on utilities. Those funds are used to pay back the loan and reduce Operating Expenses.
- Incentivized deep retrofits (longest payback is typically 20 years with the average just under 14 years)
- Common contractual documents.
- Net savings accrue to public participants who own all improvements at the conclusion of the project.
- Project Flexibility (selection of Energy Conservation Measures [ECMs] and repayment terms customized to meet participant needs while providing immediate, positive cash flows)
- Monitoring and verification protocols that support participant goals.

4.4.4. Conclusion

An SEU can facilitate increased investments in energy efficiency and customer-sited renewables, which in turn, can help facilitate a more robust regional economy. The Delaware SEU created nearly 980 jobs in construction, project engineering, and building management. The SEU model can continuously organize investments over and over, creating significant potential for the model to significantly impact the regional energy economy. At the same time, an SEU keeps value in the local economy due to the employment of local contractors and its emphasis on local production of the equipment used to meet energy needs.

The SEU positions itself as a one-stop destination for conservation/energy efficiency and renewable energy, allowing everyone to interact with a single, public-minded organization, avoiding confusion and reducing administrative costs. In this way, communities can build customized programs to meet local needs rather than focusing a one-size-fits-all solution that too often characterizes the current energy economy. Another advantage, built into the fabric of the SEU, is increased reliance on distributed rather than centralized technology architectures. Such an approach insulates communities from energy price volatility, which is common with fossil fuel energy sources.

Because the traditional SEU model requires enabling legislation, San Diego County should look to Sonoma County's SCEF, which is a scaled-down SEU model that does not require legislative action in order to implement. The County should monitor the progress and success of the SCEF program and work with subject-matter experts to determine whether a similar program might prove successful in the County.

4.5. Property Assessed Clean Energy (PACE) Financing

4.5.1. Summary

Property Assessed Clean Energy (PACE) financing is a loan alternative designed to encourage the installation of distributed renewable energy systems and energy efficiency measures by helping property owners overcome the barrier of high up-front energy equipment and installation costs.

PACE financing is designed to overcome two common roadblocks to investment in energy efficiency and renewable energy systems—lack of capital and hesitancy to make long-term investments—by (NREL 2010):

- Eliminating large up-front costs for energy retrofits.
- Reducing concerns about investment recovery when the property is sold, because the financing is tied to the property rather than to the owner.
- Converting an annual or semi-annual payment into a net monthly cost similar to that of other personal expenses (e.g., cable, cell phone service), which are often partially or wholly offset by electric bill savings.
- Improving access to credit at a competitive, fixed interest rate; in addition, PACE assessment terms of 15 to 20 years exceed typical home equity loan terms.
- Reducing the likelihood of a negative impact on the municipality's credit or obligation risk, and thus, not endangering other municipal programs.
- Providing accessible energy efficiency and renewable energy information and/or educational programs; moreover, the programs are sponsored by the municipality, which could engender more trust in the accuracy of the information as opposed to contractor-led programs.

Programs currently available in San Diego County:

- California HERO PACE Financing
- CaliforniaFIRST

- Figtree OnDemand (commercial only)

The County should continue to support PACE financing programs and help educate the public about the advantages PACE financing can provide. The County may want to explore the creation of Clean Energy San Diego PACE district to provide additional PACE financing options to the region (e.g., Ygrene Energy Fund, etc.).

4.5.2. Background

Under PACE programs, municipalities and counties form special tax districts that allow property owners to finance energy efficiency, water efficiency, and renewable energy projects on existing and, in some cases, new residential and commercial structures through a voluntary special tax assessment. Assessments are similar to loans in that they allow a property owner to pay off debt in installations over a long period of time. However, PACE assessments are not legally considered loans. Property owners who invest in energy efficiency measures and small renewable energy systems typically repay these assessments over 15 to 20 years via additional payments on their property tax bills (NREL 2010).

PACE financing can help state and local governments address two major roadblocks to clean energy development at both the commercial and residential level: (1) lack of capital and (2) hesitancy to make long-term energy efficiency and/or renewable energy investments.

With respect to the capital cost barrier, property owners often shy away from the up-front cost of energy improvements. Although a portion of the population is willing to make the investment, most consumers are cautious about any investment, especially given the recent economic environment. To finance energy improvements, traditionally property owners have had to self-finance through channels such as home equity loans or rely on small-scale state or local government rebates and other miscellaneous financial incentives. Moreover, because many homeowners move every five to seven years, they might hesitate to make a long-term investment in a renewable energy system or energy efficiency improvements. However, PACE assessments are transferable, which leaves open the possibility for property owners to recoup their investment upon sale.

As mentioned, the pivotal innovation of PACE financing is the creation of energy efficiency or renewable energy assessments that are tied directly to the house or commercial property and repaid via the property owner's tax bill. The assessment, which is secured by a senior lien on the property, does not require an up-front payment. The lien provides strong debt collateral in the event the property owner defaults on the assessment. Because the assessment and lien are tied directly to the property, they can be transferred upon sale. The basic flow of financing activity is shown in FIGURE 4-10 below (NREL 2010).

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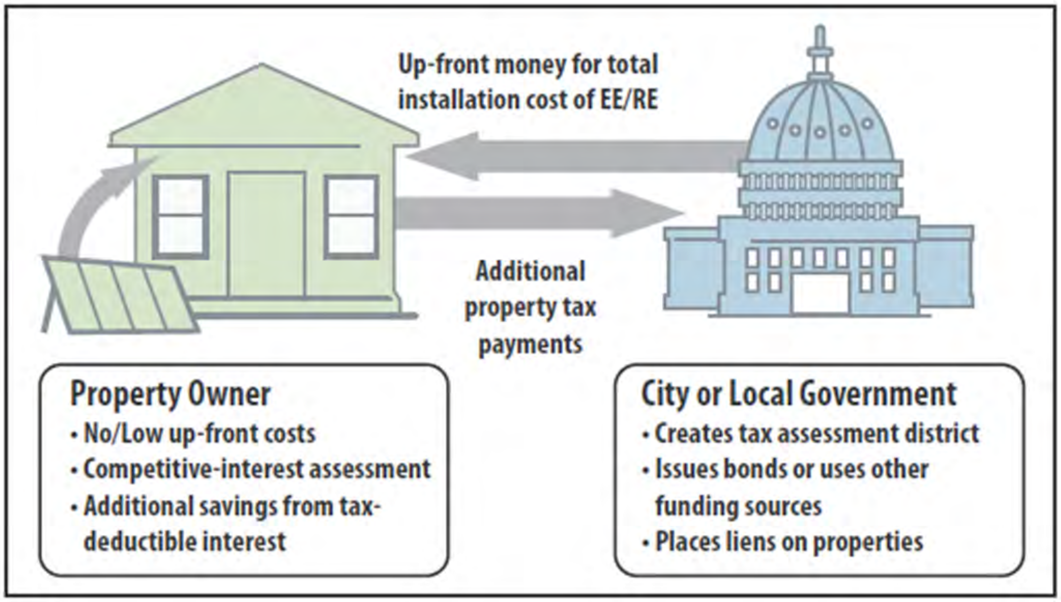
FIGURE 4-10. PACE FINANCING ILLUSTRATION



Source: NREL 2010

Once the project is complete, the property owner repays the assessment, usually over 15 to 20 years. During the repayment period, however, the property owner will enjoy reduced electric utility bills as a result of the energy investment. Not unlike a mortgage, homeowners receive a tax deduction for the interest on a PACE assessment, but not for the principal (NREL 2010).

A critical design element of the PACE financing model is the use of special tax districts known as clean energy assessment districts. These districts are regularly used in the financing of traditional local government projects (e.g., sewers and streetlights), and they provide two benefits for the localities. First, the special district shields the locality from risk, thereby ideally helping to protect its overall debt rating. Second, the special district allows the additional assessment to be placed only on property whose owners opt to participate in the program (NREL 2010).

4.5.3. PACE in California

At the local and regional level, cities and regional planning entities play an important role in implementing AB 32 through the adoption of climate action plans. In 2007, California amended the California Environmental Quality Act (CEQA) to require new regulations addressing mitigation for GHG emissions and impacts (SB 97). In response, the California Natural Resources Agency issued new CEQA guidelines in 2009 establishing review criteria for GHG emission reduction plans that can streamline CEQA review for individual projects consistent with those plans. Local governments responded by adopting climate action plans to address GHG impacts at the programmatic level, where there is a greater opportunity for flexibility in mitigation (Anders 2014).

Where the local government's objective is to stabilize or reduce total GHG emissions, PACE programs can be an effective financing measure to reduce or offset GHG emissions from buildings through efficiency and renewable energy improvements. PACE financing programs serve as a market-based mechanism to supplement existing and former rooftop solar programs, such as the California Solar Initiative and the California Energy Commission's New

Solar Homes Partnership.[19] As these programs phase out over time, financing programs such as PACE can play an increasingly important role (Anders 2014).

4.5.3.1. Enabling Legislation

PACE financing programs for rooftop solar as well as the financing for energy efficiency or water efficiency investments can be established and administered under either of two different statutory frameworks: the Improvement Act of 1911 (Improvement Act) as amended by AB 811 or the Mello-Roos Act under a city's charter authority or as amended under SB 555. Both the Improvement Act and Mello-Roos Act authorize creation of special tax districts, voluntary contractual agreements for financing between an authorized entity and the property owner, use of available funding from any source including existing bond issuing statutes and attachment of the assessment for payment of the assessment to the property (as opposed to the individual owner). Additionally, several programs were created by charter cities under their Mello-Roos Act authority before the passage of SB 555 (Anders 2014).[20]

There are several important statutory differences between the Mello-Roos Act and the Improvement Act as well as structural differences in the programs that operate under each.

- Several Improvement Act programs operate under a joint powers authority (JPA) structure, mitigating administrative burden and cost barriers that would normally be associated with creation of an Improvement Act program.
- Mello-Roos Act allows improvements on new commercial construction and new residential construction, when undertaken by the intended owner or occupant.
- Mello-Roos Act, as amended, allows financing of improvements on publicly owned buildings so long as the properties are able to receive property tax bills under their assigned assessor parcel numbers.
- Mello-Roos Act allows a leasehold interest to be used as collateral to secure the PACE financing.
- Mello-Roos Act has less constitutional restrictions than the Improvement Act.
- Improvement Act special tax assessment is not senior in status to prior existing special tax assessments.
- Mello-Roos Act districts allow off-tax roll billing at the onset of the lien.
- Improvement Act only allows assessments on single-family residences of 1-3 units and multifamily residences of five or more.

[19] The California Solar Initiative set a goal of installing 3,000 MW of PV systems by 2016 through provision of financial incentives to offset a portion of the installed cost of a qualified system. The New Solar Homes Partnership provides financial incentives and other support to homebuilders that construct new, energy efficient solar homes. Anders, J. K. a. S. J. (2014). Residential and Commercial Property Assessed Clean Energy (PACE) Financing in California Rooftop Challenge Areas, Energy Policy Initiatives Center (EPIC), University of San Diego School of Law; Center for Sustainable Energy.

[20] The City of San Francisco's GreenFinanceSF still operates under this structure. The city is currently reviewing the viability of this mechanism in light of an August 1, 2014, Fourth California Appellate District ruling invalidating a charter city's authority under Mello-Roos to levy a special tax under Government Code §53326 (landowner election) as well as the city's charter authority. It is unclear whether this decision affects the alternative mechanism to create a Mello-Roos PACE district under Government Code §53328.1 (a)-(f).

In addition to the differences noted above, the City of San Diego has identified several nuanced advantages for Mello-Roos district programs when compared to Improvement Act districts in its October 8, 2012, *Report to the City Council,* Report No: 12-125. These include:

- Minimum waiting period between placement of lien and bond issuance is shortened from 30 to 15 days.
- Lien amount placed on property is only for annual repayment obligation, rather than all amortized future payments.
- Public agency liability limited to district creation and operation rather than program creation and operation.
- Payments may be billed off tax roll in all situations rather than only in some situations.

In California, several models exist to administer a PACE program. A city, county, or special district may administer their programs themselves, contract with a private third party, or join a public entity such as a JPA that may contract with a private third party. Each option offers advantages and disadvantages in the form of costs to a city or property owners, software, program funding limits, access to financing or capital providers, minimum project amounts, mortgage lender consent requirements, and varying degrees of transparency regarding fees charged by the program administrators and their partners. While program costs to the city and its citizens are an important factor when evaluating different approaches to administer a PACE program, cities and counties should also evaluate the customer service, ease of use, marketing, and property owner participation when comparing program administrators (Anders 2014).

4.5.3.2. Obstacles for Residential PACE

Residential PACE financing has faced opposition as early as 2009 from the Federal Housing Finance Agency (FHFA), which regulates Fannie Mae and Freddie Mac. On July 6, 2010, the FHFA issued a determination that PACE programs presented significant safety and soundness concerns to existing mortgages and therefore the entities that underwrite or insure those mortgages (FHFA Statement on Certain Energy Retrofit Loan Programs 2010). This concern was expressed in the wake of the residential housing finance bubble when FHFA became the conservator of Fannie Mae and Freddie Mac (Anders 2014).

The greatest concern expressed by FHFA about residential PACE programs stemmed from the fact that PACE assessments had a lien status superior to that of existing mortgages underwritten by Fannie Mae and Freddie Mac. In the event of default and forced sale, any outstanding PACE assessment would be paid before other liens such as a first deed of trust. The FHFA stated that the superior lien status of PACE assessments added, among other things, risk to lenders and secondary markets and altered valuation of mortgage-backed securities because of the uncertainty surrounding potential foreclosures, diminution in value at sale, increased risk of delinquency, and lack of uniform underwriting standards such as loan-to-value ratios, standard credit worthiness requirements (FICO) and total debt-to-income ratios. In addition, according to the FHFA, residential PACE assessments may violate the terms of a property owner's mortgage because they can be characterized as loans rather than assessments. Specifically, the FHFA distinguished PACE programs from standard tax assessments because, in the FHFA's view, they are voluntary, opt-in contractual arrangements with cities or counties, and because owners control the use of funds, hire contractors, own the fixtures, and bear the cost of repairs (FHFA Statement on Certain Energy Retrofit Loan Programs 2010, Anders 2014).

As a result of these concerns, Fannie Mae and Freddie Mac issued guidance letters to lenders stating that they would no longer purchase mortgage loans secured by a property with an outstanding PACE assessment originated after July 6, 2010, and a first lien priority. The letters also stated that PACE assessments would be treated like home equity loans for properties with PACE loans originated before July 6, 2010. To the extent a bank wishes to offer a conforming loan to a property owner, the bank must force the property owner to pay off the PACE assessment balance in full before selling or refinancing a conforming loan. Thus, a property owner with a Fannie Mae or Freddie Mac loan would not be able to transfer the PACE assessment to a new property owner.

The FHFA also issued a directive on February 28, 2011, affirming that Freddie Mac and Fannie Mae will no longer buy mortgage loans secured by properties with outstanding residential PACE obligations originating after July 6, 2010, and its authority to order such action under 12 U.S.C. §4617. This effectively stopped residential PACE finance programs in California and across the nation.

Following a March 19, 2013, ruling in the Ninth Circuit Court of Appeals, which found for the FHFA and dismissed litigation brought by Sonoma County, the State of California and other parties, there remains additional uncertainty in California regarding residential PACE—the full implications of which remain to be seen. Despite this uncertainty, some entities continued their residential PACE programs and other entities created new residential programs during the then pending litigation. Each of these entities has chosen to approach the FHFA issue differently and the full implication of these approaches remains unclear. Accordingly, a property owner may still risk violating the terms of a mortgage by having a PACE assessment.

The FHFA's actions do not impact commercial mortgages, which are overseen by the Office of the Comptroller of the Currency (OCC). On the same day that FHFA issued its determination, the OCC issued Supervisory Guidance echoing the FHFA safety and soundness concerns and calling on national banks to "mitigate exposure and protect collateral positions" (Office of the Comptroller of the Currency 2010). The OCC has taken no other actions regarding PACE. Commercial PACE programs that require the affirmative acknowledgement or consent of the mortgage holder are considered to adequately mitigate risks to lenders.

In response to the concerns raised by the FHFA related to potential risks posed to first mortgage lien holders and their underwriters by PACE liens during foreclosure or forced sale, Governor Brown signed SB 96 on September 26, 2013, authorizing the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) to create a residential PACE Loss Reserve Program. The loss reserve program was designed to increase the availability of PACE financing and mitigate risk to PACE lien holders in California.

The CAEATFA designed the loss reserve program to make first mortgage lenders whole for any losses caused by a PACE lien during a foreclosure or forced sale. The program provides payment for losses in two instances:

- Foreclosure by first mortgage holder: Losses resulting from the first mortgage lender's payment of a PACE assessment while in possession of the property subject to the PACE assessment. Losses may also include penalties and interest where they have accrued through no fault of the first mortgage lender.

- Forced sale by county or city: In any forced sale for unpaid taxes or special assessment, losses incurred by the first mortgage lender resulting from overdue PACE assessments being paid first where the sale price is less than combined value of outstanding taxes and the first mortgage.

4.5.3.3. Case Studies

The following are PACE programs in California created under the Improvement Act as amended by AB 811:

4.5.3.3.1. Sonoma County Energy Independence Program (SCEIP)

The Sonoma County Energy Independence Program (SCEIP) was the first multijurisdictional PACE program under AB 811. As of August 2014, SCEIP has funded 2,029 residential and 61 commercial projects across all eligible project categories (including solar), disbursing $67,655,869 through its internal county financing measures. Approximately $9 million of this has been paid back to the county through early payoffs and is being used to fund new projects. Sonoma County is seeking long-term financing to make its PACE program sustainable. The program does not have additional funding for future PACE assessments beyond the $60 million authorized from the treasury pool. As such, the county seeks to pool existing assessments for sale as revenue bonds on the open market to replenish their initial funding supply to ensure continuous funding of the program (Anders 2014).

SCEIP has approved, financed, and seen the completion of 46 commercial solar projects totaling $5,036,838, and 1,255 residential solar projects totaling $40,759,091 as of June 2014. The solar projects average $32,477 for residential properties and $111,930 for commercial properties. The projects total 2.2 MW for commercial and 7.1 MW for residential in generational capacity, saving an estimated 16,770,508 kWh of electricity and 126,085 therms of gas.

Originally intended to be a statewide example and resource for PACE implementation, SCEIP was sidelined by then unresolved FHFA residential mortgage issues. SCEIP persevered through these challenges, creating exceptional resources and information for local governments, contractors, and property owners to understand PACE through its website and knowledgeable staff. The County of Sonoma administers SCEIP. The auditor-controller/treasurer-tax collector serves as the designated program administrator.

4.5.3.3.2. The HERO PACE Programs

The Western Riverside Council of Governments (WRCOG) administers the WRCOG and California HERO Programs and the San Bernardino Associated Governments (SANBAG) administers the SANBAG HERO Program. All three programs utilize services provided by Renovate America (residential) and Samas Capital (commercial). As of August 8, 2014, the WRCOG residential HERO program is approved and accepting applications in its 18-member jurisdictions within Western Riverside County. As of August 7, 2014, the SANBAG residential HERO program is approved in all 25 SANBAG jurisdictions with all 25 accepting applications. As of September 9, 2014, the residential California HERO program is approved in 139 jurisdictions statewide. The program is currently accepting applications in 96 of these jurisdictions and expects the other 43 to launch in November 2014.

Renovate America has successfully securitized $103 million in HERO bonds at an AA rating as well as securing $50 million in private equity investment capital and a $300 million credit facility. The residential HERO programs combined have funded over 14,000 projects totaling more than $360 million in all eligible improvement categories. The programs have approved 29,610 applications for a total of approximately $1,199,969,278 in improvements as of July 31, 2014. HERO program administrators report that there have been no defaults to date.

The programs total approximately 7,200 in approved solar projects since inception with approximately 3,600 of these projects financed and construction completed. Approximately 26 percent of all improvements funded through the HERO program are solar projects, accounting for approximately 35 percent of the total financed amount. The average amount financed for solar projects is approximately $25,000. These systems have an estimated capacity of 22 MW equating to an estimated electric efficiency savings of 5,300 kWH and gas efficiency savings of 50 therms per project.

4.5.3.3.3. CaliforniaFIRST

The CaliforniaFIRST program is part of the California Statewide Communities Development Authority (CSCDA), known as California Communities, a joint powers authority co-sponsored by the California State Association of Counties and the League of California Cities. CSCDA contracts with Renewable Funding to administer the CaliforniaFIRST program. The CaliforniaFIRST Program is structured for use statewide by all interested eligible government agencies.

CaliforniaFIRST has operated as a statewide commercial PACE program that uses an open-market approach to finance projects. Under the open-market approach, the commercial property owner may use a list of capital providers from CaliforniaFIRST to compare terms or may use their own capital provider. The financing transaction is run through CaliforniaFIRST in order to secure the PACE lien and corresponding benefits. Currently, the program operates its commercial program in 17 counties and more than 150 cities in California. CaliforniaFIRST's commercial program is also pending approval in additional jurisdictions.

CSCDA elected to suspend CaliforniaFIRST's residential PACE program due to FHFA issues, but reversed its decision after the establishment of the CAEATFA Residential PACE Loss Reserve Program. CaliforniaFIRST launched a full residential PACE program in September 2014. The residential PACE program is operating or pending approval in 138 jurisdictions.

To date, CaliforniaFIRST has approved financing on 55 commercial projects totaling $38,179,828. The solar project cost averages is approximately $67,663. Financing for these projects has not yet been secured to date.

4.5.3.3.4. Los Angeles County Commercial PACE Financing Program

In May 2010, the Los Angeles County Board of Supervisors approved the formation of an AB 811 Improvement Act PACE assessment district and the launch of both commercial and residential PACE programs. Cities within the county had to pass a resolution to opt into the county program in order to participate. To date, 80 of the 88 cities in Los Angeles County have opted into the program. In July 2010, however, the residential PACE program was placed on hold due to FHFA statements that PACE programs present safety and soundness concerns to the mortgage portfolios held by Fannie Mae, Freddie Mac, and the federal mortgage agencies.

Despite the residential program being put on hold, Los Angeles County's Commercial PACE Program was launched in 2012, and began initiating loans for commercial properties in 2013. Thus far, it has funded $14.1 million in commercial energy upgrade projects with an additional $176 million in projects in the pipeline.

LA County's Commercial PACE Program uses a similar open-market financing model as GreenFinanceSF and CaliforniaFIRST by which a property owner chooses an investor, negotiates financing rates and terms, and the county issues a bond that is purchased by a lender or third-party capital investor to fund the project. Notably, the primary difference between LA County and GreenFinanceSF is the statutory requirements and flexibilities set out by each program's enabling statute, the Improvement Act as amended by AB 811 and the Mello-Roos Act, respectively.

Los Angeles County launchched a countywide residential PACE program in June 2015. On August 26, 2014, Los Angeles County released an RFP to begin the open and competitive process for hiring an administrator to launch and manage the County's residential PACE financing program. Los Angeles County selected CaliforniaFIRST and HERO to begin administering the program.

4.5.3.3.5. California Enterprise Development Authority – Figtree PACE Financing Program

The California Enterprise Development Authority (CEDA) is a joint powers authority established by the California Association for Local Economic Development (CALED). CEDA currently has 40 city members and 21 county members. CEDA is the agency that forms assessment districts for the Figtree PACE financing program under the Improvement Act of 1911.

Figtree operates in 75 jurisdictions across the state. The program has financed and completed 23 projects. Of these projects, ten were solar projects totaling approximately $1 million in funding. The average amount financed per solar project is approximately $150,000. To date, Figtree has not seen any defaults.

Figtree's residential PACE program will launch in 2015 and will feature many of the same elements found in its commercial PACE program. The program will utilize the same legal structure and management team. Figtree's residential PACE program is authorized in more than 70 California cities. Cities and counties joining the Figtree program authorize CEDA to enroll both residential and commercial properties.

4.5.3.3.6. The City and County of San Francisco – GreenFinanceSF

GreenFinanceSF established a program using its charter authority to create a Mello-Roos community facilities district (CFD) prior to the passage of SB 555. San Francisco shut down its residential PACE program during the FHFA controversies but has since restarted its commercial PACE program. It should be noted that San Francisco is currently moving forward with a new multivendor residential PACE program at the time of this writing, and it is expected that financing will be available in 2015.

In October 2012, the City of San Francisco issued its first $1.4 million PACE bond to Clean Fund to finance a retrofit project of the Pier 1 property, which is owned by the Port of San Francisco. This project is unique in California because it financed the retrofit of a publicly owned building using the leasehold interest of the master tenant, Prologis, as collateral. Specifically, the Port of San Francisco created an agreement with Prologis under which the Port agreed to annex the property into the community facilities district (CFD) and for the lien securing the special taxes to be issued against Prologis' 50-year master leasehold interest on the property. This agreement eliminates the Port's liability. Additionally, the Port and Prologis agreed that should the leasehold interest be terminated, the port will identify a replacement leasehold interest that terminates no earlier than the final maturity of the bond. Prologis will also pass along the costs of the PACE financing to the other tenants of the property, which includes the offices of the Port of San Francisco, on a pro rata basis per square footage occupied.

The City of San Francisco used a qualified energy conversation bond (QECB) to support this financing. The city found that while this type of bond added additional complexity, it offered a significantly lower interest rate, less than 4 percent, and helped to accelerate the close of the financing arrangement and project approval because of hard deadlines that must be met under these types of tax-favored bonds.

GreenFinanceSF may demonstrate the advantages of using Mello-Roos and SB 555 for municipally operated open-market commercial PACE programs as compared to open-market models under AB 811, such as the Los Angeles County commercial PACE financing program.

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4.5.3.3.7 City of Sacramento – Ygrene Clean Energy Sacramento Program

Currently, Ygrene operates commercial and residential programs under the SB 555 amendment to Mello-Roos in Butte County (commercial only), the City of Sacramento, Sacramento County, Yolo County, Coachella Valley, and City of Chula Vista. To date, these programs have financed 4 commercial and 128 solar projects, for a total of approximately $300,000 financed for commercial and $2.5 million financed for residential. Three additional commercial solar projects are approved but not financed and 24 residential solar projects are approved but not financed. Of the 128 approved residential projects, 20 are pending completion. Average costs per solar project equates to $400,000 per project for commercial and $20,000 per project for residential.

Ygrene Clean Energy Sacramento is the SB 555 program with the longest operational track record. Ygrene Energy Fund Inc. administers Sacramento's program. Ygrene's Clean Energy Sacramento is a privately funded and administered program, and the only operational program of this type in California, though Clean Energy San Diego is in the review process but faces additional steps before it becomes operational. Ygrene funding comes exclusively from private capital markets, which offer the potential to provide access to large amounts of financing for PACE programs.

PACE in Sacramento has undergone several transitions. The city originally authorized an AB 811 Improvement Act program under CaliforniaFIRST in January 2010. However, CSCDA later suspended its CaliforniaFIRST program because of then unresolved FHFA issues. In light of the suspension, the city decided to examine alternatives and solicited proposals through its RFP process from private companies interested in administering a similar program.

The City of Sacramento selected Ygrene Energy Fund California, LLC to administer its PACE program under the Improvement Act of 1911. The city then rescinded its CaliforniaFIRST program over its concerns with having two authorized Improvement Act programs in its jurisdiction. The city determined that its participation in the CaliforniaFIRST program was "no longer needed." Specifically, Sacramento adopted Resolution No. 2012-205 on June 19, 2012, rescinding Resolution No. 2010-023 relating to the CaliforniaFIRST PACE program. Resolution No. 2012-205 acknowledged the uncertainty over residential PACE that led to CSCDA suspending its CaliforniaFIRST program for residential until issues raised by FHFA could be resolved.

After the passage of SB 555, Sacramento halted the creation of its Ygrene-administered AB 811 Improvement Act program and instead authorized the creation of a Ygrene-administered SB 555 Mello-Roos program. Sacramento originally sought a program administrator for a commercial-only program but chose to establish a SB 555 program out of the desire to include residential. To this end, Ygrene expanded eligibility for its program financing in July 2012 to include residential, commercial, new construction, and publicly owned buildings. This provides PACE financing to a greater number of properties than Improvement Act programs because of the Improvement Act restriction on financing only developed residential properties. The City of Sacramento also filed a lawsuit for judicial validation of its Mello-Roos program. The city completed the validation process and received a final court judgment validating the program.

The City of Sacramento has authorized Ygrene to finance up to $100 million in projects for its Clean Energy Sacramento PACE program. While Mello-Roos expressly allows for PACE financing on publicly owned buildings, the mechanisms by which to opt into paying a special tax assessment on a tax-exempt property (properties that are not part of existing tax rolls) remains an issue to be resolved. Because government and other nonprofit properties are not part of existing tax rolls, there is no established process for recording and administering the assessment.

4.5.3.3.8 PACE Program Comparison

TABLE 4-2. PACE PROGRAM COMPARISON

Program	SCEIP	WRCOG HERO	California HERO	CaliforniaFIRST	LA County PACE	GreenFinanceSF	Clean Energy Sacramento	Figtree's OnDemand PACE
Gov't Entity	County of Sonoma	Western Riverside Council of Governments (WRCOG)	WRCOG	California Statewide Communities Development Authority (CSCDA)	County of Los Angeles	City and County of San Francisco	Ygrene Energy Fund California, LLC (Issuing Entity)	California Enterprise Development Authority (CEDA)
Program Admin.	Auditor-Controller Treasurer-Tax Collector	WRCOG	Renovate America (Residential) Samas Capital (Commercial)	Renewable Funding	County of Los Angeles	City and County of San Francisco (Department of the Environment and Controller's Office of Public Finance)	Ygrene Energy Fund California, LLC.	Figtree Financing
Funding Source	Municipal Bonds	Renovate America (Residential) Samas Capital (Commercial)	Renovate America (Residential) Samas Capital (Commercial)	Program arranged capital (Residential) Revenue bonds through third-party lender (Commercial)	Revenue Bonds sold to investors	Revenue Bonds	Local and regional banks	CEDA under the Improvement Bond act of 1915
Program Funding Limit	$60 million	$900 million aggregate	$2 billion	$17 billion	Limited by investors	$100 million	No effective total program limit	~$500 million

4.5.3.4. PACE in San Diego County

There are several different PACE programs current available to San Diego County residents and businesses. CaliforniaFIRST, California HERO and Figtree's OnDemand program all offer PACE financing for commercial properties in San Diego County. In July 2014, HERO financing was extended to residential properties in the San Diego area. The HERO program has funded 206 residential projects worth $4.9

million—as of July 2014—in cities within San Diego County and shows signs of accelerating. It has received 1,200 loan applications from the area (Lee 2014) .

With respect to residential PACE, CaliforniaFIRST and the HERO program offer financing to homeowners across the unincorporated parts of San Diego County, the city of San Diego, and nearly all other local cities in the region. Further competition may be coming to residential PACE financing in San Diego through expansion of the Ygrene administered PACE program.

Clean Energy San Diego is a coalition of business leaders, environmentalists, and San Diego citizens working with Ygrene Energy Fund to create a PACE district in San Diego. Ygrene is already up and running within Chula Vista, where it had 50 projects worth $4.5 million completed or under construction at the end of 2014, but is still looking to expand into other jurisdictions. In January 2015, Ygrene announced that local governments can join its program in one efficient step that can take as little as 30 days, under a new arrangement with a local housing finance authority in Sacramento named Golden State. Ygrene is the only PACE lender in California offering 30-year solar loans to homeowners. The loan carries an interest rate of 8.49 percent. Ygrene's interest rate on a five-year loan is 5.99 percent while a 20-year loan is 8.25 percent (Lee 2015).

4.5.3.5. Conclusion

PACE programs are an innovative financing mechanism that can be used to deploy a wide range of energy and water improvements, from rooftop solar energy systems to reflective "cool" rooftops, insulated windows, low-flow toilets, and desert-friendly landscaping to replace grass lawns, to mention a few. Unlike personal home equity loans, PACE obligations are attached to the property and designed to be passed along to the next owner when homes or commercial businesses are sold.

Despite the issues with FHFA over the lien priority of PACE assessments, PACE financing in the residential sector is experiencing a strong resurgence in California. Commercial PACE financing, not having faced the same hurdles, has continued to prove successful. The County currently has an opportunity to help educate residents about the availability of these programs and encourage participation as a means to help reduce the region's electricity demand. Increased competition among the various PACE programs should result in better product offerings for County residents. As such, the County should explore how it might support efforts to create a PACE district in San Diego administered by Ygrene Energy Fund.

4.6. Bonds

4.6.1. Qualified Energy Conservation Bonds (QECBs)

A Qualified Energy Conservation Bond (QECB) is a bond that enables qualified state, tribal, and local government issuers to borrow money at attractive rates to fund energy conservation projects. A QECB is among the lowest-cost public financing tools because the U.S. Department of the Treasury subsidizes the issuer's borrowing costs.

QECBs are taxable bonds, which means that investors must pay federal taxes on QECB interest they receive. Issuers may choose between structuring QECBs as tax credit bonds (bond investors receive cash rebates from the U.S. Department of the Treasury to subsidize borrowing costs). Most QECBs are expected to be issued as direct subsidy bonds due to the current lack of investor appetite for tax credit bonds.

QECB proceeds can be used to fund capital expenditures on a variety of projects including:

- Reducing energy consumption in publically owned buildings

- Implementing green community programs (including loans, grants, or other repayment mechanisms) such as efficient street lighting replacements and loan programs for residential energy efficiency improvements
- Developing rural capacity, specifically involving the production of electricity from renewable energy resources
- Supporting energy-related research facilities, research grants and research
- Implementing mass commuting and related facilities that reduce energy consumption and pollution
- Designing/running demonstration projects to promote the commercialization of energy-related technologies and processes
- Launching public education campaigns to promote energy efficiency

The U.S. Congress authorized $3.2 billion of QECB issuance capacity, which has been allocated to states, local governments, and tribal governments based upon population.

4.6.2. Clean Renewable Energy Bonds (CREBs)

Clean Renewable Energy Bonds (CREBs) may be used by certain entities, primarily in the public sector, to finance renewable energy projects. CREBs may be issued by electric cooperatives, government entities (states, cities, and counties), and by certain lenders. The bondholder receives federal tax credits in lieu of a portion of the traditional bond interest, resulting in a lower effective interest rate for the borrower. The issuer remains responsible for repaying the principal on the bond.

The Energy Improvement and Extension Act of 2008 allocated $800 million for new CREBs. In February 2009, the American Recovery and Reinvestment Act of 2009 allocated an additional $1.6 billion for new CREBs, for a total new CREB allocation of $2.4 billion. With close to $1.4 billion in volume cap for new CREBs remaining, in February 2015, the IRS announced a March 5, 2015, opening of the rolling volume-cap application window for governments (2015).

Participation in the program is limited by the volume of bonds allocated by Congress for the program. Participants must first apply to the IRS for a CREBs allocation, and then issue the bonds within a specified time period. The new CREBs allocation totaling $1.4 billion does not have a defined expiration date under the law; however, the recent IRS solicitations for new applications require the bonds to be issued within three years after the applicant receives notification of an approved allocation (2015).

CREBs differ from traditional tax-exempt bonds in that the tax credits issued through CREBs are treated as taxable income for the bondholder. The tax credit may be taken each year the bondholder has a tax liability as long as the credit amount does not exceed the limits established by the federal Energy Policy Act of 2005.

In March 2015, the IRS solicited applications for the remaining nation volume for new CREBs. The County should consider pursuing an allocation.

4.6.3. Municipal Bonds

A municipal bond is a bond issued by a local government or their agencies. In the United States, interest income received by holders of municipal bonds is often exempt from federal income tax, and may be exempt from state income tax, although municipal bonds issued for certain purposes may not be tax exempt.

There are two basic types of municipal bonds: general obligation bonds and revenue bonds. With general obligation bonds, the principal and interest are secured by the full faith and credit of the issuer and usually supported by either the issuer's unlimited or limited taxing power. Because of this, general obligation bonds typically have a lower interest rate than revenue bonds. In many cases, general obligation bonds require voter assent. Revenue bonds, on the other hand, have the principal and interested secured by revenues derived from tolls, charges, or rents from the facility built with the proceeds of the bond issue. For example, water districts can issue revenue bonds secured by the revenues from ratepayers' water bills. Revenue bonds typically do not require electorate assent.

In California, the Attorney General has opined that the borrowing of funds by a city, county, or school district to implement an energy conservation project pursuant to the terms of Public Resources Code §25410-25421 does not require electoral assent under the provisions of Section 18 of article XVI of the California Constitution. *See* California Attorney General Opinion No. 84-306.

The County should investigate harnessing revenue bonds to help finance energy projects. In the context of renewable energy systems, revenue streams from the sale of electricity would be tied to the repayment of the bonds. In the context of energy efficiency, the bonds would be repaid via energy savings achieved through the project.

4.7. Crowdfunding

Over the past decade, crowdfunding and peer-to-peer (P2P) lending organizations have broadened the base from which capital for investments, loan repayment, and project funding can be sourced. These emerging financing mechanisms utilize the Internet to conduct their business in an easy, efficient, and low-cost manner with which larger financial institutions cannot compete.

Crowdfunded projects use large groups of people pledging money to their cause to reach a monetary goal, without the promise of repayment. Usually if the goal is reached, investors will receive products, free upgrades, or merchandise as thanks from the organization. P2P lending is geared towards individuals seeking financing for investments, loans, and new businesses, with the promise that the lenders will get their money paid back to them in a timely manner (Beesley 2012).

The two largest crowdfunding platforms, Kickstarter and Indiegogo have produced some staggering amounts of money in a very short period of time. One of the most successfully funded projects, "The Coolest Cooler" funded strictly through Kickstarter, raised $13,285,226, with an original goal of only $50,000. Indiegogo helped finance the Solar Roadways initiative, which had a goal of $1 million and ended up raising $2,200,591 in just three months from April to June 2014.

Even with all of the success of crowdfunding, P2P lending poses the larger threat to the banks, and could change the way Americans do small business. The two largest companies, Lending Club and Prosper, got their beginnings by offering individuals loans for small businesses or credit card/student loan repayment. They've been able to sustain and grow because they are able to finance loans that offer lenders a higher interest rate than putting their money into a bank, and also offer the borrower a lower rate by nearly 6 percent of what they are currently paying (Cohan 2014). Lending Club has financed over $4 billion in loans, more than all of its competitors, while Prosper has grown by 3,000 percent since its startup (Economist 2014). There seems to be exponential room for growth as these small banking companies continue to get recognized.

Companies like Lending Club and Prosper have opened the door for others with specific niches in the P2P environment. In 2009, a renewable P2P lending company named Mosaic was launched in Oakland, CA, and has since become the third largest renewable specific lender in the world, with an emphasis on solar funding. Since its public launch in 2013, Mosaic has helped finance $7 million for 20 projects with a combined capacity of 18 megawatts (Koch 2014).

Mosaic gets investments from people or companies who want to finance solar, and give that money to the borrowers who want to construct a project. The typical payback period to investors is 10 years with a 5 percent ROI. Abundance Generation (UK) and Windcentrale (NED) are similar companies operating outside of the US, financing wind and other renewable energy projects totaling €8 million and €14.3 million with ROIs of 7.25 and 7 percent respectively (Mishra 2014).

The County could explore a public-private partnership with Mosaic or a similar P2P lending entity to establish a renewable and energy efficiency specific P2P lending program. Such a program could harness distributed capital throughout the region while also allowing residents to have a sense of ownership in the region's energy investments.

4.8. Qualitative Assessment

The portfolio of institutional arrangements and financial mechanisms has been individually examined through the lens of a comprehensive qualitative assessment. Specifically, the following five weighted metrics were considered:

- Cost of borrowing
- Budget personnel
- Current legal authority
- Magnitude of impact
- Synergy (ability to leverage public/private partnerships)

Each institutional arrangement and/or financial mechanism was assigned a score for each metric, 1 through 10 (1 being weakest, and 10 being strongest) based on that particular instrument's relative performance under that metric. For example, a score of "10" under the "cost of borrowing" metric would indicate a very low cost of borrowing whereas a score of "1" would indicate a very high cost of borrowing. Similarly, a score of "10" under the "budget personnel" metric would indicate a very low budget/personnel requirement whereas a score of "1" would indicate a very high budget/personnel requirement.

With respect to the "current legal authority" metric, a score of "10" would indicate that the requisite legal authority currently exists, whereas a score of "1" would indicate that new legislative action is required.

A score of "10" under the "magnitude of impact" metric would indicate a relatively large impact with respect to shifting the County's energy portfolio from which its electricity is generated to a higher percentage of renewable resources, whereas a score of "1" would indicate the institutional arrangement and/or financial mechanism would have relatively little impact on shifting the County's generation mix.

Finally, a score of "10" under the "synergy" metric would indicate that the institutional arrangement and/or financial mechanism has the ability to complement other institutional arrangements and/or financial mechanisms thereby amplifying the effect of each. For instance, a potential CCA program, depending on how it is structured, could also administer a PACE program along with other financial mechanisms. By serving as a hub for multiple mechanisms, a CCA program scores high on the "synergy" metric and could prove far more effective in advancing the deployment of energy efficiency and renewable energy than if each institutional arrangement and/or financial mechanism were pursued in isolation. Moreover, a potential CCA program might facilitate other energy-related public/private partnerships. Conversely, an institutional arrangement and/or financial mechanism that is limited in its ability to serve as a platform for multiple financial mechanisms/institutional arrangements and/or is unable to facilitate public/private partnerships would receive a low score under the "synergy" metric.

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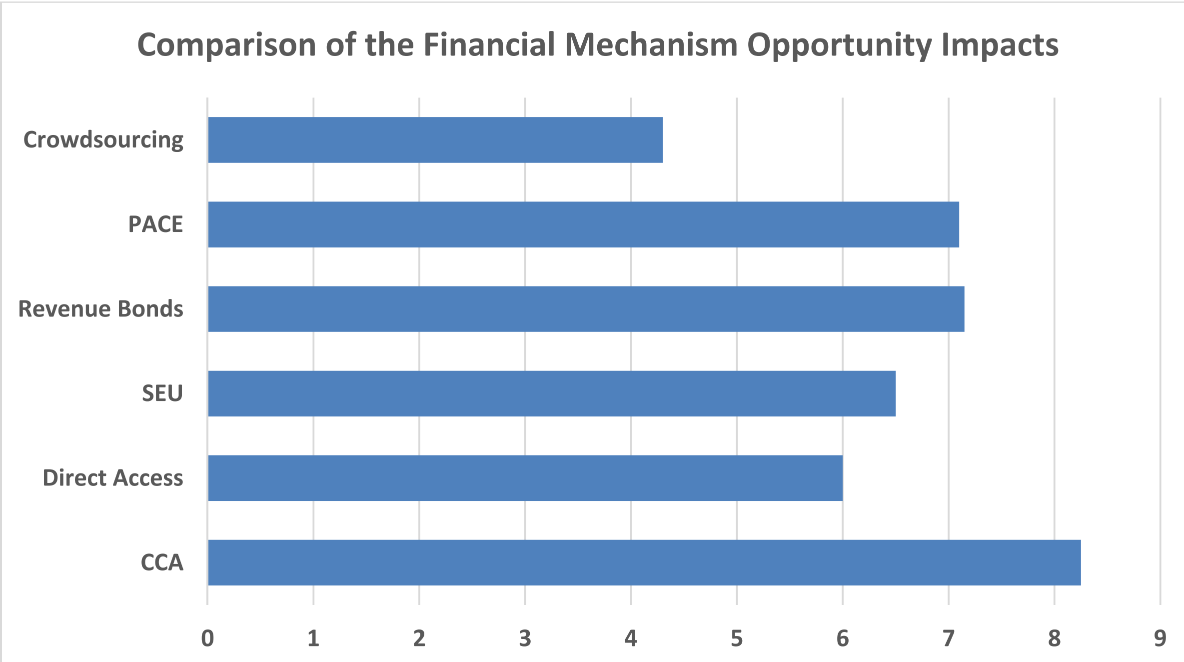
FIGURE 4-11. COMPARISON OF THE FINANCIAL MECHANISM OPPORTUNITY IMPACTS



Crowdsourcing: scored high marks for budget-personnel requirements and low marks for magnitude of impact, synergy, and current legal authority.

PACE Financing: scored high marks for current legal authority, existing political support, and budget-personnel requirements, and low marks for synergy.

Revenue Bonds: scored relatively high marks across the board, except low marks for the synergy component.

Sustainable Energy Utility (SEU): scored high marks in magnitude of impact, cost of borrowing, and synergy, but a very low mark in current legal authority to implement.

Direct Access: scored high marks in cost of borrowing, current legal authority, and existing political support, and very low marks in magnitude of impact and synergy.

Community Choice Aggregation (CCA): scored very high marks in cost of borrowing, magnitude of impact, and synergy, and relatively low marks in budget-personnel requirements.

5. Best Practices

5.1. An Introduction to Best Practices

The Comprehensive Renewable Energy Plan (CREP) could help build renewable energy markets while moving the County of San Diego beyond its historical roots in preservation and a piecemeal approach to renewable energy, to a more comprehensive focus on sustainability that can be driven by renewable energy. This is an important evolutionary step to take. Finding and implementing new energy programs, policies, and financial mechanisms already tested and proven by other local governments will be critical to helping the County implement the ambitious scenarios laid out in this report, while also minimizing the risk associated with new actions.

This Best Practice chapter is designed to accompany, inform, and bolster the economic analysis that will be used to guide the County of San Diego in Phases I and II of the CREP. The information in this chapter comes principally from other local governments, and feeds new information into long-term economic projections and scenarios.

A Best Practices review generally involves looking at policies and programs, and financial mechanisms (both mandatory and voluntary) that have been effective in addressing similar issues in the past that could be applied to a current issue; and that have also been effective in stimulating a more vigorous level of economic opportunity. For the purpose of this report, a Best Practice is defined as a practice or policy that can be isolated, replicated, and implemented that achieves the goal of integrating more renewable energy into both County of San Diego operations and within the region. This includes unincorporated and incorporated regions of the County.

Despite the highly publicized cost declines within the solar and wind industries, these technologies continue to face formidable barriers to achieving scale within the County of San Diego. In addition to expiring Federal subsidies in 2016, uncertain permitting processes, the lack of trained employees, and restrictive traditional financing and underwriting criteria combine to constrain regional solar and wind growth. The Best Practices presented here help inform how these issues can be addressed by the County. In the public interest, the authors also kept in mind other larger goals of the CREP when selecting Best Practices, which included:

- Protection of high quality habitat
- Creation of procedural improvements in County operations
- Helping the County meet the state goals such as the Renewable Portfolio Standard (RPS) of 33 percent by 2030 (and the Governor's new possible target of 50 percent by 2030), and AB 32, the California Global Warming Solutions Act of 2006
- Updating County policies and programs to match or exceed what other innovative jurisdictions are accomplishing in the renewables area
- Assisting the County with new Federal regulations and policy such as the U.S. Environmental Protection Agency (EPA) proposed regulations for cleaner power plants under Section III (D) of the Clean Air Act and others
- Enhancing the County's ability to maintain a high-quality economic development momentum based on a larger economy-wide energy and economic productivity

A robust renewable energy market, enhanced by a complementary development of the energy efficiency potential in the region, can stimulate regional economic competiveness by inducing new private capital investments. It can help reduce energy imports and healthcare costs associated with other fuel sources, stabilize long-term energy prices, and act as a hedge against rising electricity rates. In addition, manufacturing firms are known to cluster in regions with abundant clean energy (Luecke, 2011).

As discussed elsewhere in this report, consumers and businesses within the County of San Diego will spend $9 billion to meet their total energy needs[21] this year, and that number is certain to rise without significant changes in the way energy is produced and consumed in the region. The implementation of the Best Practices identified in the pages to follow can influence this $9 billion figure and, in some cases, radically alter the energy landscape within the County of San Diego.

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[21] Though over 60 percent of costs address transportation-related energy needs, this first report will not be addressing transportation and energy, with the exception of electric vehicles.

In addition to defining what a Best Practice is, it is also important to review a number of other issues before moving to the actual Best Practices, including:

- Providing the important energy context within the County of San Diego that the Best Practices are expected to fit within;
- Describing where these Best Practices come from and how they were collected;
- Explaining the close relationship between sustainability, renewable energy, and energy efficiency, and why it is difficult (and inadvisable) to separate them within a Best Practice;
- Outlining what the County has already done in the energy and renewable energy areas; and
- Describing the four information categories used within each Best Practice template, and why this specific information is provided to the reader.

Again, the primary purpose of these Best Practices is to inform and educate County of San Diego officials about potential programs and policies that can later be adopted and implemented as part of the CREP.

The programs, policies, and financial mechanisms presented here are proven, innovative, and effective tools and strategies for supporting renewable energy and energy efficiency advancement at the local level. The Empower Devices team looked for Best Practices across the U.S. as well as in the County's backyard. It is important to note that the County already has renewable energy practices worth highlighting, and potentially strengthening. For example, the County's on-line solar permitting process is heralded across the State as an exemplary model, and the City of Chula Vista has been a long-time leader on climate and energy policies. Chula Vista's 2009 "Solar Ready" Ordinance requires the installation of wiring conduit and plumbing for future installation of solar PV and solar hot water heating systems. The City of San Diego has a strong, action-oriented Climate Action Plan (CAP) underway with important consequences for solar and wind industries, and the general public. This type of local innovation should be remembered while looking at other domestic and international renewable energy Best Practices.

Best Practices can be divided any number of ways. An important distinction needs to be made early between internal government operations and practices, and external practices. Streamlined on-line solar permitting for homeowners is a good example of an external Best Practice, since it involves San Diego citizens outside of the government itself. A homeowner applies for a permit from outside government, and if done correctly, is issued one. A good example of an internal Best Practice is setting a goal to produce a set percentage of County government electricity (e.g. 20 percent by 2020) with solar energy use only in County buildings. Since the energy is produced for use within County government only, this is an internal Best Practice. The Best Practices presented in the following pages are both external and internal to the County. Combined together, these Best Practices give the County the opportunity to become a renewable energy hub in this 21st Century.

5.1.1. Site and Source Energy

Many of the Best Practices listed in this report involve renewable energy production and programs that reduce demand for energy on the customer's side of the meter. It is important to point out that Best Practices can address energy generated at the site or energy used at the source. Site energy is the amount of energy produced or used at a site (e.g., a San Diego County building or a resident's home), and source energy is the total amount of energy used to produce and transport energy to a site (e.g., the amount of energy produced from a power plant inside or outside of the County, and routed to a site within the County). Ultimately, the movement away from site energy to source energy (through renewables) will drive larger gains in economy-wide energy productivity.

It is important to point out the site versus source issue early to help bound the suite of alternatives available to the County in this report. Best Practices in the pages to follow may be as simple as installing new solar photovoltaic (PV) panels to a County building site to help increase the percentage of renewable energy used by the County, or as complex as a new "Community Solar" initiative created by the County that involves creating a "solar farm" on

County land that allows County residents to purchase the electricity generated from the solar farm. The County is interested in applying renewable energy technologies at both the site and source generally, therefore, the range of Best Practices considered is necessarily broad.

5.2. Best Practices Resources

Local governments have been implementing renewable energy (and energy efficiency) programs since the early 1970s, when oil overcharge funds were disbursed to the 50-plus State and territorial governments, who in turn doled out these dollars to local governments for these programs. Virtually all of this funding came through the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy (known simply as EERE). In order to receive these oil overcharge funds, and later State Energy Conservation Program (SECP) funds from EERE, state governments were required to design and implement renewable energy programs. As a result, there is a large 40-year collection of diverse renewable energy programs spread across the country.[22]

Renewable energy Best Practices have grown in number and sophistication over the last four decades. Solar photovoltaic (PV) programs were often limited to small, individual applications in the 1970s and 1980s, whereas, recent programs often involve new financing vehicles such as power purchase agreements (PPAs) and innovative leasing arrangements, or the integration of multiple technologies within a microgrid.

The Best Practices presented here were collected through extensive research, document analysis, and expert interviews. Per guidance from County of San Diego staff, our team searched for Best Practices from Imperial, Los Angeles, San Francisco, Sonoma, Marin, and Santa Barbara Counties. However, our focus was clearly national, and not limited to California. The authors contacted the following organizations and solicited Best Practice expertise and advice from each:

- The County of San Diego
- The National Association of Counties (NACO)
- The California State Association of Counties (CSAC)
- Public Technology Institute (PTI)
- The National League of Cities (NLC)
- The U.S. Department of Energy (Office of EERE, mentioned earlier)
- The National Association of Regional Councils (NARC)
- The Solar Foundation (TSF)
- The Database of State Incentives for Renewables and Efficiency (DSIRE, a 50 State Database)
- The California County Planning Directors Association (CCPDA)
- The Center for Biological Diversity (San Francisco)

5.2.1. Best Practices Organization

Many Best Practices documents are organized by sector, with programs and policies organized across the buildings, agricultural, transportation, and utility sectors, with some including an additional education and outreach section that often cuts across all sectors. Aside from electric vehicles, which are discussed in this section of the report, the transportation sector is largely reserved for later phases of the CREP.[23]

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[22] The State Energy Office (SEO) was/is usually the best place to find information about these programs, so the authors consulted SEOs as part of their quest for appropriate renewable energy Best Practices.

[23] County of San Diego officials specifically requested that the transportation sector be avoided aside from a discussion of electric vehicles (EVs) in Phase I of the CREP, therefore this sector is intentionally not covered in this report.

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For each Best Practice presented in this report, four categories of information are provided to help inform options for the next Phase (Phase II) of the CREP. These four categories include an Overview, Description of Benefits and Costs, Who Else is Doing It, and Where to Go For More Information. These four categories were selected from a much larger list of criteria, and were judged by our team to be the most appropriate given the more general purpose of this report for the Phase I CREP process.

5.2.2. Best Practices Topics

The following Best Practices were chosen for the County to consider as it moves into Phase II of developing the CREP.

5.3. Amend the General Plan by Adding an Energy Element

5.4. Establish a New Office of Sustainability/Office of Energy Resources

5.5. Establish an Institutional and Financing Capability

5.6. Establish a Sustainable Energy Workforce Development Initiative

5.7. Build an Energy Resilience Plan (ERP)

5.8. Increase the County's Percentage of Energy Derived from Various Renewable Energy Technologies

5.9. Establish a Renewable Energy Group Procurement Initiative

5.10. Participate in the Creation of a New Regional Energy Network (REN)

5.11. Create a Renewable Energy Overlay / Combining Zone

5.12. Establish Building Energy Disclosure policies

5.13. Promote More Aggressive Building Standards Including the Significant Retrofit of Existing Buildings

5.14. Increase Renewable Energy Education and Outreach

5.15. Start a Community Solar Initiative

5.16. Establish a Microgrid and Develop Policies Related to Microgrids

5.17. Establish Electric Vehicle Programs

Transportation is very important, and responsible for more than 75 percent of the energy used in the County. Renewable energy applications within the transportation sector may be covered in later CREP Phases.

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5.3. Amend the General Plan by Adding an Energy Element

Definition

The County of San Diego's General Plan expresses the County's development goals and embodies public policy relative to the distribution of future land uses, both public and private. California cities and counties are required by the state to update their general plans to conform to changes in state law and other legal requirements, and to reflect changes in land development patterns since the last general plan was adopted (Grattidge and Lawler 2003). Under state law, every local general plan must include seven elements, or sections: *land use, circulation, housing, conservation, open-space, noise,* and *safety*. The Governor's Office of Planning and Research's State of California General Plan Guidelines recommends inclusion of energy considerations in general plans in two of the seven elements required by state law: housing and conservation. Jurisdictions may also voluntarily adopt additional elements, such as energy, growth management, public health, and water resources among others to reflect policy priorities unique to them.

Done correctly, a new Energy Element can consolidate major energy production and consumption policies, supplement priorities in mandated chapters of the General Plan, and reflect a commitment to create and maintain social and economic well-being, managed economic growth, and responsible resource conservation.

Last updated in 2011, the County's General Plan does not include an Energy Element.

CREP-Related Options for the County of San Diego

- Introduce a new Energy Element to the General Plan
- Approach the California Energy Commission (CEC) about funding CREP-related policy work in 2015, while working with the five counties that received 2013 funding from the CEC for renewable energy policy improvements, and evaluate their applicability in the County of San Diego

Note: Without the specificity mentioned above, the Energy Element is vague and relatively meaningless. We advocate leaving that language (in the first bullet) alone.

5.3.1. Overview

5.3.1.1. Definition

The General Plan expresses the County's development goals and embodies public policy relative to the distribution of future land uses, both public and private. The General Plan bridges the gap between community values, visions and objectives, and physical decisions such as large and distributed energy projects, subdivisions and public works initiatives. The County of San Diego's General Plan was last updated in 2011.[24] California cities and counties are required by the state to update their general plans every eight

[24] There have been at least seven major amendments to the Plan since 2011.

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to ten years (Housing Element updates must occur every five years) to conform to changes in state law and other legal requirements, and to reflect changes in land development patterns since the last general plan was adopted (Governor's Office of Planning and Research, 2003).[25] The state does not mandate a specific timetable for general plan updates, and many jurisdictions initiate the update process every decade or two depending upon economic and social developments.

Under state law, every local general plan must include seven elements, or sections: land use, circulation, housing, conservation, open space, noise, and safety. The Governor's Office of Planning and Research's State of California General Plan Guidelines recommends inclusion of energy considerations in general plans in two of the seven elements required by state law: housing and conservation.[26] Since Elements such as an Energy Element are optional and are included in the General Plan at the discretion of the County, they can reinforce the County's values and priorities.

Dozens of California local governments have added a separate Energy Element to their general plans in recent years, demonstrating their commitment to clean energy job creation and economic development, emission reductions, climate goals, and indigenous local energy supplies (i.e,. sunshine in Southern California). The County of San Diego does not have an Energy Element in its General Plan at this time.

5.3.1.2. Value Proposition & Benefits

The State of California considers local government general plans to be, "…a constitution for development, the foundation upon which all planning decisions in a city or county are to be based. It expresses community vision and values, and it embodies public policy relative to the distribution of future land use, both public and private" (Governor's Office of Planning and Research, 2003). Given the very significant role that energy already plays within the County of San Diego, adopting an Energy Element to the General Plan that focuses on the short- and long-term opportunities for renewable energy technologies for County facilities and future community development is recommended. A new Energy Element in the San Diego General Plan sends a strong message to the public and industry that energy, and more specifically renewable energy, are new, important priorities for the County, and as a result, the County is organizing its business around these new issues.

Done correctly, a new Energy Element can consolidate major energy production and consumption policies, supplement priorities in mandated chapters of the General Plan, and reflect a commitment to create and maintain social and economic well-being, managed economic growth, and responsible resource conservation.

Adding a new Energy Element is much less time-consuming than weaving sustainability through an entire general plan, as Marin County did.[27]

[25] General Plan Guidelines, 2003, Governor's Office of Planning and Research. See page 33. The Office of Planning and Research (OPR) will send a letter of notification to cities and counties if their general plans have not been updated within eight years. If ten years pass since a general plan was updated, OPR must also notify the State Attorney General.

[26] Since the last General Plan was passed in 2011, the cost of solar dropped drastically and land-use disputes in Eastern San Diego County have increased in number. Land-intensive commercial solar project developers have been pitted against proponents of small-scale solar photovoltaics (PV) atop existing rooftops in favor of leaving San Diego County's land and associated habitat free of more construction.

[27] Marin County planners in 2007 made sustainability a central environmental ethic across nearly every goal, objective and policy in their General Plan. Marin County's General Plan emphasized "sustainable communities" and reflected strong concern about global climate change. The American Planning Association later gave Marin County a national award for excellence in planning implementation around this sustainability thread (T. Snellings, 2014; Marin County, 2007).

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5.3.1.3. Function of an Energy Element

Typical goals, objectives and policies in the Energy Elements cited above include, but are not limited to, general public education on energy production and consumption, energy efficiency in municipal buildings, regional planning, workforce training, and promotion of specific renewable energy technologies.

An Energy Element effectively "paves the way"' for the rest of the renewable energy tools laid out in this report, such as streamlined permitting, renewable energy overlay zones, more flexible administrative requirements, and other energy policies (Snelling 2014). While the Energy Element does not specify what the County must do, it will at a minimum encourage their use with stated policies and objectives.

5.3.1.4. Structure and Budget (Costs)

Costs for adopting an Energy Element to the General Plan will vary depending on staff time committed to developing a proposal, expected time for public review and comment, and other actions stipulated for amendments to the General Plan. The California Energy Commission (CEC) awarded $3.3 million in renewable energy planning grants to five counties in 2013, suggesting that a comprehensive approach to this issue in San Diego County might require more funding. Importantly, these CEC grants involved much more than developing an Energy Element in each jurisdiction (CEC 2013).

5.3.2. Application to San Diego County (Recommendations)

5.3.2.1. Existing Context

There is a precedent for an Energy Element within the County of San Diego. The County of San Diego 1990 General Plan included an Energy Element. However, for unknown reasons the Energy Element was excluded from the comprehensive General Plan update of 2011.

In June 2013, the California Energy Commission (CEC) awarded "renewable energy planning" grants to five counties in recognition for their Energy Elements or their energy-related ordinance and policy development. Imperial, Inyo, and San Bernardino each received $700,000 for their Energy Element work, and San Luis Obispo and Los Angeles Counties each received roughly $600,000 for energy-related ordinance and policy development. These jurisdictions offer a wealth of information, since the awards were specifically tied to improving renewable energy development processes as part of their comprehensive General Plans. For example:

- Imperial County is updating and amending the geothermal/alternative energy element of the county's general plan.
- Inyo County is updating the county's renewable energy general plan amendment and preparing an environmental impact report (EIR).
- San Bernardino County is creating a renewable energy and conservation element in the new general plan, while also making strategic changes to the county's regulatory system.
- San Luis Obispo County is revising its policies and ordinances by creating a renewable energy streamlining program, where allowable land uses in areas identified as renewable energy combining zones will be eligible for renewable energy development over other land uses.
- Los Angeles County is creating a renewable energy ordinance and a programmatic Environmental Impact Report (EIR) that will help mitigate development issues such as cumulative impacts. Having the ordinance and the EIR will help shorten the environmental review in Los Angeles County

because developers can use information from the EIR when seeking permits for individual projects (Douglas, 2013).

5.3.2.2. Next Steps

Local governments who have created Energy Elements maintain that early goal setting was one of the first key steps when adding an Energy Element to a general plan. The County can begin this by revisiting some of the goals in its original Energy Element:

- Goal 1: Define and assure adequate energy supplies for San Diego County
- Goal 2: Encourage the utilization of alternative passive and renewable energy resources
- Goal 3: Maximize energy conservation and efficiency of utilization
- Goal 4: Minimize environmental impact of energy sources
- Goal 5: Minimize economic or social impacts of energy supply and demand
- Goal 6: Minimize possibility of energy shortages and resulting hardships
- Goal 7: Seek equitable sharing of both the benefits of energy consumption and the hardships of energy shortage
- Goal 8: Encourage compatibility with national and state energy goals and city and community general plans/regional comprehensive plans

While all of these goals are worthy of revisiting in a new Energy Element, clearly, language related to renewable energy is missing. This can be remedied in part by adding the following goal:

- Goal 9: Maximize the integration of renewable energy applications

The County of San Diego can incorporate an Energy Element based solely on renewable energy if it desires, while integrating existing energy efficiency programs, plans, and other important energy-related factors.

5.3.3. Who Else is Doing It?

Many California counties and cities have already adopted a separate, optional energy element.[28] Scott Morgan with the California Office of Planning and Research noted that at least 25 jurisdictions have added an Energy Element into their general plan over the past 20 years, including Kern, Marin, Sacramento, and Santa Barbara Counties. Imperial County adopted a unique Geothermal/Alternative Energy and Transmission Element in 2006 (2014). These jurisdictions are listed below in TABLE 5-1 by chronological order.

[28] Please note that these are only the jurisdictions that responded to the Governor's Office of Planning and Research 2013 survey and specifically have an Energy Element. Many other jurisdictions have included energy in one of their required seven elements and are not included in this list. For example, Butte County includes energy issues in the Open Space and Conservation Element (Morgan, 2014).

TABLE 5-1. California Counties and Cities with Energy Elements

1980s	1990s	2000s	2010s
Santa Ana (1982)	Lassen County (1993)	Costa Mesa (2002)	Dixon (2010)
	Sacramento County (1993)	Kern County (2004)	Ontario (2010)
	Siskiyou County (1993)	Shasta County (2004)	Rosemead (2010)
	Santa Barbara County (1994)	Banning (2006)	San Luis Obispo (2010)
	Ukiah (1995)	Marin County (2007)	Taft (2010)
	Yucca Valley (1995)	Riverside (2007)	Yuba County (2011)
	Sierra County (1996)	Cathedral City (2009)	Simi Valley (2012)
	Sutter County (1996)	Emeryville (2009)	Tulare County (2012)
			San Mateo County (2013)

It is helpful to review the reasons other jurisdictions incorporated an energy element. Please see TABLE 5-2 below for a summary of selected jurisdictions and the primary reasons they added an energy element.

Table 5-2. Reasons for Adding Energy Elements by CA Jurisdiction

Jurisdiction	Primary Reasons for Adding an Energy Element
Sacramento County	Energy Element was originally adopted in 1979 as part of a national response to the energy crisis
Kern County	To manage and protect energy resources; environmental, public health, and safety standards; and promote energy development
Marin County	Concern over impending climate change impacts. Incorporates GHG reduction plan. "Sustainability" a guiding principle for the entire General Plan
Santa Barbara	1981 General Plan amendments focused on energy conservation and incentives. Subsequent amendments address green building and incentives to exceed Title 24. Also encourages County to use and promote renewable energy where feasible, appropriate, and cost-effective
Imperial County	Economic development by increasing transmission capacity and developing renewable energy resources
San Mateo County	Long-term implementation of County's Energy Efficiency Climate Action Plan

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5.4. Establish A New Office of Sustainability / Office of Energy Resources

Definition

A local Office of Sustainability is a centralized authority responsible for developing and implementing sustainability programs and policies that advance energy, economic, and environmental priorities. By consolidating efforts, a formal Office of Sustainability enables counties to more effectively and efficiently promote sustainability, government-wide. Additionally, the presence of an Office of Sustainability is now a prerequisite for many federal, state, and private funders, since many want to see full government participation in their (funded) initiatives (Colorado Energy Group, 2014).

CREP-Related Options for the County

- Consolidate energy related programs within an Office of Sustainability. Three potential options to consider for the location of the new office are as follow:
  - The **Department of General Services**, which is already responsible for facility maintenance, energy efficiency, and renewable energy projects for county buildings; and the (internally-focused) Strategic Energy Plan (SEP).
  - The County's **Office of Planning and Development Services** could also be home to the new office since so many building and code-related initiatives fall under their oversight.
  - Create an Office within the **County Executive's Office**, which would be independent of other departments, and also respond directly to elected officials. In several large cities, the Mayor or City Council have taken the lead in establishing an Office of Sustainability to demonstrate their respective approaches to achieving energy, economic, environmental, and sustainability success.
- Consider an Office of Sustainability as a potential implementer of the CREP and Climate Action Plan (CAP)
- Consider extending and transitioning the CREP Technical Advisory Committee (TAC) as a formal advisory body to a new Office.

5.4.I. Overview

5.4.1.1 Definition

A local Office of Sustainability is a centralized authority responsible for developing and implementing sustainability programs and policies that advance energy, economic, and environmental priorities. An informal survey of 40 large counties in the U.S reveals that 16 counties (40 percent) have a formal Office of Sustainability and 12 counties (30 percent) have either a centralized authority or one person in charge of sustainability programs, including renewable energy and energy efficiency programs as opposed to sharing this responsibility among several full-time employees (FTEs).

5.4.1.2 Value Proposition & Benefits

By consolidating efforts, a formal Office of Sustainability enables counties to more effectively and efficiently promote sustainability government-wide. Additionally, the presence of an Office of Sustainability is now a prerequisite for many federal, state, and private funders, since many want to see full government participation in their (funded) initiatives (CEG 2014).

The benefits of having an Office of Sustainability can include:

- A more visible public commitment to sustainability issues;
- Demonstration of commitment to a thought out and comprehensive approach to responsible economic development.
- A formal link between the county and the general public on the core values associated with sustainability programs, namely saving water and energy, recycling, and using more renewables (this link can be relied upon and used in the future to achieve county energy, water, recycling, and other goals);
- More attention paid to energy-and water-saving and other sustainability programs inside of county government;
- Economies of scale that follow with centralized data collection;
- Consolidation and cost savings that accrue from centralizing energy education and outreach activities;
- Potential cost savings from consolidation of existing sustainability programs;
- Easier integration of existing sustainability programs into a common theme or primary message; and
- Increased attention from funding entities nationally (whether governmental, foundations or large donors) that recognize the potential impacts and benefits associated with a centralized office

5.4.1.3. Functions of a Sustainability Office

Almost all large municipal Offices of Sustainability measure and report on the progress of their municipal government across a number of sustainability indicators, such as energy use, water use, greenhouse gas emissions, and vehicle miles traveled (VMT).

Most local government sustainability offices focus on a handful of key issues, including:

- Providing the leadership to assure that programs are put in place to coordinate and achieve established energy-related goals such as those in a Climate Action Plan, Operations Plan, and/or regional initiatives.
- Acquiring and implementing energy efficiency and renewable energy grants and programs for counties across the building, agricultural, transportation, utilities, and industrial sectors;
- Representing the county on multiple local, regional, and statewide energy and environmental task forces, committees, energy-related collaboratives, and related groups (including lobbying the General Assembly and Public Utilities Commission);
- Integrating the sustainability ethic and associated behaviors across departments, and sometimes across the seven (or more, including Optional) elements of the General Plan.

- Providing leadership on green procurement policies, including paper use reduction and green fleet purchases;
- Leading the implementation of clean energy-related education and outreach (E&O) programs to the public;
- Managing in-house and external recycling, green building, and water reduction programs; and
- Working with community groups, non-government organizations, and the local business community to develop successful renewable and energy efficiency programs.

The County has organized seven departments into a Land Use and Environment Group (LUEG) including the Air Pollution Control District, Environmental Health, and Planning and Development Services. An Office of Sustainability can identify a broad range of County programs and connect or align them to improve the effectiveness of meeting sustainability objectives. Creating an Office of Sustainability involves little to no programmatic changes within the County's organizational structure.

An Office of Sustainability could be the County's eyes and ears for sustainability issues and opportunities, such as by adding programs encouraging the production and consumption of local food sources to their agenda.[29] Furthermore, it could instill a stronger ethic of sustainability among employees and express to the community that the County is committed to sustainability.

5.4.1.4. Budget & Structure (Costs)

Office of Sustainability budgets vary from jurisdiction to jurisdiction. Some have little to no budget and limited staff, as they focus largely on information gathering and sharing. Larger budgets reflect a mixture of allocations from the General Fund, local fees for services, grant funds, and/or (leftover) American Recovery and Reinvestment Act (ARRA) funds. According to the International Council of Local Environmental Initiatives (ICLEI), the average salary, including benefits, for mid-level county Sustainability Office staff range between $60,000 and $75,000 (2011).[30]

ICLEI surveyed 38 municipal Offices of Sustainability, and reported their various funding sources (2011):

- 55 percent were funded at least partially through their general funds;
- 37 percent were funded through special fees or rebates, such as solid waste fees;
- 29 percent used federal Energy Efficiency and Conservation Block Grant (EECBG) or other federal stimulus funding;
- 24 percent were funded through foundation grants and partnerships; and
- 16 percent were funded with the cost savings they helped achieve.

Budgets depend on:

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[29] The City of Atlanta, Georgia's, Sustainability Office is responsible for bringing local food within 10 minutes of 75 percent of all residents by 2020 (Quarles, D., A. Bastian and R. Norton). (2014) "About the Office of Sustainability." from http://www.atlantaga.gov/index.aspx?page=153.

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- The number and type of programs (i.e., basic public education through traditional media and the county website, through more sophisticated energy management programs managed jointly with utilities and others);
- New staff required or existing staff who have had their job descriptions modified to include new responsibilities; and
- Whether the positions are funded directly by the county General Fund, and/or new or existing fee-for-service assessments, or via grants or other entities such as utilities or foundations.

5.4.2. Application to San Diego County (Recommendations)

5.4.2.1 Existing Context

Existing sustainability initiatives across the county include the Local Government Partnership Program between the County and SDG&E. With support from SDG&E, the County of San Diego has been able to train staff and run partnership programs together.[31] The County has no Full Time Equivalents (FTEs) dedicated to renewables, energy efficiency programs, or sustainability. Currently, a few County staff members share management of these three program areas, with some consultant assistance. There is an Energy and Sustainability Manager position (not full-time) located in the General Services Department that is focused only on energy efficiency and conservation,.

Innovative renewable energy, energy efficiency, and climate programs are already underway within the County in cities such as Chula Vista, San Diego, and Carlsbad (many in place for more than a decade). These cities could offer a wealth of knowledge and support to the County. The City of Chula Vista, for example, has a Climate Change Working Group that develops recommendations to the City on actions to address climate change.

5.4.2.2. Possible Next Steps for the County

A sustainability office could institutionalize sustainability issues and potentially be responsible for implementing the CREP as well as the County's Climate Action Plan (CAP). The CREP Technical Advisory Committee (TAC) could continue to exist as a formal advisory body to a new Office.

The County of San Diego could house an Office of Sustainability in several places.

- The **Department of General Services** could be a potential home, since transportation is so fundamental to the County and to meeting greenhouse gas (GHG) reductions. Further, this department is already responsible for facility maintenance, energy efficiency, and renewable energy projects for county buildings; and the (internally-focused) Strategic Energy Plan (SEP).
- The County's **Office of Planning and Development Services** could also be home to the new office since so many building and code-related initiatives fall under its oversight.
- Some jurisdictions have created an Office independent of other departments that respond directly to elected officials by being located within the **County Executive's Office**. In several large cities,

[31] Some examples of programming include the Smart Building Pilot Project at the South Bay Regional Center, the Energy Upgrade California Multi-family Building Program, and the further development of Zero Net Energy (ZNE) buildings in the County (County of San Diego, 2015). Additional work on buildings that exceed the minimum code is referred to as a "reach code" or "stretch code."

the Mayor or City Council have taken the lead in establishing an Office of Sustainability to demonstrate their respective approaches to achieving energy, economic, environmental, and sustainability success.

The following table illustrates what a new fully staffed Office of Sustainability might require, based on information from other offices and using the existing County of San Diego pay scale (County of San Diego, 2012).[32] (Note that the illustrative table has not been reviewed by County or Union staff yet.)

TABLE 5-3. Sample Office of Sustainability Staff

Potential Job Title	Potential Annual Salary[33]
Chief Sustainability Officer	$105,000
Manager, Climate and Sustainability Programs	$100,000
Manager, Communications (Education and Outreach)	$88,000
Program Coordinator	$72,000
Program Manager	$65,000
Program Manager	$65,000
Administrative Assistant	$50,000
Program Coordinator	$50,000
TOTAL WAGES	$595,000

[32] Based on data provided by 2012 County data reported to State Controller (www.publicpay.ca.gov) for Department of Planning & Development Services. Yee, B. T. (2012). "Welcome to the Government Compensation in California (GCC) Website." from http://publicpay.ca.gov/.

[33] Based on "Regular Pay" of similar position at PDS, but not exceeding their 2012 "current pay."

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5.4.3. Who Else Is Doing It

The table below provides information on comparably sized counties (in terms of populations) by 2010 Census data, the name of the office, the programs it manages, and available budget.

TABLE 5-4. Comparable Offices of Sustainability

County, State (US Census 2010)	(1) Office Name (2) Organizational Location	Programs and Initiatives	(1) Budget (2) FTEs
Los Angeles County, CA (9,818,605)	County Office of Sustainability Internal Services Department	Energy Upgrade California Environmental Service Centers Green Building SolarMap.LACounty.gov GreenLACounty.gov The Energy Network Southern California Regional Energy Center	$414,000 3.0 FTE (10.0 ARRA funded)
City of Los Angeles, CA (3,884,000)	Office of Sustainability Mayor's Office of Budget & Innovation	City Sustainability Initiative Sustainability Plan by each Department GreenLA/SustainLA Green Building EV infrastructure Waste diversion	N/A 6.0 FTE
Miami-Dade County, FL (2,496,535)	Office of Sustainability Regulatory and Economic Resources	Greenprint Sustainability Plan Annual Progress Report, Sustainability Scorecard, Implementation Table Community Resources Website	$606,100 5.0 FTE
Clark County, NV (1,951,269)	Office of Sustainability Comprehensive Planning Department	County Eco-Initiative Serve as liaison with public and private entities Cultivate Funding Resources Create Strategic Marketing Plan Create website of Sustainability Efforts Promote Ongoing Conservation Efforts	N/A .75 FTE
Santa Clara County, CA (1,781,642)	Office of Sustainability County Executive Office	Energy Upgrade California Silicon Valley 2.0 Climate Action Plan for Operations and Facilities (2009) County Sustainability Policy (2010) Green Building Green Business	N/A 1.0 FTE

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County, State (US Census 2010)	(1) Office Name (2) Organizational Location	Programs and Initiatives	(1) Budget (2) FTEs
Broward County, FL (1,748,066)	Office of Energy and Sustainability Environmental Planning and Community Resilience	Climate Change Task Force County Seal of Sustainability County Sustainability Stewards STAR Sustainable Community Urban Land Enhancement Program GoSOLAR	N/A ~3.75 FTE
Philadelphia County, PA (1,526,006)	Office of Sustainability Mayor's Office	Solar Energy in the City Local Food Tree Planting Energy Benchmarking EnergyWorks	N/A 4.0 FTE
Alameda County, CA (1,510,271)	Alameda County Sustainability General Services Agency	Regional Renewable Energy Procurement (R-REPP) Climate Action Plan Environmentally Preferable Purchasing Fleet Management and EVs Solar Energy Community Energy Program Business Energy Program Regional Purchasing Stopwaste.org	~$500,000 5.0 FTE
Sacramento County, CA (1,418,788)	No formal office/department Currently in Water Resources	Climate Action Plan for County Government Operations Sacramento Area Sustainable Business ProgramPublic EV Charging StationsGreen Sacramento County	N/A1.0 FTE
Hennepin County, MN (1,152,425)	(No formal office/department) Minneapolis (Hennepin Co.) & St. Paul (Ramsey Co.)	Environmental Coordinating Team (since 1994) Energy Innovation Corridors Annual Greenprint Progress Reports Sustainable St. Paul Electric Vehicle Deployment and Charging Stations Brownfield site development Light rail transit	N/A 1.0 (State of MN) 5.0 (St. Paul)

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County, State (US Census 2010)	(1) Office Name (2) Organizational Location	Programs and Initiatives	(1) Budget (2) FTEs
Contra Costa County, CA (1,049,025)	No formal office/department) Office of Conservation and Development	Environmental Action Programs for Schools East Coast Habitat Conservancy Home Energy Improvement incentives/rebates East Bay Energy Watch Weatherization Resources on green building	N/A 1.0 FTE
Travis County, TX (1,024,266)	City of Austin Office of Sustainability Sustainability Department	Climate Program Green purchasing, energy, water, environmental metrics reporting Rethink/ Mobile App Austin Green Business Leaders Positive Impact on Climate and Community (PICC) Sustainability Action Agenda EcoDistrict Initiative	N/A 6.0 FTE
Salt Lake County, UT (1,029,655)	(No formal office/department)	Salt Lake County Green County Sustainability Cabinet Sustainable Building and Business Program Energy Efficiency and Renewable Energy Open Space and Urban Farming Air Quality Water Quality Recycling	N/A3.0
Pima County, AZ (980,263)	Office of Sustainability and Conservation Public Works	Sustainable Action Plan for County Operations (2014) NZE Buildings Program LEED County Buildings Green Purchasing Land Conservation and Management Water Conservation and Management Renewable Energy and Energy Efficiency Health and Wellness	N/A N/A

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County, State (US Census 2010)	(1) Office Name (2) Organizational Location	Programs and Initiatives	(1) Budget (2) FTEs
Fresno County, CA (930,450)	(No formal County office/department)	Go Green Fresno County! Powergreen Buildgreen Commutegreen Purchasegreen Operategreen Workgreen	N/A N/A
Shelby County, TN (927,644)	Office of Sustainability Department of Planning and Development	Sustainable Shelby Implementation Plan (2008) Social Media Outreach Sustainability Advisory Committee Mayors Regional Roundtable Sustainability Summit Mayors Energy Challenge Green Building Incentives and Task Force Public Building Benchmarking Business EE Roundtable	$3.6 Million (grants) 1.0 FTE
Marion County, IN (903,393)	Indianapolis Office of Sustainability Department of Public Works	SustainIndy County and Community Program Areas include Energy and Emissions Air Quality Green Building Water and Land Local Food Waste Management SustainIndy Grants	N/A 8.0
Sonoma County, CA (484,698)	Energy and Sustainability Division General Services	Sonoma County Energy Independence (SCEIP) SCEIP Financing Sonoma County Energy Watch (SCEW)	$4.5 million 10.0 FTE
City of Berkeley, CA (112,580)	Energy and Sustainable Development Department of Planning and Development	CCA Money for Energy Efficiency (ME2) Municipal Energy Conservation Energy Financing Districts Green Building SmartSolar Assessments Berkeley FIRST Transportation	$866,0000 5.2 FTE

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5.5. Establish an Institutional and Financial Capacity

Definition

If the County of San Diego is interested in transforming the region to a renewable energy jobs center, major changes will be needed that include new clean energy-sector strategies. A growing number of counties, including Los Angeles County, are pursuing sector-specific initiatives that integrate workforce and economic development strategies. Importantly, this is consistent with the reauthorization of the federal Workforce Investment Act (WIA), via the Workforce Innovation and Opportunity Act (WIOA) of 2014.

WIOA funds directed to the County of San Diego can be more valuable (and spent with full federal and state support) if the County directs them toward renewable energy jobs (and not just energy efficiency jobs) as part of new clean energy sector approach. The County can work with local partners on a major, sector-driven approach to workforce development that focuses on the needs of regional employers within the renewable energy industry. If prioritized, the County can increase the mere dozens of employees trained in solar annually in the County to hundreds.

CREP-related Options for the County of San Diego

- Authorize the development of a CCA technical feasibility study
- Support enhanced customer choice through an expanded Direct Access program
- Explore the formation of a Sustainable Energy Utility "light" model similar to Sonoma County
- Support the continued expansion of Property Assessed Clean Energy (PACE) financing programs and help educate the public about the potential advantages of PACE
- Harness capital through federal bond programs and municipal bond issuance
- Explore a public-private partnership with a peer-to-peer lending entity to establish a renewable and energy efficiency specific lending program

Refer to Section 4 for further information on CCA, Direct Access, and PACE financing.

5.6. A Solar Energy Workforce Development Initiative

5.6.1. Overview

If the San Diego region is to become a hub for renewable energy production and associated job growth, the region will benefit from a clean energy workforce initiative. If prioritized, the County can increase the mere dozens of employees trained in the solar industry annually in the County to hundreds.

As the U.S. moves away from traditional fossil fuels to more solar- and wind-generated electricity, there is a concern that there will not be enough qualified solar and wind workers to meet the future demand. According to the National Association of Counties, the "skills gap" is one of the major concerns of counties in a recent national survey (NACO 2014). In contrast to an aging electric utility workforce nationwide, the San Diego region is known for having a relatively young electric utility workforce (Laitner 2014). While this bodes well for the near future, the County must consider an active pipeline of renewable energy workers for the next 35 years in order to meet the planning horizon of 2050.

Without action, there will be 340,000 fewer new jobs in the County over the next 35 years (See economic analysis in Chapter 3). This same economic analysis shows that by adopting many of the Best Practices outlined in this report, committing to renewable energy across the region, and by choosing one of four scenarios, the County can help bring between 600 and 1,300 new jobs per year (on average) to the region between 2015 and 2050. Better trained workers through a new workforce initiative can help the County keep jobs, help the industry avoid this significant cost, and help the County meet the Governor's call for 50 percent renewables by 2030.

5.6.1.1. Definition

Clean energy workforce development programs in the region are dominated by energy efficiency-related jobs (Clark 2014). Hundreds of job seekers are currently trained in the energy efficiency field, while a handful to dozens of the same are being trained for the solar field. While this is normal and based largely on supply and demand, if the County of San Diego is interested in transforming the region to a renewable energy jobs center, major changes will be needed that include new clean energy-sector strategies.

A growing number of counties, including Los Angeles County, are pursuing sector-specific initiatives that integrate workforce and economic development strategies. Importantly, this is consistent with the reauthorization of the federal Workforce Investment Act (WIA), via the Workforce Innovation and Opportunity Act (WIOA) of 2014. WIOA funds directed to the County of San Diego can be more valuable (and spent with full federal and state support) if the County directs them toward renewable energy jobs (and not just energy efficiency jobs) as part of a new clean energy sector approach. The County can work with local partners on a major, sector-driven approach to workforce development that focuses on the needs of regional employers within the renewable energy industry.

5.6.1.2. Structure and Budget (Costs)

With so much utility scale and residential solar PV expected in the region, it is worth noting what happens if the County does *not* spend time and effort on providing adequate solar training through a new workforce initiative. A March 2014 study on domestic residential rooftop solar installations estimated the cost of removal, repair, and reinstallation of poorly installed solar equipment at $2,500 to $9,500 each (Solar, Solar et al. 2014). If only 1 percent of the expected 500,000 residential installations in the U.S. over the next two years require such reinstallation, this translates to a potential $47 million financial burden on the solar industry. This financial impact can impact County of San Diego solar companies, solar job growth, and the associated emission reductions expected by the County (through the solar PV installations).

The costs of preparing a major renewable energy workforce initiative in the near-term are mostly related to the *significant* staff time required to generate support from existing and new foundational partners for the initiative. Once this network is in place, training program dollars become bigger budget items. Building support at the local, regional, state, and federal levels for redirecting money to the San Diego region for such an initiative can require months, and should not be undertaken without careful organizing.

Budgets for leading renewable energy workforce training programs range from $500,000 to $8.5 million.[34] The organizations that implemented these programs include the following: National Association of Regional

[34] The $8.5 million budget was for a three-year ARRA program that resulted in 500 newly trained solar (and energy efficiency) workers. The County should not expect the same magnitude of federal funding for stimulus purposes.

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Councils (NARC) in Washington, D.C., the Center for Sustainable Energy (CSE), the California Workforce Association (CWA), the San Diego Workforce Partnership, SDG&E, and the California Workforce Investment Board (CWIB).[35] Many of these organizations have extensive experience implementing renewable energy training programs since 2009, when literally billions of federal stimulus dollars were directed to state and local governments.

Implementation time for the programs run by the aforementioned organizations ranged from one year to three years, with average start-up times requiring three to six months. Budgets for these programs were generally divided among three categories with the following percentages:

- Staff and overhead expense: 30 percent
- Program dollar expenses: 50 percent
- Equipment and miscellaneous expenses: 20 percent

Therefore, with a hypothetical, new $5 million solar workforce development program, the County can expect to spend $1.5 million on staff and overhead, $2.5 million on program dollars, and $1 million on training equipment and miscellaneous expenses. As a result, one workforce development expert predicts that more than 300 solar workers could be trained over a one-year period. (reference: Discussion with Fred Abousleman, former Executive Director of the National Association of Regional Councils (NARC), based on his experience with the 2009-2012 Pathways Out of Poverty Program, November 2014.)

5.6.2. Application to San Diego County

5.6.2.1. Existing Context

A well-developed, extensive workforce development infrastructure already exists within the San Diego region. For example, SDG&E works with the County and the nonprofit sector on a number of market-building and skill-building programs designed to help shape the clean energy market while also training workers with specific skills needed as part of a solar or energy efficiency career path in the future. Workforce development efforts for the County are led out of the County's Office of Education, that works closely with trade schools, the community college network, and four-year colleges.

For now, there is no skills gap in the San Diego region when it comes to solar, since these jobs are usually taken by construction workers, according to Andy Hall, Vice President and Chief Programs Officer for the San Diego Workforce Partnership. However, Mr. Hall concedes that this is definitely a short-term phenomenon, and over the long term he recognizes that the infrastructure for a vibrant solar workforce that could help the County meet Governor Brown's goal of 50 percent renewables by 2050 simply is not there. His organization is very interested in establishing new solar and wind training. Hall added, "The clean energy sector is one of our top priority areas, and the authors expect to devote significant resources and time to it in coming years. The County is an important partner" (Hall 2014).

One of the primary reasons for the lack of solar job growth in the San Diego region is the fact that solar companies are training their employees in-house and at out-of-state locations, and then bringing them in to

[35] Experts within each of these organizations were contacted and asked how the average workforce development program budgets are structured and divided, what kind of implementation schedules are normal, and what types of total budget numbers the County of San Diego can expect with a major new renewable energy workforce initiative.

the region for short-term work as solar markets develop. Plus, firms like SolarCity, one of the fastest growing solar companies in the world are training employees only with company-specific job skills, which may not be portable to other companies and regions later. Solar City is known for its innovative leasing programs that dominate new solar installations; as much as 90 percent of recent solar installations in many states are set up as leasing structures (RAP 2013). Local utilities are generally not involved in solar training. The San Diego Gas and Electric (SDG&E) Company has no formal solar training programs (Brock 2014).

5.6.2.2. Recommendations

Best practices dictate collaborating with local workforce development agencies to maximize job training, partnerships with community groups, and workforce guidelines, including local hiring goals. Brandi Turner, the SDG&E Energy Innovations Center Manager of SDG&E Office of Customer Programs noted that long-term jobs on steady career paths are more likely to happen with multi-organizational collaboration (Turner 2015).

Phase II of the CREP could address the following questions:

- Where will these jobs come from?
- Where should the County focus its job training efforts?
- What role does the military play in this equation?
- What should a new renewable energy workforce initiative look like?
- How do existing workforce programs figure into a new initiative?

5.6.2.2.1. Approach Industry to Figure out Their Workforce Needs via the CREP Process

The County of San Diego can apply an Industry Competency Model to help determine where future renewable energy job skills will be needed. The competency model graphic below shows the foundation, workplace, and technical competency areas required in an industry.[36] The models can also be used as blueprints for developing curricula, performance standards, and the assessment instruments that measure the acquisition of knowledge and skills in the renewables area.

[36] A competency is the capability to apply or use a set of related knowledge, skills, and abilities required to successfully perform "critical work functions" or tasks in a defined work setting. Competency should not be confused with competence, a competency describes a behavior, but does not attempt to describe a level of performance. For more information, see the *Technical Assistance Guide for Developing and Using Competency Models: One Solution for the Workforce Development System* (2012), as used by the U.S. Department of Labor, Employment and Training Administration (ETA)

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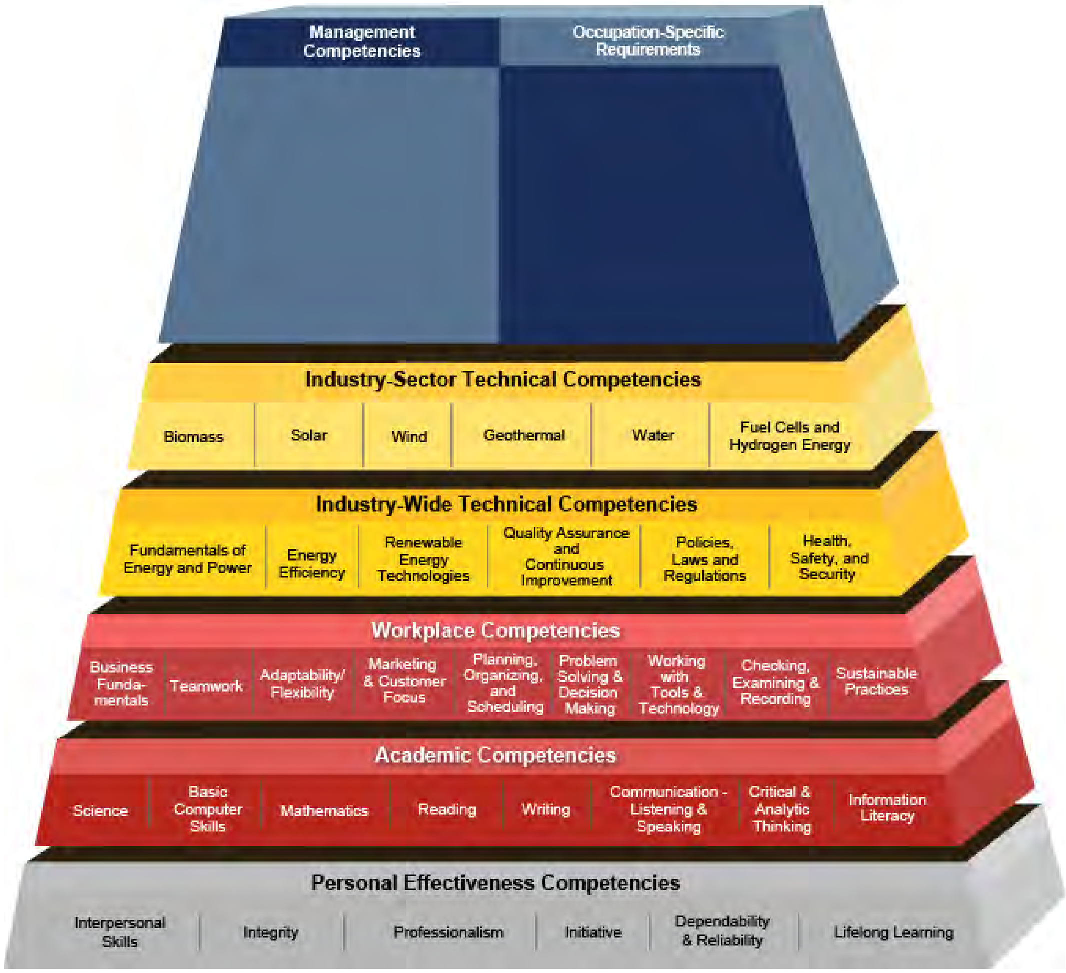
FIGURE 5-1. INDUSTRY COMPETENCY MODEL (SOURCE: THE INTERSTATE RENEWABLE ENERGY COUNCIL (IREC))



In discussions with employers and workforce development professionals, County officials will need to gauge whether the industry-wide and industry-sector technical competencies outlined in this model are actually being applied in the San Diego region. If not, the County should consider evaluating which technical competencies will be needed by regional workers for the clean energy jobs of the future. Furthermore, an Industry Competency Model must also account for mobility *within* the renewable energy field for regional workers after they start.

Phase II of the CREP could address work force development through a collaborative effort with the San Diego County Office of Education.

5.6.2.2.2. Build Upon Existing Programs

The County could adopt an approach that integrates solar job training into existing energy efficiency programs so that stand-alone solar training does not fall with fluctuating markets. Laure-Jeanne Davignon of the Interstate Renewable Energy Council (IREC)[37] suggests new strategies in the County, such as making sure that workers primarily engaged in the Heating, Ventilation and Cooling (HVAC) business and electricians are also trained on renewable energy technologies along with their primary focus (Davignon 2014). This requires a major commitment to changing the ways things are done currently, since employers cannot be expected to provide this training, or part of this training, without some assurances that future jobs will be there in the renewables field. HVAC companies and others must be convinced that solar markets will be there before they dedicate funding and budgets to expected new solar opportunities. Via the CREP, the County can change policies and create a major new renewable energy workforce initiative to show the private sector that a real commitment has been made for the long term to build the renewable energy job base in the region.

5.6.2.2.3. Partner with Community Colleges

Working with community colleges on solar training programs is another strategy the County should consider, since 80 percent of community college students are more likely to stay in the area they attend school after they graduate as compared to students who attend four-year colleges, according to Joe Sarrubi, Manager of the U.S. Department of Energy's Solar Instructor Training Network (Sarrubi 2014). Fortunately, community colleges in the San Diego region already work together through the San Diego and Imperial Counties Community Colleges Association (SDICCCA). This association can help operationalize a new regional effort involving solar and energy efficiency training efforts. New workforce development experts are actually being located in eastern San Diego County and in parts of Imperial County with the mandate to build joint County energy partnerships (Hall 2014). SDICCCA colleges are the region's largest workforce preparation providers, conferring more than 10,000 degrees and certificates each year (SDICCCA 2011).

5.6.2.2.4. Start a New Initiative

Another solution to this challenge is to bring all of the workforce development players together and design a new, one-of-a-kind renewable energy initiative. The San Diego Workforce Partnership and Center for Sustainable Energy (CSE) are two interested, capable and ready partner organizations that can help the County lead a new renewables workforce initiative through the CREP.

With a hypothetical, new $5 million solar workforce development program the County can expect to spend $1.5 million on staff and overhead, $2.5 million on program dollars, and $1 million on training equipment and miscellaneous expenses.[38]

Any new renewable workforce initiative must also be cognizant of renewable projects in the pipeline. The larger the project, the larger the economic impact on the regional community generally. Most of the jobs created around a large renewable project are created on the developer (or vendor) side. According to J.W. Postal, Vice President of SunShare, a solar developer in Colorado, typically about one-third of the local non-vendor jobs will last longer than one year (Postal 2014). These roles include operations and

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[37] Interstate Renewable Energy Council (IREC) is the organization responsible for accrediting and credentialing the majority of solar workers in the U.S.

[38] Breakdown of costs is based upon the information provided by the National Association of Regional Councils (NARC) in Washington, D.C., the Center for Sustainable Energy (CSE), the California Workforce Association (CWA), the San Diego Workforce Partnership, SDG&E, and the California Workforce Investment Board (CWIB) and their respective budgets for their workforce development programs.

maintenance, finance and accounting, and other support jobs. Local jobs (with vendors) that last less than a year are most often construction-based jobs, including labor and installation.

5.6.2.2.5. Collaborate with the Military

The County can help transition existing military technical training certifications to civilian solar opportunities. The County can also look to U.S. Department of Energy officials responsible for implementing the "Troops to Energy Jobs" initiative in 2014 for workforce-related renewable energy technical assistance.

The clean energy sector is well positioned to leverage the skills, talent, and experiences of approximately 250,000 individuals who nationally transition annually to civilian careers from active duty service (Sarrubi 2014).[39] From 2012 to 2013, the solar workforce grew in size from 119,016 workers to 142,698 full-time professionals; that same year, the solar industry reported employing nearly 13,200 veterans, or 9.2 percent of its total (IREC 2014). Many energy companies recruit veterans because they already possess the foundational skills for energy-related job competency. In addition to their intangible skills, many transitioning service members and veterans have a technical skill set gained through military courses; making today's U.S. military a highly technical force. Veterans often work with complex equipment that they were trained on and then entrusted to operate, maintain, and repair.

5.7. Build an Energy Assurance Plan (EAP)

Definition

An Energy Assurance Plan (EAP) is an emergency management plan that ensures that key assets within the community will remain operational in the event of a power outage.

Generally, successful EAPs are components of an existing or are appendices to, or addendums of, Hazard Mitigation Plans (HMPs), Climate Action Plans (CAPs), Energy Emergency Plans (EEPs), or Continuity of Operations Plans (COOPs). Local government EAPs appeared for the first time in 2009.

An Energy Assurance Plan (EAP) in the County of San Diego will:

- Ensure County "key assets" are functional when needed;
- Build critical public-private partnerships before emergency energy incidents happen;
- Gain awareness of energy dependencies and interdependencies within the County; and,
- Take firm actions to move towards energy resiliency (that will also contribute to County Climate Action Plan and Strategic Energy Plan goals).

[39] There are also 1.1 million members of the National Guard and Reserve, who are engaged in their civilian careers at the same time they serve.

CREP-Related Options for the County of San Diego

- Identify actions and renewable energy projects that can mitigate the negative impacts of energy disruption on the County's key assets.
- Continue working with SDG&E and others to identify all renewable energy generation opportunities with County facilities.
- Make the EAP a major priority within any new Regional Energy Network (REN) that the County may join.

5.7.1. Overview

5.7.1.1. Definition

An Energy Resilience Plan (ERP) is an emergency management plan that focuses on energy and makes sure that key assets within the community during a power outage are operational. As policy tools, local government EAPs are relatively new, having first appeared in 2009 (Mosley 2014).

5.7.1.2. Value Proposition & Benefits

With the County of San Diego evaluating Community Choice Aggregation (CCA) and a more active role in the energy arena in the near future, an EAP can be a great tool to familiarize County staff with how energy is used across the County and to help the County mitigate the negative impacts of energy disruption on key County assets. Key assets could be as big as an entire building (i.e., Police or Fire Station) or as small as an element within a building (i.e., communications or an HVAC system). Further, an EAP will help the County discover ways to reduce its energy demand and make its energy supply more energy resilient.

Historically, the County has relied on its energy providers to meet energy demand. In some instances, this leaves the County in the position of having all of the responsibility to provide essential services, such as traffic lights and emergency power to wastewater and water treatment facilities, but having little-to-no control over the energy resources needed to provide the essential service. The EAP is intended to bridge this gap and foster a plan to identify ways to ensure availability of energy resources.

With an EAP, the County can assert more control over the energy supply it needs in an emergency. When the primary supply of energy is disrupted in the future, the County will be able to more closely manage its own energy supply until the primary supply of energy is restored. An EAP can help the County keep the power running to key services and assets internally, such as communication and IT equipment, so that the County's role in keeping commerce moving externally is not compromised. This effectively allows the County and the region to stay insulated to a degree from man-made and natural disasters. For example, distributed generation resources that are located on County sites as part of an EAP provide an extra layer of energy security. An EAP can also help protect public health, by making sure that wastewater treatment plants continue to operate and filter waste during an emergency.

Many emergency managers will state that building partnerships after a disaster is too late. Attempting to identify who needs to be reached and working around potential obstacles to reach them (i.e., limited, or downed telecommunications equipment during a storm) will be difficult. Establishing these relationships through a CREP and an EAP in advance of an emergency will help the County anticipate actions and clarify

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roles and responsibilities prior to events; thus increasing the likelihood of a successful and efficient response and recovery (Petrow and Mosley 2013).

5.7.1.3. Function of an Energy Assurance Plan (EAP)

Since Energy Assurance planning would be new to the County of San Diego and because there are so many variables, setting Energy Assurance priority areas is a good way to focus action and identify projects. Energy Assurance priority areas can take many forms. According to Ronda Mosley, the Deputy Executive Director for Research & Government Services at the Public Technology Institute (PTI), a 2014 review of local government EAPs funded by the Department of Energy included the following priority objectives:

- Energy Efficiency
- Renewable Energy
- Energy Management
- Energy Security

Most EAPs are appendices to, or addendums of, Hazard Mitigation Plans (HMPs), Climate Action Plans (CAPs), Energy Emergency Plans (EEPs), or Continuity of Operations Plans (COOPs). As such, it could be attached to a future County CREP[40] or an existing County plan. Generally, successful EAPs are new components of another existing plan that the government already values (such as the SEP).

5.7.1.4. Structure and Budget (Costs)

The economic costs of preparing an EAP to the County are largely related to the staff time required to write a draft EAP and then to implement it. Based on experience with assisting more than 50 local governments across the country, the Public Technology Institute (PTI) suggests that it will take a County FTE six months to oversee and draft an EAP, along with minor consulting support (Burmeister, Mosley et al. 2011). Implementation of the EAP should be considered a long-term process, similar to an Emergency Management Plan or other County plan that annual or biannual updates. PTI suggests that the average cost for building a new County EAP for a county similar in size to San Diego County is $250,000, and is equally split between County staff and contractor support (Mosley 2014). Most of this cost is incurred in collecting energy-related data across the government, managing group meetings designed to achieve consensus around the EAP, and interacting with government staff from multiple departments.

5.7.2. Application to San Diego County (Recommendations)

5.7.2.1. Existing Context

The County of San Diego drafted an EAP in 2013 through a short-lived California Energy Commission CALEAP program, but decided at the time to wait until 2017 to codify it within an existing plan (X 2014). Since the draft was completed, a number of important game changers have occurred necessitating that a new EAP be drafted. Chief among these new developments is the County's exploration of a CREP, as well

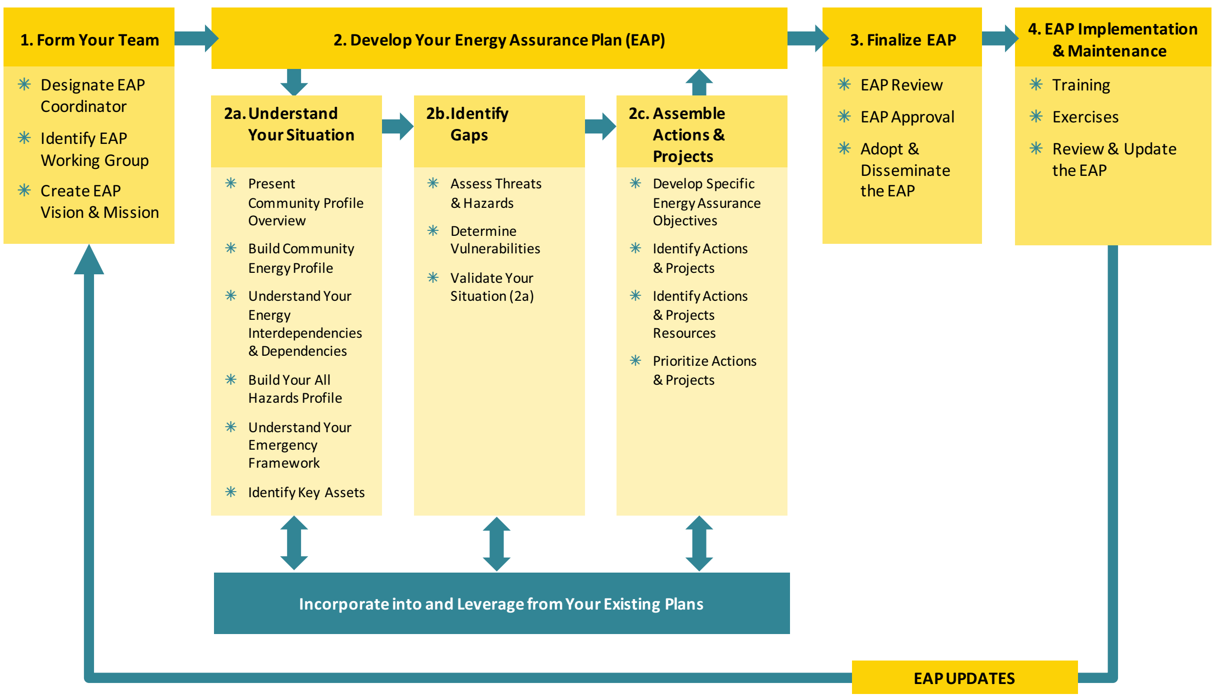
[40] The link between a CREP and an EAP can be as simple as providing solar photovoltaic (PV) back-up power to a single wastewater pump that keeps sewage from backing up into the water supply during an energy emergency, or as complex as having the County develop a microgrid project that powers dozens of County buildings through the combined use of PV, fuel cells, energy efficiency, and combined heat and power (CHP). A CREP-driven EAP/microgrid project can supply primary power 24/7 as part of day-to-day operations, as well as provide power when traditional power sources from a major utility may be unavailable due to a storm or other issue.

as the drastic drop in solar prices (for emergency power needs), the role of electric vehicles, new battery and storage technologies, and the introduction of CCA into County energy planning scenarios. Therefore, the County should consider revisiting the draft EAP, taking into account these issues and many others.

5.7.2.2. Next Steps

The following graphic[41] depicts an EAP development process that the County can use:

FIGURE 5-2. 4 Steps to Developing and Implementing an Energy Assurance Plan



Source: http://www.caleap.org

An EAP would help the County look at all energy services and uses in the County, including the providers and producers of energy supplies, the transportation or transmission of energy supplies, and the subsequent distribution of supplies to end users within the County (which are often categorized as commercial, industrial, transportation, and residential).

5.7.2.2.1. Identifying Key Assets

The first step in an EAP is usually to identify the key assets of the essential services in the community and determine their vulnerabilities. The "key assets" could be as big as an entire building (i.e., Police or Fire

[41] http://www.caleap.org/. Note: Empower team member CEG helped create this diagram and the CaLEAP website, and provided in-depth EAP technical assistance to local governments between 2009 and 2013.

Station) or as small as an element within a building (i.e., communications or an HVAC system). Typical key assets identified by dozens of other local governments are provided in Table B below (CaLEAP 2014).[42]

TABLE 5-5. Identifying Key Assets

Key Assets	Essential Services
Police stations, fire stations, paramedic stations, emergency communication transmitters	Personal safety, fire protection, 911, life-saving, life preserving,
Energy production, transmission, distribution; drinking water supply treatment plants, and pumping stations; wastewater pumping stations and treatment plants; solid waste facilities	Provide energy services to the community, supply drinking water (quantity and quality), wastewater evacuation and disposal, solid waste pick-up and transfer
Traffic intersections and rights-of-way, aviation, bus, rail terminals, and air traffic control, railroad crossings, electric rail systems	Maintain open access to and functionality of important transportation routes
Hospitals, nursing homes, mental health treatment facilities, specialized treatment centers	In- and out-patient surgery, dialysis, cancer therapy, rehabilitation and blood donation centers, emergency rooms, flight for life
Nursery schools, kindergarten, elementary schools, high schools, colleges, business and trade schools	Emergency sheltering
Day care facilities, sitter services, after school centers	May not be a key asset
Senior citizen centers, retirement communities	May not be a key asset
Homeless/transient shelters, missions and soup kitchens, youth, family, and battered person shelters, heating & cooling shelters	Emergency sheltering
Churches, synagogues, mosques, and other houses of worship	Emergency sheltering
Jails, youth detention centers	Probably not a key asset except to maintain security lock-down
Libraries, civic centers, recreational facilities	Emergency sheltering

[42] CEC CaLEAP website, accessed November 2014. In addition to identifying each key asset, also include the responsible entity, energy provider, and type.

Key Assets	Essential Services
Sports stadiums, concert auditoriums, theaters, cinemas, shopping malls, conference centers, museums, art centers	Emergency sheltering
Hotels, motels, boarding houses	Emergency sheltering
Mayor's Office, Office of Emergency Management, IT office	Communications with other political/elected/appointed leaders, access to Office of Emergencies management
Restaurants, grocery stores, supermarkets, food processing facilities	
Hazardous material handling	May not be a key asset except to guard against leakage, spillage, storage, and handing

Source: Local Government Energy Assurance Guidelines, Public Technology Institute, 2011.

5.7.2.2.2. Create EAP Coordinator Position (Full-time)

Building relationships between the County and energy suppliers and major energy users often requires a leader within the County, and can be the responsibility of one key employee, known as the EAP Coordinator. The EAP Coordinator is responsible for guiding and facilitating discussions with the planning team, and in some instances, with outside interest groups. The EAP Coordinator's ability to explain, engage, motivate, and in some cases inspire, is critically important to the overall success of the EAP. It is recommended that they brief individuals on the proposed planning process and get them involved as soon as possible in the development of the EAP. The EAP Coordinator should have a specific set of skills that will allow them to build consensus, be the EAP's primary architect, and become the internal and external champion/advocate of the EAP. Based on the expected role of the EAP Coordinator, an appropriate skill set would include the ability to:

- Build strong relationships with planning teams and outside interest groups;
- Understand and articulate complex technical energy issues;
- Identify essential service and key assets;
- Develop energy-focused projects; and
- Apply energy assurance messaging across local government departments and industries.

The messaging of energy assurance as part of, and separate from, the CREP is vital. The EAP Coordinator must be able to customize the message so all see the value and relevance in their role in the community.[43] While it is certainly a bonus, the EAP Coordinator does not have to be an expert in energy or emergency

[43] For example, the head of a city water department with stationary water pumps and miles of underground pipeline has drastically different energy assurance concerns than the head of the city transportation department who oversees the traffic light system, above-ground fuel supply routes, and operation of city fleets.

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response. It is more important that the EAP coordinator have a good understanding of the local government's capabilities and its relationship with outside governments and organizations (i.e. DOE, Cal EMA, utilities).

5.7.2.2.3. Assemble a County of San Diego EAP Working Group

The EAP working group is responsible for the development and review of the EAP. The EAP working group should be made up of the members within the County who are directly or indirectly affected by an energy outage or play a role in response and/or recovery operations.[44] The EAP working group should be kept at a manageable number.[45]

These groups often grow as the scope of the effort becomes clarified. To help manage the numbers, an EAP working group can grow and contract as necessary to address particular issues, as long as the "core" EAP working group remains intact. It is important to keep the continuity of the core EAP working group. Another option is to create EAP working group subcommittees. These subcommittees convene to discuss a particular issue and disband when the issue is resolved. The findings from the subcommittees are brought back to the core EAP working group. It is important to note that if you use this method, it is vital to provide some perspective on the EAP and allow the subcommittee to participate in the final review of the EAP.

5.7.3. Who Else Is Doing It

Chula Vista, San Jose, and Visalia were the first three California local governments to design an EAP as part of a $10 million U.S. Department of Energy-funded project that resulted in 43 new EAPs across the country since 2009.[46] Chula Vista's expertise in this area is noteworthy, and its staff expressed interest in assisting San Diego County with any subsequent efforts in this area. They should be considered resources to the County of San Diego. The following cities and counties, organized by state, have written Energy Assurance Plans since 2009 with DOE funding:

TABLE 5-6. Cities and Counties with Energy Assurance Plans

Phoenix, AZ	Windham, CT	Speedway, IN	Wilmington, NC
Tucson, AZ	Delray Beach, FL	Manhattan, KS	Newark, NJ
Chula Vista, CA	Lake Worth, FL	Louisville-Jefferson Co., KY	Hamilton, OH

[44] Historically, EAP working group members have included the following Departments: Emergency Management, Environment, General Services, Communications/Public Affairs, Fleet Management, Facilities Management, Fire Department, Police Department, Public Works, Health Services, Energy Management, Procurement, Electricity/Gas/Water Utilities, and Information Technology (IT). However, it can also be helpful to involve outside members to support your EAP working group. This could include CPUC or CEC staff, regional government leaders and some private sector organizations. It is also important to include decision-makers, subject matter experts (i.e., cyber security experts), or related personnel from relevant utilities.

[45] While there is no set number, the EAP working group has to be large enough to allow representation from a diverse cross-section of the community, but not too large as to impede the ability of the group to complete its tasks. For example, the City of San Jose, California, for example, (population, 948,000) has 13 members represented on its EAP working group (R. Mosley, personal communication, June 2014).

[46] This U.S. DOE funding was discontinued in 2013.

San Jose, CA	Palm Beach Gardens, FL	Baton Rouge, LA	Portland, OR
Visalia, CA	Roswell, GA	Boston, MA	Salem, OR
Aspen, CO	Davenport, IA	Baltimore, MD	Philadelphia, PA
Aurora, CO	Hailey, ID	Flint, MI	Heber, UT
City/County of Denver, CO	Chicago, IL	Mayville, MI	Salt Lake City, UT
Durango, CO	Hoffman Estates, IL	Columbia, MO	Virginia Beach, VA
Lakewood, CO	Peoria, IL	Asheville, NC	Casper, WY
Wheat Ridge, CO	Fort Wayne, IN	Raleigh, NC	

In addition, a number of California cities and counties started EAPs through a California Energy Commission (CEC) "CALEAP" project in 2010. These jurisdictions are highlighted on the maps below.

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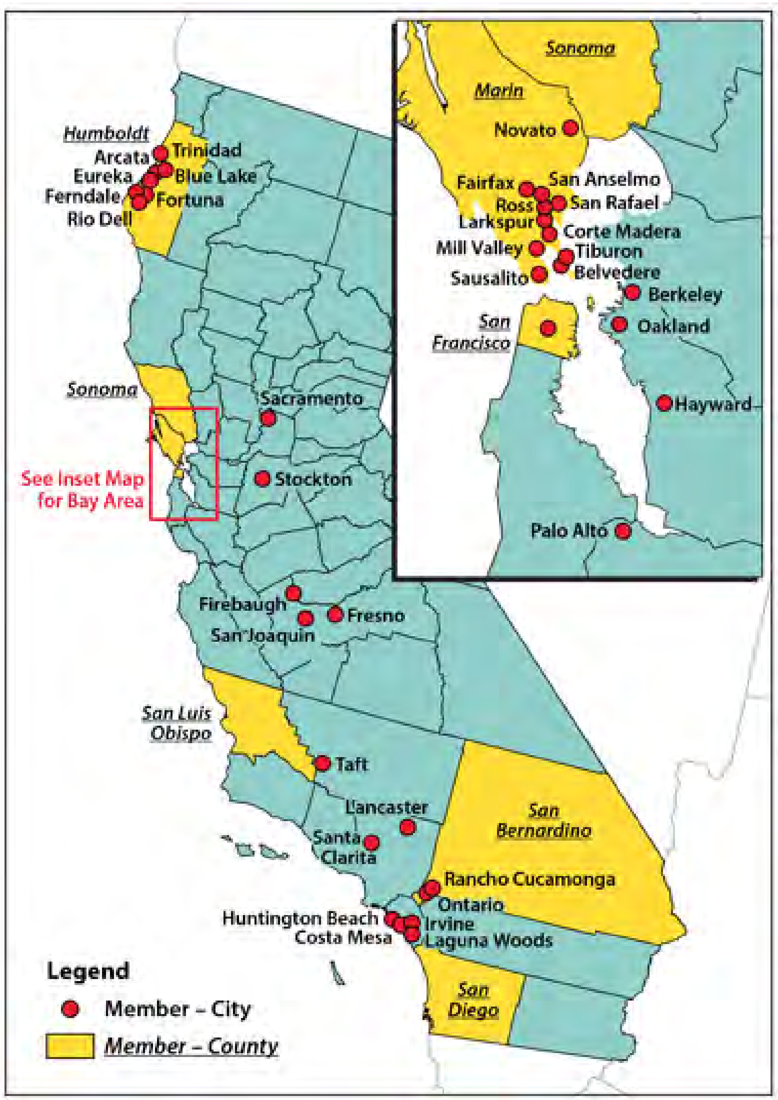
FIGURE 5-3. MEMBER CITIES AND COUNTIES OF CEC CALEAP PROGRAM



SOURCE: CALEAP MEMBER GOVERNMENTS AND CONTACTS HTTP://WWW.CALEAP.ORG/INDEX.PHP/TGP1/INS/C10

5.8. Increase the County's Percentage of Energy Derived from Various Renewable Energy Technologies

CREP-related Options for the County of San Diego

- Analyze the long-term costs and benefits of increasing the County's percentage of electricity derived from renewables to a higher percentage.
- Investigate opportunities for small-scale wind energy projects at County facilities and in the community.
- Work with the Center for Sustainable Energy (CSE) and other appropriate partners on a major new community renewable energy outreach program, aimed at meeting already published County and community goals. Involve associated national and regional industry associations and their local members in this effort to promote solar hot water work with the 29 approved solar thermal contractors that participated in the 2007-2009 pilot program, and incorporate lessons learned into the program design.
- Review the current solar hot water heater permit process and considers ways to further streamline and expedite.
- Work closely with the cities of Carlsbad and Chula Vista and discover how they were able to achieve success with solar thermal technology.

5.8.1. Overview of County Renewable Energy Goals Efforts on Renewable Energy Technologies

The County has already demonstrated success by surpassing 2009 Strategic Energy Plan (SEP) goals for the percentage of annual electricity usage through renewable energy systems. The County is capturing 2.3 percent of its annual electricity needs through a number of small PV systems at local parks and recreation centers as well as through a Power Purchase Agreement (PPA) completed in 2011 (County of San Diego, 2013).[47] These achievements have helped achieve County SEP goals of controlling utility costs, accelerating distributed generation deployment, and reducing the region's carbon footprint.

The 2013–2015 Strategic Energy Plan set a goal to "increase total energy consumed at County facilities provided by distributed generation systems from 2.5 percent to 10 percent by the end of FY 2014-2015." The County may want to consider a higher goal of at least 25 percent by 2020.

Meeting County electricity needs through renewable energy systems addresses local, regional, state, and federal emissions targets, and is one of the most basic policy options available to the County. The San Diego County region spends approximately $23 billion on utility bills (CREP TAC Presentation # 2, January 2015). Increasing the use of renewable energy technologies in more public buildings and lands helps reduce these GHGs while contributing to meeting State directives to reduce GHG's emissions economy-wide to 1990 levels by 2020, and to 80 percent below 1990 levels by 2050.

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[47] The original goal was for the County to provide at least 2 percent of its annual electricity usage through renewable energy systems by FY 2011-2012.

As with most Best Practices outlined in this report, this best practice also helps the County meet Governor Brown's January 5, 2015, announcement that he will seek to raise the renewables portfolio standard (RPS) target from 33 percent to 50 percent by 2030 (Overton 2015).

Governor Brown's proposals to reduce emissions statewide are already in the works (CALSEIA 2015, Network 2015, SEIA 2015).

- SB 350 would increase the current Renewable Portfolio Standard from 33 percent to 50 percent by 2030
- SB 32 would strengthen the current AB 32 to require the state to cut GHG emissions 80 percent by 2050
- SB 185 would require that state pension plans divest from companies with 50 percent or more of their revenues in coal mining or coal burning
- SB 189 would create a legislative advisory committee on clean energy and climate policies

A number of California cities and counties have established target dates for percentage requirements of electricity generated by renewable energy to coincide with GHG emissions reduction targets including Alameda County and the cities of San Francisco, San Jose, and Riverside. Their ambitious renewable energy generation targets are listed below in TABLE 5-7.

TABLE 5-7. Renewable Energy Generation Targets of Select CA Counties and Cities

Alameda County, CA	40 percent of electricity supplied from renewables by 2020 (Alameda 2010), reduce 2005 GHG emissions by at least 15 percent by 2020 and 80 percent by 2050 (Alameda 2010)
King County, WA	At least 50 percent renewables by 2012 and on an ongoing basis (County 2014)
City of Riverside, CA	33 percent renewables by 2020 (Riverside 2015)
City of San Francisco, CA	100 percent electricity supplied from renewables by 2020 and 80 percent reduction in GHG emissions by 2050. Zero related Greenhouse gas (GHG) emissions by 2023 (Murray 2012)
City of San Jose	100 percent renewables by 2022 for City operations and in the community (Jose 2014)

Costs for increasing the County's RPS goal to any specific percentage by a specific end-date will vary depending on the sources through which the renewable energy is acquired. Potential sources for future renewable electricity production include the purchase or lease of renewable energy technologies at county facilities (distributed generation, or DG), Consumer Choice Aggregation (CCA), Direct Access (DA), through more PPAs, or some blend of these options. (CCA, DA and PPA are presented in detail in other portions of this report).

It is useful to briefly review County efforts across five primary renewable energy technologies: wind, solar photovoltaics (PV), concentrating solar power (CSP), solar thermal, and biomass. Geothermal resources are important but largely located outside of the County (in Mexico and Imperial County) (Meisen and Black 2010). Wave and tidal energy resources are outside the scope of this report.

5.8.2. County Efforts on Renewable Energy Technologies and Recommendations

5.8.2.1. Wind

While wind technology remains very cost-effective, much of the remaining prime wind resource areas in the state are facing strong and well-organized opposition. Approximately 50 MW is currently being generated in the County at the Kumeyaay Wind Farm (Campos Indian Reservation). Utility-scale projects on prime agricultural land have met opposition in some areas of the state including the County of San Diego.

5.8.2.1.1. Benefits and Costs

The California Wind Energy Association estimates that 5,812 MW of electricity (enough to meet the needs of two million homes) is now generated statewide and that the wind resource could contribute 20 percent of the state's electricity supply by 2030 (CWEA 2014).

Installation costs of small residential turbines vary greatly depending on the specific turbine's size and height as well as permitting costs. On average, a large residential system costs $30,000, but very small systems (less than 1 kW) cost as little as $4,000. Small systems (up to 10 kW) can have a payback period of 6 to 30 years depending on the specific turbine installed, electricity rates, and use by the consumer (Yeager 2014). These costs can be reduced substantially with the 30 percent federal income tax credit.

5.8.2.1.2. Existing Wind Policies and Programs

The County's Wind Energy Ordinance adopted in 2013 (POD 10-007) amended the zoning code by categorizing wind turbines as small (less than 50 kW, up to 80 feet in height, and up to 3 towers permitted) and large (50kW and higher, height set during planning/permitting and multiple towers allowed). The ordinance also modified community plans in Boulevard and Borrego for development of wind. Community activitists subsequently filed a lawsuit against the County in June 2013 asserting the County, in part, failed to adequately comply with CEQA requirements. The case was last heard in April 2014…….. (Any insight on the status of this?). To date, that ordinance is on hold. While the State Superior Court upheld the County's Wind Energy Ordinance and Boulevard Plan Amendment in 2014, it has been appealed and is currently before the Fourth District Court of Appeals.

The County has offered building permit fee waivers since 2008 for residential small wind turbine electrical system permits. During FYs 2010-2014, only one system has been permitted, questioning both the value and the amount of the fee waivers.

5.8.2.1.3. Wind Opportunities

Small wind energy systems (1 to 10kW) are a reliable and low-maintenance way to produce electricity when sited correctly and are ideal for off-grid use (California Wind Energy Collaborative, 2014). Combined with a microgrid, small wind turbines may have ancillary benefits to the County.

5.8.2.2. Solar Photovoltaics (PV)

Electricity from solar photovoltaic (PV) system installations in the County has grown tremendously in the last decade, and a corresponding decrease in system costs has made PVs a popular option for utilities and homeowners. Homes and businesses in particular have led the way with rooftop installations as they are offered installation rebates and awarded credits to their bills through net metering policies. Some recent statistics on solar PV statewide and from within the County of San Diego:

- California has enough installed solar PV capacity to power over 1 million homes; one-half of that capacity was installed in 2013 alone (CSE 2015).

- The industry employs more than 50,000 in California (Heavner 2014).

- The County has almost 200 MW of installed rooftop solar panels in homes and businesses (CEC 2015).

5.8.2.2.1. Existing PV Policies and Programs

The County has been offering building permit fee waivers for residential systems since 2001 and is offering online permitting for residential roof-mounted systems that do not require a meter upgrade. During the first four months of FY 2014-2015, the County issued 1,935 residential (more than 80 percent through Planning and Development Service's (PDS's) on-line system) and 18 commercial solar PV permits (EDC 2014).

In San Diego Gas and Electric's territory, consumer demand for the state solar PV rebates (provided through the Center for Sustainable Energy) has been so strong that funds have been depleted and rebate applicants have been wait listed since April 2014 (CSE 2015).

The County has installed at least 16 solar PV systems on County facilities, including parks, recreation centers, and the County Operations Center (Diego 2012).

Most recently, the Board of Supervisors amended the County building code to make it easier and less expensive to install rooftop PV panels. Beginning July 1, 2015, new single-family homes are required to have conduit installed for future electrical connections to solar PV panels as well as have at least 250 square feet of south-facing roof space reserved for panel installations.

5.8.2.2.2. Benefits and Costs

Photovoltaic systems are cost-effective. According to research from Lawrence Berkeley National Laboratory, the costs of most programs that use solar photovoltaics to meet their demand are equivalent to less than 2 percent of retail rates in 17 states. Ten of those 17 states have estimated costs equivalent to less than 1 percent of retail rates.

The California Solar Initiative estimates that the typical rooftop solar PV system costs $34,800 (for a 4 kW system) and, depending on the electricity rate, consumers can expect 9 percent to 14 percent rates of return on their investment (California 2015). Customers taking advantage of the 30 percent federal income tax credit can decrease their final cost to $24,360.

5.8.2.2.3. PV Opportunities

There are still more opportunities for both the County and its residents to further increase the percentage of electricity generated from renewable energy. The County may want to consider increasing the number of solar PV installations at additional County facilities as well as leasing any available County land for a community solar, or group procurement initiative project (see the Community Solar Initiative and Renewable Energy Group Procurement Initative Best Practices discussed later in this report). Lastly, the County may want to consider expanding its consumption of electricity from solar PV through its Direct

Access agreements and Community Choice Aggregation, which are discussed in great detail earlier in this report.

5.8.2.3. Concentrating Solar Power (CSP)

The Global Energy Network Institute's 2010 San Diego Plan for 100 percent Renewable Report (Meisen and Black 2010) relied on a local group of experts for their analysis, and discovered a 2.9 Gigawatt potential for CSP in the County (mostly in Borrego Springs). The authors in this 2010 report identified three primary CSP technologies: Parabolic Troughs; Linear Fresnel Systems; and Power Towers (Meisen and Black, 2010).

5.8.2.3.1. Benefits & Costs

Concentrating solar power costs enjoy a relatively low levelized cost of electricity (LCOE) versus other technologies (Soitec 2014).

5.8.2.4. Solar Thermal

Another opportunity for the County to use more renewables is to increase the use of solar thermal technology, specifically for solar hot water heating. Solar thermal technology uses the sun's energy to heat water for homes or businesses, or to heat other fluids to produce steam for the generation of electricity. It can also power heating and cooling systems. Solar thermal systems differ from solar photovoltaic (PV) systems, which generate electricity rather than heat.

5.8.2.4.1. Benefits and Costs

Solar thermal systems can effectively reduce energy demand, primarily from burning natural gas, for residential and commercial hot water use. Solar thermal systems typically provide for around 60 percent of residential end-use demand for hot water, while saving homeowners 50 percent to 70 percent on water heating bills, and paying for themselves within 10 years in California (depending on the amount of hot water consumed and the cost of natural gas) (CPUC 2008, AMECO 2014, CSE 2015). A well-designed system can last 25 to 30 years.

The price of a solar hot water heating system depends largely upon the following variables:

- Amount of hot water needed (usually determined by the number of people living in the home)
- Size and brand of solar panel
- Roof material where the panels are mounted
- Orientation of panels
- Building code and permitting requirements

In an average home, a person uses between 15 and 25 gallons of hot water a day, which can cost $5to $25 per person every month or between $384 and $1,200 per year (AMECO 2014). The cost of a residential solar water heater can vary from $4,000 to $8,000 in California (AMECO 2014). The typical residential system in San Diego County costs $7,300 before CSI incentives (CEC 2015). The cost for commercial systems varies widely depending on size and intended use(s).

5.8.2.4.2. Existing Solar Thermal Policies and Programs

Principal barriers to greater use of solar thermal within the County are the initial installation costs and low current natural gas rates. The County participated in a California Energy Commission solar hot water pilot program between 2007 and 2009, which was administered by the California Center for Sustainable Energy (CCSE, now the CSE). The CSE remains interested in working with the County on ways to promote new solar water heating systems (Oliver 2014).

State legislation (AB 1470, 2007) authorized the creation of the California Solar Initiative (CSI) thermal incentive program and set a goal of installing 200,000 systems over ten years. Market penetration statewide over the first four years of the program was less than 5 percent (residential and multi-family/commercial sectors combined) of this goal (CPUC 2014).[48]

5.8.2.4.3. Upcoming Changes to Incentives (Effective May 2015)

Changes to the incentives and program structure were proposed by the California Solar Energy Industries Association and the CSI-Thermal Program Administrators, and were approved by the CPUC in January 2015. Under the new program the average rebate for a single-family home will increase from $2,170 to approximately $3,440, and is capped at $4,366. The impact of the new multifamily/commercial system rebates is harder to calculate because of variations in system size and use, but is expected to be approximately 30 percent higher, and the cap is increased within this sector from $500 to $800 (Sikkema 2015). Multi-family/commercial systems also benefit from accelerated depreciation schedules which offset the financial impact of an installation. Currently, the system must be rated by the Solar Rating and Certification Corporation (SRCC) to qualify for these tax benefits. Lastly, a new package of rebates will be available for pool heating systems that will provide up to 50 percent of total system costs.

These solar thermal programmatic and incentive changes are expected to take place in May 2015, and customers that requested rebates after July 23, 2014, (the date of the industry's petition) will receive an additional rebate that will supplement their original rebate (Oliver 2015). After these incentives, customers can take advantage of the federal 30 percent income tax credit on the remaining installation costs. The federal tax credit is scheduled to expire on December 31, 2016, and CSI's rebates for these systems run through December 31, 2017.

5.8.2.4.4. Solar Thermal Opportunities

The recent changes to the CSI-Thermal program mentioned earlier may increase interest in installations. Immediate solar thermal opportunities include:Consider amending the County ordinance adopted in March 2015 that requires the installation of the conduit in single-family homes for future PV panel installations to include a requirement for "pre-plumbing" of new homes for solar thermal installations as well.

- Consider streamlining the solar thermal permitting process similar to what has already been implemented for solar PV installations.
- Consult with contractors that participated in the 2007 – 2009 solar thermal pilot study about their experience and any recommendations they may have for implementing any additional programs within the County.
- Work with builders to examine how solar thermal fits into a future County-led Zero Net Energy (ZNE) buildings initiative.
- Encourage builders to incorporate solar thermal systems into new homes and evaluate related costs and benefits.

[48] The California (CSI) statewide database of solar thermal systems identifies a total of 3,900 single family and multi-family/commercial installations across the three major investor-owned utility (SCE, SDG&E and PG&E) service areas.

- Identify opportunities to install more solar thermal systems at County facilities

5.8.2.5. Biomass

Energy from biomass is produced by the burning or the decomposing of organic matter. Typical biomass resources include forest wood; construction waste; agricultural and food processing waste, and municipal solid waste; landfill gas-to-energy; waste water treatment; and animal and food waste digestion. It is no surprise that biomass energy has been developed much more in northern and central California due to available natural and agricultural resources in close proximity to population centers.

5.8.2.5.1. Biomass Activity in California

According to the California Energy Commission, a total of 82 biomass power plants are in operation in the state with a combined capacity of 1,117 megawatts (CEC 2015). Solid waste resources power over 40 percent of the aforementioned biomass power plants, the closest of which is the Greenleaf Desert View facility in Mecca in Riverside County.

5.8.2.5.2. Biomass Opportunities

Opportunities for biomass energy resources in the County of San Diego are limited to municipal solid waste-to-energy and landfill gas applications as there is little to no agricultural (crop or animal) waste resource. The Global Energy Network Institute suggested that the County of San Diego had 72 Megawatts of landfill gas capacity potential, 3 to 5 Megawatts of (limited) forestry wood waste capacity potential, 40 to 100 Megawatts of urban wood waste capacity potential, and negligible agricultural waste capacity potential (Meisen and Black 2010).

The County may want to consider collaborating with its incorporated cities to determine if construction and municipal solid waste facilities are an option for electricity generation. Likewise, the County may want to consider revisiting available biomass resources and biomass-to-energy plants.

A recent California Energy Commission report highlights a number of biomass plant issues including volatility of vehicle fuel costs for transportation, and whether generating plants can achieve long-term contracts with suppliers (CEC 2015). An earlier draft report estimated that in addition to the costs of transporting biomass fuel resources to a waste-to-energy and/or electricity generation facility, the costs of biomass applications are expected to rise between 2.5 to 6 ercent over the next decade entirely because as electricity generating facilities they would still need to purchase emissions credits as fossil-fueled power plants do (CEC 2014).

5.9. A Renewable Energy Group Procurement Initiative

Definition

A renewable energy Group Procurement Initiative (GPI) is a regional, multi-agency collaborative purchase of renewable energy equipment for public agency facilities (e.g., city halls, fire stations, libraries, community centers) such as rooftop solar photovoltaic (PV) panels.

Renewable energy procurement initiatives benefit participants through economies of scale; volume discounts, shared costs, and shared resources. Group procurement of renewable energy allows the County and other public entities to address the challenges facing renewable energy adoption, including resource limitations and lack of expertise, while leveraging collaborative procurement to lower costs and negotiate more competitive contract terms (World Resources Institute, 2011).

CREP-Related Options for the County of San Diego:

- Establish a relationship with government and private sector leaders of the Silicon Valley Renewable Energy Project (SV-REP) and research the costs and benefits and lessons learned from its Group Procurement Initiative experiences
- Conduct a feasibility study of a renewable energy Group Procurement Initiative under Community Choice Aggregation (CCA) scenarios
- Add a Group Procurement Initiative as an early potential project for the potential new Regional Energy Network (REN) under discussion
- Analyze how a Group Procurement Initiative would work within a County-led microgrid project
- Encourage SANDAG to pursue a Group Procurement Initiative for its member jurisdictions and local renewable energy industry leaders
- Evaluate the feasibility of including Tribal members in a new County-led Group Procurement Initiative

5.9.1. Overview

California counties such as Santa Clara, Alameda, Contra Costa, and San Mateo and municipalities such as Cupertino, Menlo Park, Oakland, Berkeley, and Mountain View have successfully utilized GPI as a way to accelerate regional clean energy adoption.

The Silicon Valley Renewable Energy Project (SV-REP), led by the Joint Venture Silicon Valley Public Sector Task Force and Santa Clara County, was California's first large-scale public renewable energy procurement initiative.[49] It was built on the private sector's pioneering Collaborative Solar Project (TCSP), and led by the World Resource Institute. The EPA Green Power Partnership endorsed the SV-REP as a model for increasing the country's clean energy supply.

5.9.1.1. Definition

A renewable energy Group Procurement Initiative (GPI) is a regional, multi-agency collaborative purchase of renewable energy (such as rooftop solar PV panels) for public agency facilities (e.g., city halls, fire

[49] Specific project details are included in the last section of this best practice.

stations, libraries, community centers). Purchased in bulk, renewable energy technology is installed at numerous chosen installation sites (Heeter and McLaren 2012). The purpose of a GPI is to put more renewable energy power on the electricity grid. The GPI approach has been successfully adopted and advocated by numerous counties, municipalities, nonprofits, and for-profit entities (Donalds 2014).

5.9.1.2. Value Proposition & Benefits

One of the most obvious benefits of a new renewable energy procurement initiative is the ability to obtain significant discounts when purchasing products and services in bulk. Group purchasing can also lower transaction costs, staff time, organizational burden, and reduce the redundant efforts by multiple stakeholders.

A GPI maximizes the purchasing power of governmental entities for numerous installations, alleviating the need for negotiating (often smaller) projects on a case-by-case basis. Participating in a GPI lowers the risk and project costs for each participant. Large projects also tend to be more interesting to vendors, thereby attracting quality vendors that might not otherwise be interested in a smaller project. More competitive bids can also mean potentially better pricing. Also, depending on how the project is financed and the size of the project, the end users of the renewable energy can potentially benefit from lower energy costs and/or lower taxes.

According to the World Resource Institute's 2011 study[50] of SV-REP and TCSP, quantifiable benefits from utilizing a GPI included the following:

- 10 percent to 15 percent reduction in energy cost, in comparison to individual projects;
- 75 percent reduction in transaction and administrative time for GPI participants; and
- More competitive contract terms.

California County staffs involved in GPIs maintain that renewable energy procurement initiatives are relatively inexpensive to start and generate significant economic benefits, including in some cases tens of millions of dollars in new local economic activity, hundreds of jobs, and reduced electricity costs.[51]

Larger projects will also have a bigger impact on the local economy through direct spending and economic stimulation, as well as workforce development. Larger projects also have a greater environmental impact, helping to reduce human-induced climate change and to meet community environmental goals.

5.9.1.3. Components of a Group Procurement Initiative

5.9.1.3.1. Ownership

Through a GPI, a third party generally owns the property. A third party private sector vendor typically constructs and owns the renewable technology, which is solar photovoltaics (PV) in most cases. In a GPI, government staff negotiates the terms of the energy supply with an energy provider.[52] A government entity

[50] For a more complete read of the two case studies, see WRI's report Purchasing Power: Best Practices Guide to Collaborative Solar Procurement (2011). The report is complete with a 12-step process with detailed instructions and sample RFP and bid documents.

[51] Matt's TAC meeting comments, meeting number two.

[52] A GPI is just one of several ways public entities can procure electricity from renewable energy technologies. With the Community Choice Aggregation (CCA) model, the CCA management team negotiates final project costs and implementation time tables.

will typically purchase the power produced from these sources. Some governments can install the technology directly on their own property and use the energy produced from it, while other local governments may not need the power but can sell it to those who do.

5.9.1.3.2. Participants and Internal Leadership

Establishing a new GPI requires a collaborative effort among numerous stakeholders and participants. In this approach, participants are defined as the public agencies buying the renewable energy technology. Participants in past projects have included counties, municipalities, and districts. Site hosts have included hospitals, community centers, libraries, fire stations, and schools. Because regional collaborative teams often become large, complex, and operate out of multiple locations, strong leadership and project management are imperative.

San Diego County can consider the three-tiered leadership team that Alameda County developed for its GPI project. The leadership team consisted of conveners, a lead agency, and a steering committee.

- **Conveners** are responsible for coordinating the project and outreach to the outside stakeholders. Conveners bring the stakeholders together, facilitate communication, and protect the stakeholders' interests. While it is recommended that the conveners have interests in renewable energy and economic development, generally it is advised that they should not have any financial interest in the project. Conveners are often renewable energy and economic development nonprofit organizations.

- The **lead agency** is a participant that has the motivation and capability to purchase the renewable energy technology and sees benefit in both developing a collaborative project and taking a leadership role for its own financial benefit, as well as for the benefit of the region. The lead agency leads the procurement and purchasing process and acts as an intermediary between the conveners and the other participants.

- The **steering committee** is a local leadership team that oversees the project and provides guidance and relevant regional input. The committee is comprised of municipal government staff, business development non-profits such as the local Economic Development Corporation, interested organizations, and people with renewable energy project experience.

Participants might also find it useful to employ technical, financial, and legal consultants if the team does not have certain needed skills or experience. Consultants have been used to assess technology and vendors, assess site feasibility and site bundling, analyze the project economics, design project financing, evaluate bids, manage procurement, and to manage the legal aspects of the project.

5.9.1.3.3. Vendors

Vendors are the for-profit companies providing, building, and installing the renewable energy technology.[53] Large projects tend to attract more vendors, which can be beneficial for competitive bidding and for ensuring project quality. Large projects can also involve the participation of multiple vendors. Vendors can be selected and matched by installation type or site bundling. As a way to reduce vendor risk while employing both large national and small local vendors, the county can bundle the installation sites per

[53] Examples of vendors in the County of San Diego include Solar City or Soitech for a solar PV projector and Vestas for a wind project.

vendor. Strategic site bundling is a process by which installations are grouped by size, installation characteristic, and proximity. This approach allows for the ideal vendor to be matched to the ideal installation project and site. Depending on the project, each bundle contains a certain number of installation sites, grouped accordingly. Past GPI projects have found value in using national vendors for their expertise and capability for the larger installations, and local vendors for the smaller installations (Bloede 2014). As part of this Best Practice, the lead agency will release a Request for Information (RFI), so vendors can market their benefits and strengths appropriately.

5.9.1.3.4. Workforce Development

Most of the jobs created around a large renewable project are created on the vendor side. Of the non-vendor jobs, typically about one-third of the local jobs will last longer than one year (Bloede 2014).These roles include operations and maintenance, finance and accounting, and other "back office" support jobs. Local jobs that last less than a year are most often construction-based jobs, including labor and installation. Andy Hall, Director of Adult Programs for the San Diego Workforce Partnership, reported recently that most short-term solar-related jobs are taken in the San Diego region by unemployed construction workers, effectively cancelling any skills gap that might occur otherwise, for now (Hall 2014).

5.9.1.4. Structure and Budget (Costs)

5.9.1.4.1. Cost of GPI Initiation and Coordination

While the cost of a GPI is contingent on the size and complexity of the project, initiating one can be relatively inexpensive for a county. The best estimate of initiating and coordinating a project is 1/2 FTE for the first three months, then 10 hours per month for the remaining one to three years (Bloede 2014). Without considering the technology capital costs and the time spent by county employees to implement a larger renewable energy GPI project, additional costs can include technical, financial, and legal consultants to ensure the success of the project and protect the interests of the county.

5.9.1.4.2. Financing A GPI Project

Aside from the County of San Diego owning the renewable energy technology outright, one of the most common ways to finance a larger renewable energy GPI project in the County is through a power purchase agreement (PPAs). A PPA is a funding mechanism in which a third-party developer finances, owns, operates, and maintains the renewable energy generating technology for the County. While the host (County) would not own the power generation, it benefits from a long-term, stable, low-cost, clean-energy contract. PPAs are ideal for cash-poor participants, as cash is not required upfront nor is the participant required to pay for operations and maintenance. The downside is not having the long-term economic benefit of ownership.

Other financing options were discussed in detail in this report (Section 4) and can include cash, low-interest loans (private and public), grants, and government issued bonds.

5.9.2. Application to San Diego County (Recommendations)

5.9.2.1. Existing Context

The GPI approach has been successfully adopted and advocated by numerous counties, municipalities, nonprofits, and for-profit entities (Donalds 2014).[54] California counties such as Santa Clara, Alameda,

[54] The Association of Bay Area Governments manages "ABAG POWER" (ABAG Publicly Owned Energy Resources), a separate joint powers agency that serves as a non-renewables GPI. ABAG POWER's primary goal in starting the program more than a decade ago was to conduct pooled purchasing of natural gas and electricity on behalf of local governments

Contra Costa, and San Mateo and municipalities such as Cupertino, Menlo Park, Oakland, Berkeley, and Mountain View have successfully utilized GPI as a way to accelerate regional clean energy adoption.

5.9.2.2. Next Steps

Executing a successful collaborative GPI is dependent on good leadership and regional support. Multiple organizations will have to step forward and lead the effort.

- If the County participates in a Regional Energy Network (REN) in the future, the REN is an ideal convener for a GPI. These organizations will be required to have vision, dedication, and be willing to work hard to see the project through. Regionally, there must be a strong interest and commitment among all the participants in acquiring renewable energy.
- It is crucial for the County to collaborate with local workforce development agencies to maximize job training partnerships with community colleges and related groups that focus on long-term career paths and industry-recognized, portable credentials.

5.9.3. Who Else Is Doing It

The following table outlines the counties and cities that have participated in a collaborative renewable energy GPI initiative. The Silicon Valley Renewable Energy Project (SV-REP), led by the Joint Venture Silicon Valley Public Sector Task Force and Santa Clara County, was California's first large-scale public renewable energy procurement initiative. It was built on the private sector's pioneering Collaborative Solar Project (TCSP), and led by the World Resource Institute. The EPA Green Power Partnership endorsed the SV-REP as a model for increasing the country's clean energy supply. The Renewable Energy Procurement (R-REP) project that started later improved upon the lessons learned during SV-REP. The two projects, SV-REP and R-REP, are the largest multi-agency procurements of renewable energy in the country to date.[55]

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and special districts that voluntarily join a Pool. ABAG POWER was principally interested in aggregating local government loads only. The Pool is currently purchasing natural gas for 39 local governments and special districts in the Bay Area. The goals of the natural gas purchasing pool are price stability and cost savings. The Program attempts to provide gas procurement services for less than the equivalent services provided by the default provider, the PG&E Company. ABAG POWER used to have an electric aggregation program. However, in September 2001 the California Public Utilities Commission (CPUC) suspended all new electric aggregation programs (ABAG).

[55]JVSV. (2015). "Renewable Energy Procurment (REP)." from http://www.jointventure.org/index.php?option=com_content&view=article&id=1108&Itemid=727.

TABLE 5-9. Renewable Energy Procurement Initiatives

Projects	Participants	Technology	Mega Watts[56]	# Installation Sites	Economic Benefits
TCSP The Collaborative Solar Project (2008-09)	Hewlett Packard, Intel, Staples, Wal-Mart in California Convener: World Resources Institute (private sector only collaborative)	Solar PV	6.2-8.0 MW	19	N/A
SV-REP **Silicon Valley Renewable Energy Project** (2009-12)	County of Santa Clara, Cities of Milpitas, Cupertino, Morgan Hill, Pacifica, Mountain View, Los Gatos, Santa Clara Valley Transportation, South Bayside Waste Management Authority, Convener: Joint Venture Silicon Valley Public Sector Task Force (reps from 50 Silicon Valley cities)	Solar PV	14.4 MW	70	$70M in local economic activity and 300 jobs created
R-REP **Regional Renewable Energy Procurement** (2011-14)	Counties of Alameda, Contra Costa, and San Mateo, Cities of Berkeley, Cupertino, Emeryville, Foster City, Fremont, Menlo Park, Mountain View, Oakland, Redwood City, Richmond, and Walnut Creek, Alameda County Fire Department, Castro Valley Sanitary District, Central Contra Costa Sanitary District, Hayward Area Recreation and Park District, Berkeley Area Recreation and Park District, Conveners: Joint Venture Silicon Valley and Contra Costa Economic Partnership	Solar PV, solar thermal, and fuel cell	20-50 MW	186	$200M plus in local economic activity and 839 jobs created

[56] A megawatt is a unit of measuring power that is the equivalent of one million watts. One megawatt is equivalent to the energy produced by 10 automobile engines. A typical power plant can generate 1,000 megawatts CEA. (2010). "What is a Megawatt and a Megawatt-Hour." Solar Resources, from http://www.cleanenergyauthority.com/solar-energy-resources/what-is-a-megawatt-and-a-megawatt-hour/.

5.10. Participate in the Creation of a New Regional Energy Network (REN)

Definition

A Regional Energy Network (REN) is a formal collaboration between local governments, in which they act as energy efficiency program administrators. A REN is eligible to design and implement energy efficiency programs, and can submit proposals directly to the California Public Utilities Commission (Local Government Commission, 2012). REN programs are designed to *supplement*, not supplant existing efforts of investor-owned utilities (IOU).

There are currently two official pilot RENs in the State of California, the BayREN and the SoCalREN.

CREP-Related Options for the County of San Diego

- Approach the CPUC as a third pilot REN as planned with SANDAG as lead, but also evaluate opportunities for a new County-led renewable energy focus as supplement.
- When developing the REN, identify opportunities for the County to receive renewable energy program funds through the organization separately (while keeping with the spirit and intent of the new REN).
- Exclude specific renewable energy programs that the County is already pursuing from the REN (i.e., the County may want to lead on specific programs and this is one way to help guarantee that possibility).
- Continue to participate in REN development opportunities in the San Diego region.

5.10.1 Overview

First introduced in California in 2012, Regional Energy Networks (RENs) were designed to give local governments more flexibility and independence in managing rate-payer funded energy efficiency programs. The CPUC requested proposals from local groups to submit applications for two pilot RENs in the state in May 2012. Proponents argued to the California Public Utilities Commission that RENs would lead to an increase in total energy savings by increasing the participation and influence of local governments, including those that have traditionally not participated in utility-sponsored programs.

The CPUC provided these groups with the opportunity to demonstrate their models of managing local energy programs beyond what they could traditionally do through Local Government Partnership (LGP) programs. The LGP is a statewide program funded through the CPUC, in which local governments sign contracts with their investor-owned utility to implement energy efficiency programs over this time period as part of the LGP.[57] For 2013-2014, SDG&E provided more than $13 million in funding support for five Local Government Partnership programs, included the County of San Diego, City of San Diego, City of Chula Vista, the Port of San Diego, and the 16 additional municipalities that SANDAG offers services to (CPUC 2014).

Though San Diego does not have a REN, it is not a newcomer in regards to regional energy planning. San Diego had one of the first regional energy offices in the country, the San Diego Regional Energy Office. First formed in 1996,

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[57] Between 2009 and 2012, more than 3.1 billion in ratepayer funds were directed to energy efficiency programs, including the LGP. Report to the San Diego City Council: The CPUC Local Government Partnership Program, October 28, 2009.

the San Diego Regional Energy Office served primarily as the strategic energy planning arm of the San Diego Association of Governments (SANDAG). It later became the California Center for Sustainable Energy in 2007 to reflect a growing involvement throughout the state.[58]

5.10.1.1 Definition

A Regional Energy Network (REN) is a formal collaboration between local governments in which they act as energy efficiency program administrators. A REN can submit proposals directly to the California Public Utilities Commission (CPUC), and are eligible to design and implement energy efficiency programs (Local Government Commission, 2012). Importantly, in May 2012 the CPUC agreed to fund two pilot regional energy networks (RENs) in 2013-2014, the BayREN and the SoCalREN.

These REN pilot programs supplement (but do not replace) existing utility programs, and they are designed to do the following:

- Leverage local and regional expertise and resources;
- Serve as regional incubators for innovative programs;
- Reach markets not covered by existing programs; and
- Demonstrate their success for broader adoption in the future.

5.10.1.2. Value Proposition & Benefits

The national trend toward regional energy planning over the last two decades involved local governments attempting to gain more control of not only their energy generation sources but also the management of energy programs run by investor-owned utilities (IOUs) in their territory. The stakes are high: California's three major IOUs spend nearly 1 billion dollars annually on energy efficiency programs (CPUC 2014).[59]

Both the SoCalREN and BayREN projected deeper energy efficiency savings through their programs as compared to IOU Local Government Partnership (LGP) programs. Higher savings projections were favorable in both RENS' successful funding efforts as the CPUC is very interested in minimizing duplication with existing IOU energy efficiency programs. REN programs are designed to *supplement*, not supplant existing IOU efforts, which the County should keep in mind.

Regional energy organizations withstood a better chance of receiving local government federal stimulus dollars exceeding $3.2 billion distributed between 2008 and 2010 (Colorado Energy Group 2012).

The proposed benefits of a Regional Energy Network include the following:

- Effective, formal platform for multiple local government energy programs that benefit from regional consistency and scale;
- Potential for more renewable energy- and energy efficiency-related funding for the County;

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[58] The Center for Sustainable Energy dropped "California" from its name in 2014 to reflect an expanding role throughout the country in supporting the adoption of clean and renewable energy technology.

[59] The CPUC approved $1.1 billion dollars for the 2013-2014 energy efficiency budgets of 5 four IOUs (SCE, SCG, PG&E, and SDG&E) and 2 RENs (SoCalREN and BayREN). Each utility presented its 2015 energy efficiency portfolio filings at Phase I of Rulemaking 13-11-005 Workshop on Program Administrators' Proposed 2015 Energy Efficiency Portfolios on March 17th, 2014. For individual presentations, visit www.cpuc.ca.gov.

- Potential to raise energy funds outside of traditional IOU channels with greater ease;
- More efficient use of County energy staff time (essentially requiring less hours for the same or greater impacts);
- Future dividends from goodwill generated and peer exchange benefits;
- Formalize the County's commitment to energy-related goals and objectives related to important initiatives such as the CREP, the Strategic Energy Plan (SEP), and the Climate Action Plan (CAP) among others;
- Bring more best practices and local innovation into the County from increased interaction with other local governments;
- Carry an independent, strong voice that may be taken more seriously at the state or federal level;
- Less duplication among jurisdictions and stretching limited energy-related dollars farther; and
- County can help develop governing structure and goals through early, active involvement in REN establishment.

5.10.1.3. Function of a REN

The two pilot RENs are administered by regional planning agencies and council of governments (i.e., ABAG and SCAG).[60] Like IOUs, RENs are subject to oversight by the CPUC in requesting authorization for their energy efficiency budgets. BayREN and SoCalREN will need to demonstrate cost-effectiveness in order for the CPUC to consider extending RENs beyond the pilot stage. RENs are increasingly involved in Climate Action Plan (CAP) and related program implementation, especially energy efficiency programs.

The 2012 CPUC decision advised that any proposed REN pilot proposal should meet the following criteria:

- Demonstrate that any proposed REN represents a broad geographical area that encompasses a variety of demographic characteristics with a depth and breadth of coverage toward its energy efficiency program goals and objectives; and
- Demonstrate that any proposed REN serves as a deep retrofit program that will achieve deep energy efficiency savings.

5.10.1.3.1 Further REN Criteria and Programming

The 2012 CPUC decision that created two pilot RENs specified five desirable energy efficiency program criteria to be included in a REN. All five of these criteria also could figure prominently in a CREP, and may be integral parts of a REN application:[61]

- Leverage additional state and federal resources so that energy efficiency programs are offered at lower costs to ratepayers;

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[60] BayREN is set up with ABAG as the fiscal agent and contractor. The Coordinating Committee includes representatives from the nine counties that BayREN serves. Whereas the Coordinating Committee is strictly concerned with governance, the Technical Executive Committee is responsible for programmatic, regulatory, and reporting activities. These two committees are also a platform for sharing information and knowledge among the participant counties and cities of BayREN (BayREN, 2014).

[61] The authors assume that any REN application will be led by SANDAG, and not the County.

- Address the water/energy nexus;
- Develop and deploy new and existing technologies;
- Address workforce training issues; and
- Address hard-to-reach customer segments, such as low- to moderate-income residential households and small- to medium-sized businesses. (Meis 2012)[62]

Programs run by the two California pilot RENs currently include:

- Revolving (energy) loans;
- Education and outreach programs;
- Technical assistance;
- Marketing support;
- Energy code compliance;
- Green building certification;
- Low- and moderate-income energy efficiency;
- Multifamily buildings;[63]
- Bundled residential retrofit incentive programs; [64] and
- Workforce training programs.

5.10.1.4. Structure & Budget (Costs)

To help County of San Diego officials with REN discussions, the budgets for both REN pilots are provided below.

TABLE 5-10. SoCalREN and BayREN Budgets (2013-2014)

SoCalREN Projected Totals of 4 Subprograms, by Calendar Year	2013	2014	Total
Admin ($)	1,954,945	1,954,945	3,909,890
General overhead ($)	0	0	0
Incentives ($)	118,039	118,039	236,078

[62] Central California Local Government Partnership Presentation, "Regional Energy Network Overview," Kate Meis, Local Government Commission, September 2012.

[63] As of January 2015, the BayREN Multifamily program reported 8,384 completed units, totaling $6.2 million in rebates (BayREN, 2015). Visit www.BayREN.org for monthly program update reports.

[64] BayREN administers the Energy Upgrade California Home Upgrade and the Advanced Home Upgrade Assessment across the nine counties of San Francisco Bay Area (BayREN, 2015).

Direct Install Non Incentives ($)	13,620,923	13,620,923	27,241,846
Marketing & Outreach ($)	2,706,256	2,706,256	5,412,512
Education & Training ($)	0	0	0
Total Budget	**22,400,164**	**22,400,164**	**44,800,328**

Source: (SoCalREN 2014)

BayREN Projected Totals of 4 Subprograms, by Calendar Year	2013	2014	Total
Admin ($)	786,502	793,528	1,580,030
General overhead ($)	0	0	0
Incentives ($)	1,650,450	6,248,250	7,898,700
Direct Install Non-Incentives ($)	5,489,429	6,652,011	12,141,440
Marketing and Outreach ($)	1,968,790	1,660,790	3,629,580
Education and Training ($)	656,643	661,357	1,318,000
Total Budget	**10,551,813**	**16,015,937**	**26,567,750**

SOURCE: (PG&E 2012)

5.10.1.4.1 Challenges to Creating a REN

Getting all members of the REN behind a new initiative can require extensive time and political capital.[65] Pressure to join and/or participate in programs supported by other local jurisdictions is likely to be more intense, thus making it harder for the County to dissent without losing political capital. It will take significant time to develop program implementation plans that all parties, and the CPUC, agree to in the beginning. The SoCalREN was developed after two full years of collaboration between governments and others in the REN process. The BayREN and SoCalREN are pilots; there is no guarantee that they will be around in the future. Therefore, a huge amount of labor could be utilized setting up a REN only to have the CPUC decide to abandon the concept.

San Diego County would need to conduct comprehensive analysis of what the REN organizational and governing structure would be, as well as program areas and goals. If structured like the other two California RENs, renewable energy programs would be outside the focus of the organization. Existing RENs

[65] Though the CPUC ("the Commission") began accepting proposals in May 2012, the configuration of governments that formed BayREN originally coalesced for Energy Upgrade California in 2010. Funded by the American Reinvestment and Recovery Act (AARA) until March 2012, this coalition did not receive formal approval by the Commission until late 2012 (BayREN, 2014).

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currently target only energy efficiency and do not address opportunities to advance renewable energy. An extra administrative burden can be expected for REN staff, since accountability to the CPUC for energy programs is likely to be more time-consuming and demanding than under the existing LGP. Showing the CPUC that REN programs are cost-effective and meet identified energy savings and emissions reductions will likely be a more labor-intensive process for municipal REN proponents (and/or SANDAG were it to house the REN) than that currently required by SDG&E through the LGP.

In the short term, existing multi-jurisdictional energy projects and programs would probably need to be reshuffled, and reorganized. This may result in delays, duplication, and/or indecision at times. Furthermore, the existing LGP program may be adversely impacted; the County should take steps to evaluate exactly what components of the LGP it wants to see remain (or emulated through the REN) after the new REN is established. The REN may slow down decision-making processes within the County in the long term, since an extra layer of bureaucracy has been created. A REN can be an extra buffer between citizens and government, perhaps providing an unnecessary extra layer of bureaucracy between the County and those it serves.

Perhaps most importantly, the proposed REN involving San Diego County would be the only one-county REN in the state. As a result, a substantial administrative or financial burden may be placed upon the County. Given the smaller proposed scale of this new REN proposal, the benefits and costs need to be carefully analyzed by the County.

5.10.2 Who Else Is Doing It

The BayREN is run by the Association of Bay Area Governments (ABAG) and consists of the nine San Francisco Bay Area counties (Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, Solano, and Sonoma). BayREN was awarded $26 million to expand the single-family Energy Upgrade California program, implement a comprehensive multi-family building energy efficiency program, and oversee programs for single and multi-family buildings, as well as provide codes, standards enforcement, and training programs.

The SoCalREN is run by the County of Los Angeles, and received $41 million to expand the Energy Upgrade California program and to develop energy efficiency financing programs, as well as to expand the existing Southern California Regional Energy Center (SoCalREC) Pilot to the entire region. The SoCalREN region includes Los Angeles, Orange, Ventura, Santa Barbara, Riverside, San Bernardino, Kern, Tulare, Inyo, and Mono counties.

Please note that these two RENs only manage IOU energy efficiency programs, and are not involved in IOU renewable energy programs typically.

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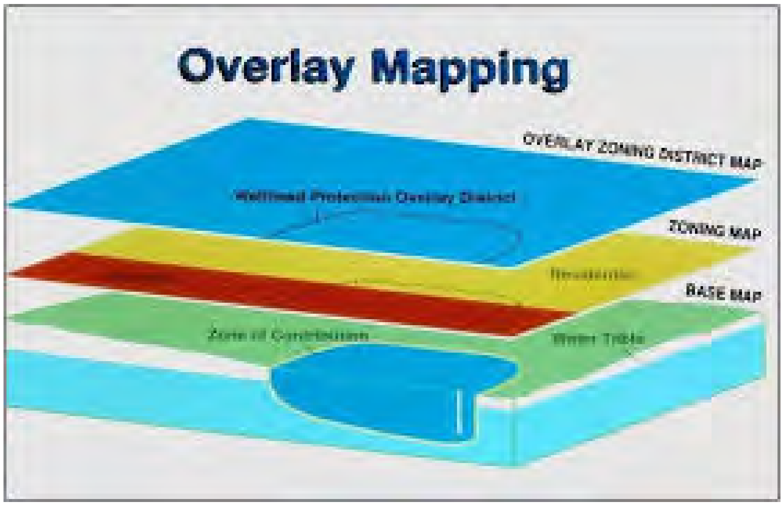
5.11. Renewable Energy Overlay / Combining Zones



Definition

Overlay zoning is a regulatory tool used to expedite the planning process so that renewable energy project construction can occur more expediently. Implemented by amending the existing zoning code, an overlay zoning ordinance provides a supplemental layer of regulations. A special zone is placed over the existing base zone(s), and identifies additional regulations for the purposes of renewable energy development. The overlay district can share common boundaries with the base zone or cut across base zone boundaries.

Energy overlays zones are common in other states, saving significant time and expense, and adding certainty to the permitting process for both developers and government. Advocates for renewable energy overlay zones also include wildlife organizations calling for "smart from the start" renewable energy development (Kelly and Delfino 2012).

CREP-related Options for the County of San Diego

Criteria for delineating a renewable energy overlay zone must be straightforward and align with the County's various renewable energy and land use goals. The steps to develop a renewable overlay zone are:

- Define the purpose of the overlay zone district (supporting renewable energy development);
- Identify the areas that make up the overlay zone district; and
- Develop specific rules that apply to the identified overlay zone district (specify the streamlined permitting process, if applicable, and expectations of the developers and the County).

5.11.1. Overview

5.11.1.1. Definition

While the concept of an overlay zone has been used for many years for a variety of land use planning activities, its use for renewable energy development planning is relatively recent (Commerce 2011).[66] Overlay zoning is a regulatory tool used to expedite the planning process for renewable energy project construction.[67] To be certain, overlay zones can help speed-up the permitting process by saving time for both developers and County staff. However, developers will still need assurance that their submittals meet requirements of underlying zones. Without this feedback, overlay zones can have the opposite effect on developers by creating more administrative requirements.

Implemented by amending the existing zoning code, an overlay zoning ordinance provides a supplemental layer of regulations. A special zone is placed over the existing base zone(s), and identifies additional regulations, in this case, for the purposes of renewable energy development. The overlay district can share common boundaries with the base zone or cut across base zone boundaries.

5.11.1.2. Benefits & Costs

Creating an overlay zoning amendment is an alternative to the existing piecemeal approach of re-writing the original zoning code to approve a specific use in a particular area; the existing method is costly in time and expenses for a municipality.

Imperial County is one of the few counties in California with an Energy Overlay Zone (Alex and Morgan 2012).[68] Notably, the zone acts effectively as a holding zone pending[69] future CEQA/Environmental Impact

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[66] California Government Code Section65850.

[67] At the first CREP Technical Advisory Committee (TAC) meeting, three members expressed a strong interest in replicating a Renewable Energy Overlay/Combining Zone in some of the unincorporated portions of the County of San Diego through the CREP process.

[68] Some of the interest in overlay zoning from the CREP TAC Committee was traced to recent overlay zoning efforts within Imperial County where there has been a significant push for renewable energy development opportunities in recent years. Imperial County received a California Energy Commission grant on July 15, 2013, to update the Renewable Energy and Transmission Element of its General Plan and to develop a Renewable Energy Ordinance to implement its policies and priorities. Funds were used to develop an inventory of baseline date, review opportunities for developing

Reports (EIRs). A very large majority (92.3 percent) of respondents to the California Office of Planning and Research's (OPR) survey said the reason they have not pursued an energy overlay zone is because of lack of funding.[70] Respondents also noted that the expected average cost of creating an Energy Overlay Zone was $100,000, with a maximum of $250,000.

Energy overlay zones are common in other states, saving significant time and expense, and adding certainty to the permitting process for both developers and government. A 2010 analysis of eight case studies in Washington State found that predefined mitigation through an energy overlay zone was estimated to have saved private developers between $8.8 million to $35.2 million, and public developers from $2.8 million to $11 million in opportunity costs (Commerce 2011).

Tim Snellings, Butte County Director of Development Services and former President of California County Planning Directors' Association (CCPDA), commented:

> *An energy overlay provides an incentive by reducing planning process time and by providing more certainty to investors. It saves the developer and the government money, but how much is unclear. Regardless of how much it saves, it sends a signal to investors that the County wants to see solar photovoltaics in these locations (Snelling 2014).*

Advocates for renewable energy overlay zones range from developers interested in saving time and money to wildlife organizations, such as the Washington, D.C.-based Defenders of Wildlife. Defenders of Wildlife advocate for establishing renewable energy combining or overlay zoning districts, or siting criteria to incentivize "smart-from-the-start" renewable energy development (Kelly and Delfino 2012). The organization supports overlay zones because the zones can be used to strike an important balance between addressing the near-term impact of industrial-scale renewable development on wildlife and wild lands, and the long-term impacts of climate change on biological diversity, fish and wildlife habitat, and prime agricultural lands. While Defenders of Wildlife's 2012 report focuses on incentivizing the siting of renewable energy projects within the San Joaquin Valley, the information within the document can be broadly applied to renewable energy development within the County of San Diego.

5.11.1.3. Functions of an Overlay Zone

Through an overlay zone, the County could allow for renewable energy development projects in specific areas and effectively set minimum site requirements within the overlay zone while addressing concerns over agricultural lands, water, wildlife issues, transmission lines, and others. Public comment would still be required with an overlay zone, but the new process allows County officials and developers to avoid much of the economic uncertainties that characterized the process before an overlay zone existed.

5.11.2. Application to San Diego County (Recommendations)

5.11.2.1. Existing Context

While overlay zones can be regional or statewide, most overlay zones are used at the city or county levels (Miskowiak and Stoll 2005). Most local governments in California do not currently have zoning codes that

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various renewable energy resources, develop an outreach program, prepare the revised ordinance and renewable energy overlay zone, and prepare the Project Environmental Impact Report (PEIR).

[69] A holding zone is often used for an area going through a rezoning process. Such an area can temporarily be deemed a low-density zone until the final rezoning ruling has been made. (source: definitions.uslegal.com)

[70] OPR reported an 87 percent overall survey response, but only 22 of 58 respondents answered this question.

are specific to renewable energy projects or facilities, and those that do, have enacted overlay zoning in many cases. Municipal governments still have to go through the process of adopting the overlay zone ordinance, which requires consistency with the General Plan, public hearings, and Program Level EIRs (Snelling 2014). Regulations and requirements specific to the overlay zone can address community priorities such as permitting, environmental protections (air, water, and wildlife), avoidance of prime agricultural lands, proximity to available utility infrastructure, and adjacency to distributed generation (DG) users.

5.11.2.2. Next Steps

Counties still need to amend their zoning ordinances to include the prescribed use of an overlay zone as well as address any impacts in its Program Level EIR.

The establishment of a renewable energy overlay zone requires three primary steps:

- Define the purpose of the overlay zone district (supporting renewable energy development);
- Identify the areas that make up the overlay zone district; and
- Develop specific rules that apply to the identified overlay zone district (specify the streamlined permitting process, if applicable, and expectations of the developers and the County).

To be perceived as fair, all properties within the renewable energy overlay zone need to be treated equally, and the criteria for delineating the zone should be straightforward and aligned to County energy and land use goals.

5.11.3. Who Else Is Doing It

Much of the energy-related overlay zone activity in recent years has taken place in the southwestern United States, especially California and Arizona. Washington State is also known for its emphasis on energy overlay zones.

5.11.3.1. Gila Bend, Arizona

Gila Bend uses a Solar Field Overlay Zone (SFOZ), which the Planning Director characterizes as "soft zoning" (for utility scale solar power development) on top of existing "hard zoning" (of agricultural land which is no longer being utilized for farming). The County uses the SFOZ primarily for utility scale solar projects and benefits greatly from having interstate transmission line capacity nearby. Gila Bend officials state that the SFOZ shortens the permitting time by not requiring any general plan or comprehensive amendments, and not requiring duplicative environmental reviews. According to Gila Bend officials, the SFOZ is the, "fastest entitlement/engineering process in the nation," with the turnaround from application submission to council approval in as little as four weeks (Fitzer and Smith).

5.11.3.2. Tucson, Arizona—Sonoran Model Overlay Ordinance (2013)

The Sonoran Model Overlay Ordinance serves a good example of how to address habitat issues around renewable energy projects. The Sonoran Institute drafted the Model Overlay Ordinance to help local jurisdictions in the Morongo Basin protect natural landscapes and wildlife habitat corridors, the boundaries of which do not necessarily follow the boundaries of existing zoning districts. Importantly, the Model Overlay Ordinance does not propose to change the existing permitted uses or development densities within a jurisdiction's zoning districts. Rather, it sets forth design standards, construction requirements, best practices, and incentives to minimize habitat disturbance and reduce land fragmentation that results in adverse impacts to connectivity and habitat for treasured native desert species.

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5.11.3.3. Sonoma County, California (2013)

In October 2013, the County of Sonoma, California, adopted changes to its zoning code. The changes implement the resource conservation policies of the County's General Plan to provide for widespread use of renewable energy through distributed generation and increased opportunities for renewable energy power producers.[71]

5.11.3.4. Klickitat County, Washington (2005)

In 2005, Klickitat County in Washington State adopted an Energy Overlay Zone (EOZ) using a process modeled after the state's Planned Action process for the Washington State Environmental Policy Act (SEPA)—the equivalent of the California Environmental Quality Act (CEQA). The process is clear and straightforward, and could work in the County of San Diego. It provides a fair amount of predictability for county elected officials and staff, citizens, developers, and investors.[72] The Klickitat County EOZ process takes approximately six months and is processed administratively (although the developer is required to conduct one community meeting).[73] The EOZ process appears to be more efficient and less costly overall in Klickitat County than the pre-existing licensing process with the state agency, Energy Facility Site Evaluation Council (EFSEC). It is worth noting that in Klickitat County there have been no applications requesting review through the EFSEC process rather than the local EOZ. This process has also allowed local control to remain with the county.

5.11.3.5. Inyo County, California (2010)

In Inyo County, California, a General Plan Overlay was developed and adjusted through an iterative process, based on input from interested parties (public officials, members of the public, alternative energy developers, public agencies, the U.S. Military, local tribes, and others) and a series of public outreach meetings. Through an extensive public engagement effort, General Plan Land Use Diagram Overlay maps were designed, refined, and updated iteratively. The General Plan Land Use Diagram Overlay maps now show areas where it may be appropriate to develop renewable wind and solar energy projects based on a more comprehensive set of criteria (Department).

As is currently the case in the County of San Diego, a variety of planning efforts led by State and Federal agencies, and directed at alternative energy development were already underway prior to the development of the Inyo County General Plan Overlay. These include, but are not limited to: the Renewable Energy Transmission Initiative (RETI); Desert Renewable Energy Conservation Plan (DRECP); Bureau of Land Management (BLM) Environmental Impact Statements for Wind, Geothermal, Energy Corridors, and Solar; and the State of Nevada's Renewable Energy Transmission Access Advisory Committee.

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[71] This effort was funded in part by an American Recovery and Reinvestment Act (ARRA) grant from the U.S. Department of Energy. Metrics surrounding this initiative were requested, but were not provided by the County.

[72] Klickitat County requires submittal of an expanded SEPA checklist, as well as site-specific studies for impacts to habitat and wildlife (including avian impacts), cultural resources, and a grading and storm water management plan. In addition, EOZ projects must meet established development, use, and construction standards, including specified setbacks and standards related to noise, air quality, vegetation and wildlife, storm water, geologic and flood hazards, water resources, cultural resources, visual resources, and public safety. For more information, read Energy Overlay Zones, A Report Prepared to Support the 2010/2012 State Energy Strategy, Department of Commerce, Washington State, October 2011.

[73] According to the Energy Facility Site Evaluation Council (EFSEC), a state agency that coordinates all of the licensing and evaluation for major energy facilities, its review process takes a minimum of 14 months and requires a final decision by the Governor.

5.12. Building Energy Disclosure

Definition

Building energy disclosure involves the analysis and documentation of a building's energy performance as a way to drive improvements in energy efficiency and reduce energy use. One of the major goals of this policy is to incorporate a home or commercial building's energy performance into its overall value.

There are three main types of building energy disclosures:

- An **asset rating** is the most rigorous, transparent, and most expensive type of building energy disclosure. A building is assigned a performance index on computer simulations of its architectural and system characteristics combined with results from onsite diagnostic testing. Asset ratings use standardized weather and occupancy conditions so that a building's energy performance is normalized and can be compared quantitatively with other buildings.

- An **operational rating** uses metered energy and water use data to compare usage trends as well as consumption against other buildings, and compares this data via benchmarking. Benchmarking is a preferred method of disclosure for large multi-use residential and commercial buildings because acquiring an asset rating for these types of buildings can be expensive and complicated.

- A **Residential Energy Conservation Ordinance (RECO)** requires a homeowner to achieve minimum residential energy and water efficiency requirements such as attic insulation, hot water heaters, appliances and air-conditioning systems when conducting an extensive remodeling project and/or before their home can be sold. Similarly, a Commercial Energy Conservation Ordinance (CECO) requires an energy analysis and disclosure of results.

CREP Related Options for the County of San Diego

- Incorporate building water efficiency data into potential disclosure policies
- Take inventory of the number and types of commercial buildings in the County and research the potential impact that incentives play in disclosure policies
- Start and maintain a database of public and private sector building energy performance to aid in identifying opportunities to cut GHG emissions
- Reward public disclosure of building energy consumption through a County-led contest
- Follow building disclosure developments in San Francisco and Berkeley

5.12.1. Overview

Policies that drive energy efficiency improvements in buildings provide opportunities for the County of San Diego to make significant strides in greenhouse gas (GHG) reductions and to reduce electricity use. In 2012, approximately 10 percent of total US GHG emissions were generated from residential homes and businesses (EPA 2014). The

California Air Resources Board estimates statewide emissions from the buildings sector to be 12 percent, a percentage point higher than GHG emissions from electricity generated in the state (EPA 2014).

5.12.1.1. Definition

Building energy disclosure involves the analysis and documentation of a building's energy performance as a way to drive improvements in energy efficiency and reduce energy use. For large building owners (including the County), ongoing analysis allows them to "benchmark" energy use and compare their building to similar buildings and the use of other technologies. One of the major goals of this policy is to incorporate a home or commercial building's energy performance into its overall value. Of all the energy efficiency policies available to the County of San Diego, building energy disclosure is already consistent with many existing policies, and is one of the best suited to leading by example.

5.12.1.2. Value Proposition & Benefits

Building owners, buyers, and sellers can benefit from greater transparency of building performance data. Wielding information of energy consumption-related costs, building owners can make more informed decisions on cost-effective improvements. Home sellers benefit by being able to distinguish themselves from similar homes on the market. A recent study in Portland, Oregon, found that homes with a home energy rating or efficiency certification (such as EPA Energy Star Home) commanded a price premium of 8 percent (Cluett and Amann 2013). Though premiums for commercial buildings have increased, they are harder to quantify because of the great range of sizes and uses.

A building's energy efficiency can be reported or disclosed periodically or when rented or sold. Building energy disclosure is particularly beneficial in the commercial sector as building owners or renters whose energy costs affect their bottom line more adversely than others are more susceptible to long-term fluctuations in energy prices. Access to building performance data lends security when making financial decisions, and that extends not just to commercial building owners but also homebuyers with limited incomes. The Institute for Market Transformation reported that default risks are 32 percent lower on average on energy-efficient homes (Cluett and Amann 2013).

5.12.1.3 Types of Energy Disclosure Policies

5.12.1.3.1. Asset Ratings

The most rigorous, transparent, and most expensive type of building energy disclosure is an asset rating.[74] An asset rating is the assignment of a performance index that is based on computer simulations of the architectural and system characteristics of the building, combined with results from onsite diagnostic testing. Asset ratings use standardized weather and occupancy conditions so that a building's energy performance is normalized and can be compared quantitatively with other buildings.

For homes, the oldest and most widely used rating system is RESNET's Home Energy Rating System (HERS). In 2010, Lawrence Berkeley National Laboratory developed the Department of Energy Home Energy Score (HES) in an attempt to create a simpler and more accurate rating system. The Department of Energy has also developed a free Building Energy Asset Score for commercial and multifamily buildings.

5.12.1.3.2. Operational Rating

[74] The cities of Austin, Texas, Santa Fe, New Mexico, and Boulder, Colorado, all adopted asset rating disclosure policies and require the use of the HERS rating system.

An operational rating uses metered energy and water use data to compare usage trends, as well as consumption against other buildings, and compares this data via benchmarking. Benchmarking is a preferred method of disclosure for large multi-use residential and commercial buildings because acquiring an asset rating for these types of buildings can be expensive and complicated. The preferred software tool for operational ratings and benchmarking is EPA's Portfolio Manager. A free resource for users, the tool is also the mostly widely used by local governments and industry. This tool is used for benchmarking in Boston, Cambridge, New York City, Washington D.C., Philadelphia, and Minneapolis. California also requires the use of Portfolio Manager for the Nonresidential Building Energy Disclosure Program described earlier.

A simpler operational rating is the disclosure of utility bills. This method is often employed in the residential sector, particularly at the time of a home sale or rental negotiation. Different programs vary on the timing of disclosing utility information. Utility bill disclosure is used in Alaska, New York, Hawaii, and in Chicago.

5.12.1.3.3. Energy Disclosure by Local Government Ordinance

A Residential Energy Conservation Ordinance (RECO) requires a homeowner to achieve minimum residential energy and water efficiency requirements such as attic insulation, hot water heaters, appliances and air-conditioning systems when conducting an extensive remodeling project and/or before their home can be sold.[75] A RECO can be enforced two different ways:

a) Requiring a simple walk-through energy audit or assessment by the utility, a certified professional, or

b) Through the County's building department inspection process.

A home energy rating by a state-certified professional that provides a numerical score for the home is strong proof of the improved energy efficiency of a building. Similarly, a Commercial Energy Conservation Ordinance (CECO) requires an energy analysis and disclosure of results.

5.12.1.4. Costs

Monitoring and verification (M&V) and other analysis can be quite expensive for the County. Depending on existing resources, hiring an outside consultant is recommended. The SDG&E Company is a valuable resource in M&V, and as such can help the County analyze the data after it is collected. Collecting the data can be time-consuming and costly. If the County decided to incent disclosure in the commercial sector, the budget needed is based on the amount of the incentive and the number of building owners who take advantage of the incentive. A $250 incentive payment to 500 building owners carries a $125,000 cost to the County.[76] Even with free management tools like the U. S. Department of Energy's Standard Energy Efficiency Database (SEED) and County staff dedicated to the effort, establishing a disclosure program requires significant time. Local government costs related to a building disclosure program also include

[75] Adopted in Berkeley, San Francisco, and Boulder, Colorado, there have been mixed results in the implementation of RECOs. San Francisco adopted a RECO in 1982, and there are discussions underway now to expand the requirement to all of Alameda County (R. Schwartz, personal communication, Oct 2014). Berkeley, on the other hand, is considering replacing its RECO (adopted in 1992) with a Building Energy Savings Ordinance (BESO) after opposition from realtors and building owners over the increased time and cost of making retrofits. The BESO would remove the minimum energy and water efficiency measures that are to be installed at point of sale and instead require owners to perform and disclose energy and water efficiency assessments. (For more information, read the City of Berkeley Energy Commission's BESO Staff Report, 2014).

[76] This figure does not factor in the costs that building owners will incur to comply with the program.

public education and outreach expenses.[77] At least one full-time employee is required for implementing a disclosure policy and providing ongoing program support (Group 2012).

The cost of a homeowner's compliance with a County RECO mandate will vary widely and depends on the extent of the requirements and the size and age of the home. Costs can be significant to the homeowner if extensive upgrades are needed. A home energy rating typically ranges from $200 to $500, and energy audits typically range from $200 to $400 depending on the size of a home and the extent of analyses performed. The homeowner is responsible for this expense in most cases, although many programs subsidize this expense to help generate interest in energy efficiency improvements. Home energy ratings and audits within the County of San Diego are available through Energy Upgrade California.

For commercial and large multi-family buildings, building energy and water benchmarking costs fall on building owners and can range widely depending on building categorization (school, retail, hospital, etc.), varying energy demands, and hours of operation. In addition to the cost of improvements chosen, other costs include the energy audit, subsequent energy modeling, and the time spent by an energy expert developing recommendations.

5.12.2. Application to San Diego County (Recommendations)

5.12.2.1. Existing Context

California is already moving forward with a commercial building energy disclosure program. The California Energy Commission is in the process of finalizing regulations of the Nonresidential Building Energy Disclosure Program (CEC 2007). The program requires the owners of all nonresidential buildings above 5,000 square feet to determine their building's energy and water use and provide that documentation to the California Energy Commission and to any prospective buyers prior to a sale of the building. It should be noted that the CEC has postponed reporting requirements for buildings above 50,000 square feet to July 1, 2016, to allow owners to adequately assess their facilities.

In 2008, the California Public Utilities Commission created the Long Term Energy Efficiency Strategic Plan as a roadmap to achieve bold goals for reduced building energy consumption. This plan set building disclosure-related goals such as:

- All new residential construction will be Zero Net Energy in 2020.
- All new commercial construction will be Zero Net Energy in 2030.
- Heating, ventilation, and air-conditioning (HVAC) will be reshaped to ensure optimal performance for California's climate resulting in a 50 percent improvement in efficiency in the HVAC sector by 2020.
- Existing homes will use 20 percent less energy by 2015 and by 40 percent less by 2020 (CPUC 2014).

5.12.2.2. Next Steps: Building Energy Disclosure Policy Considerations

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[77] For a more in-depth report advising the City of Boston with its own building energy disclosure efforts, read *Benchmarking and Disclosure: A Lesson from Leading Cities* by a Better City and Meister Consulting Group (2012). Leading cities include New York, Washington D.C., Seattle, San Francisco, and Austin.

An important first step is to consider the number and age of existing buildings in the County, as well as projections for future development. Owners and potential buyers of existing residential and commercial buildings will benefit the most as those buildings were built to codes and standards less stringent than those of Title 24. While new commercial and residential buildings will certainly be more energy-efficient than older buildings, building energy performance disclosure is still an effective way to demonstrate the performance of homes built beyond minimum requirements.

There are a host of software programs and rating tools to analyze and document a building's energy performance. As mentioned above, EPA's ENERGY STAR Portfolio Manager is a common choice for analyzing commercial buildings and has become the standard tool recommended by state and local governments, including the State of California itself. The U.S. Department of Energy is also developing software that provides additional features for commercial building energy managers. The Standard Energy Efficiency Database (SEED) program will offer even more in-depth analysis of energy use data.[78] A home energy rating performed by a certified rater is the most widely recognized when it comes to documenting the value of a home's energy performance.

Whether for commercial or residential buildings, it is important for the County to use widely-recognized programs that provide cost information to consumers, and that is also easy to understand. County-generated information on disclosure can provide consumers with resources on available rebates and tax credits. Likewise, it would be beneficial for the County to consider energy performance analyses when buildings have been permitted for major retrofits.

The County can consider its own, and the State's energy and GHG reduction goals when designing and implementing a performance rating and disclosure policy. These policies need to work in conjunction with existing rebate, retrofit, and energy efficiency programs. Disclosure work is best coordinated with all energy efficiency programs managed through the County, especially SDG&E Local Government Partnership programs. Linking new disclosure policies to these programs can help educate the public about energy efficiency opportunities.

Lastly, it is important to reach out to key stakeholders such as realtors, builders, contractors, and their respective associations.[79] Chambers of Commerce can be instrumental in building support for disclosure policies. These groups provide industry insight and advocacy, and engaging them in the development stage can help build important stakeholder support early in the process. Some cities have built-in considerations for educating and assisting building owners with the transition, including having several benchmarking deadlines, only one of which is made public. With deadlines spaced far enough apart, building owners can make improvements before the second deadline (Meister Consulting Group 2014).

5.12.3. Who Else is Doing It

California state legislation (AB 1103) already requires commercial building owners to benchmark their building's energy and water use, as well as greenhouse gas emissions beginning in 2016, and to disclose that data prior to the sale, lease, financing, or refinancing of the building. Additional major cities and counties across the country that require benchmarking for commercial buildings include San Francisco, New York City, Boston, Philadelphia,

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[78] More information can be found at Office of Energy Efficiency and Renewable Energy's Energy.gov website (http://energy.gov/eere/buildings/standard-energy efficiency-data-platform).

[79] After opposition from realtors and building owners over the increased time and cost of making retrofits, Berkeley is considering replacing its RECO (adopted in 1992) with a Building Energy Savings Ordinance (BESO).

Minneapolis, Austin, Chicago, Seattle (and Washington state), Montgomery County (MD), and Washington, D.C. A detailed summary of local and state building energy disclosure requirements is provided below.

TABLE 5-11. Energy Disclosure Requirements by Jurisdiction

Public Jurisdiction	Year	Disclosure Type	Driving Policy	Notes
Chicago, IL	1987	Utility Bills	Utility Cost Disclosure Ordinance	Disclosure at time of listing
New York	1987	Utility Bills	New York State Truth in Heating Law	Disclosure at time of sale
Maine	2006	Energy Efficiency Features	LD 2704, An Act Regarding Energy Efficiency Standards for Residential Rental Properties	Only applies to rental properties
Boulder, CO	2007	Asset Rating	Green Building and Green Points Program	HERS rating system, Part of Building Permit Process
Kansas	2007	Energy Efficiency Features	Kansas Energy Plan of 2007	New construction single-family homes built to 2006 IRC/IECC codes. HERS ratings recommended
Berkeley, CA	2008	Asset Rating	Originally RECO/CECO but becomes the Berkeley Building Energy Savings Ordinance (BESO) effective December 1, 2015.	Reporting to EPA Portfolio Manager
Alaska	2008	Utility Bills	Alaska Building Energy Efficiency Standard	Disclosure at time of sale
New Mexico	2009	Asset Rating	New Mexico Conservation Code	20 percent beyond 2006 IECC energy savings
South Dakota (Voluntary, not written into law)	2009	Energy Efficiency Features	SDCL 11-10-8 to 11-10-10	New construction single-family homes built to 2006 IRC/IECC codes
Hawaii	2009	Utility Bills	Mandatory Seller Disclosures in Real Estate Transactions	Disclosure at time of sale
California	2010	Benchmarking	Assembly Bill 1103	Nonresidential 5,000 sq. ft. and greater, reporting to EPA Portfolio Manager
New York City, NY	2010	Benchmarking	Greener Greater Buildings Plan	Applies to 10,000 sq. ft. and above
Austin, TX	2011	Asset Rating	Energy Conservation Audit and Disclosure Ordinance (ECAD)[80]	Reporting to EPA Portfolio Manager

[80] In Austin, Texas, the City's Energy Conservation and Audit Disclosure (ECAD) ordinance approved in 2008 as part of the city's Climate Protection Plan requires all single-family, multi-family, and commercial properties that are ten years or

Public Jurisdiction	Year	Disclosure Type	Driving Policy	Notes
Washington	2011	Asset Rating	Senate Bill 5854	Nonresidential above 10,000 sq. ft. Reporting to EPA Portfolio Manager
San Francisco, CA	2011	Benchmarking	Existing Commercial Buildings Energy Performance Ordinance	Nonresidential 10,000 sq. ft. and greater, reporting to EPA Portfolio Manager
Seattle, WA	2011	Benchmarking	Council Bill 116731	Applies only to large and medium size buildings, Uses EPA Portfolio Manager
Boston, MA	2013	Benchmarking	Building Energy Reporting and Disclosure Ordinance (BERDO)	Applies only to large and medium size buildings
Minneapolis, MN	2013	Benchmarking	Commercial Building Rating and Disclosure Ordinance	50,000 sq. ft. and above, uses EPA Portfolio Manager
Philadelphia, PA	2013	Benchmarking	Bill No. 128420	50,000 sq. ft. and above, uses EPA Portfolio Manager
Cambridge, MA	2014	Benchmarking	Building Energy Reporting and Disclosure Ordinance (BERDO)	Applies only to large and medium size buildings

older to undergo energy audits and present the results three days before the final sale of the home. The major goal of the ordinance is to make the City a national leader in reducing and reversing the negative impacts of global warming. Non-compliance with the code includes fines of $500 to $2000. Since 2009, 58 percent of single family homes and 76 percent of commercial properties have received energy audits and rating designations in Austin (For more information, read Austin City Code Update Report Presentation, 2013).

5.13. Promote More Aggressive Building Standards Including the Significant Retrofit of Existing Buildings

Portfolio of Building Standards

With buildings in the U.S. accounting for around one-third of the nation's total energy use and two-thirds of total U.S. electricity use and corresponding air emissions, the adoption and implementation of building energy efficiency codes is critical to the County of San Diego from both an economic and environmental perspective (Database of State Incentives for Renewables and Efficiency, 2014).

Building energy efficiency standards in California are designed generally to ensure new and existing buildings achieve energy efficiency, and preserve outdoor and indoor environmental quality. Energy codes set minimum standards and define the least-efficient buildings (public and private) that should be constructed. The California Energy Commission (CEC) last updated the Energy Code, also known as Title 24, in 2013. Title 24 includes goals for Zero Net Energy (ZNE) buildings, in which a building produces as much energy onsite as it consumes on an annual basis.

The portfolio of more aggressive building standards for the County to consider may include the following:

- Mandating the procurement of efficient equipment within County facilities and/or conduct a life-cycle analysis (LCA) of County-owned buildings.
- Beyond code ("stretch" or "reach") standards that exceed the minimum requirements of the Title 24 energy code.
- Adding a requirement that new single family homes be "pre-plumbed" for solar thermal systems to existing County ordinance that requires "pre-wiring " for solar PV panels in new single-family homes.
- Since EVs both consume and produce electricity and "plug-in" to buildings, a portfolio of building standards would be incomplete without those concerning EV infrastructure.

CREP-related Options for the County of San Diego

- Create a new Zero Net Energy (ZNE) definition and policy for the County, which has firm goals around ZNE commercial and residential market penetration (e.g. 50 percent of all residential new construction should be ZNE by 2025 or a future date).
- Create a ZNE competition with architects for County, commercial, and residential buildings.
- Collaborate with the building industry through industry-specific training and limited financial incentives to achieve above-code energy efficiency levels or ZNE levels in a target segment of the market (e.g., existing homes in unincorporated San Diego County)
- Work with the San Diego Regional Electric Vehicle Infrastructure (REVI) Working Group and others to adopt/update language to include prewiring of residential and commercial buildings for electric vehicles

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5.13.1 Overview

5.13.1.1. California State Energy Policy Goals

Several State energy policy goals drive the design of the current building energy standards in the County:

- The Governor's new plan to increase the State's Renewable Portfolio Standard (RPS) to 50 percent by 2030;
- The "loading order," which directs that California's growing energy demand must first be met by electricity suppliers with cost-effective energy efficiency;
- "Zero Net Energy" (ZNE) goals for new homes by 2020, and commercial buildings by 2030;
- Governor Brown's Executive Order on Green Buildings, which requires large state buildings to meet U.S. Green Building Council's (USGBC's) Leadership in Energy & Environmental Design (LEED) "Silver" certification, and sets ZNE targets for all future buildings;
- The Green Building Standards Code (CALgreen); and
- AB 32, which mandates that California reduce its greenhouse gas emissions to 1990 levels by 2020.

In addition to these, at least three other major factors come into play for the County when addressing new building energy efficiency standards:

- The new (mandatory) 2013 Title 24 energy efficiency standards are aggressive and as noted below, incur new costs to County builders and consumers;
- Title 24 is updated by the State every three years (the next one occurs in 2016) and the significant changes to Title 24 in 2013 mandate that all new residential buildings by 2020 and new commercial buildings by 2030 will be ZNE; and
- A ZNE building produces as much energy onsite as it consumes on an annual basis.[81] Therefore, solar photovoltaics (PV) as one of the proven, cost-effective technologies of choice for citizens and government in 2015, will likely be an important technology for the County in both the residential and commercial sectors going forward in the near term. As such, PV-related policy, building permitting, and processes will be increasingly important in the near future warranting attention.

5.13.1.2. Existing Building Standards in the County

Building standards can apply to residential, commercial, and the County's own buildings. The County already has excellent building policies in place in both the renewables and energy efficiency areas, including its nationally recognized online solar permitting program. [82] In fiscal years 2010 through 2013, there was an

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[81] This site-focused definition is currently the most agreed upon nationally. Please note that the U.S. Department of Energy issued a request for ZNE definitions in December of 2014. While no national standard was implied as the result of comments received, mostly on the grounds of the need for consistency, our team believes that one will result from this U.S. DOE request.

[82] California enacted legislation in 2007 requiring that solar-energy systems be installed on all state buildings and state parking facilities by January 1, 2009, where feasible. State law also requires the installation of solar-energy systems on all new state buildings constructed after January 1, 2008, if it is feasible and there are sufficient funds to do so. In addition, the state's Green Building Action Plan aims to reduce grid-based energy use by 20 percent of 2003 levels by 2018 at major state-owned facilities.

average of 1,588 photovoltaic permits issued each year in the unincorporated area of San Diego County, with a 138 percent increase from 2011 to 2013 (County of San Diego 2013) This progress provides an excellent complement to future ZNE efforts. A partial list of some of the building-related accomplishments in both the renewables and energy efficiency areas is important to highlight here.

- The County has offered permit fee waivers for residential solar PV electrical system permits since 2001
- Permit fee waivers for residential small wind turbine electrical systems have been in effect since 2008
- The County offers permit streamlining for residential roof-mounted solar PV projects, and a shortened administrative permit process including height and setback exceptions for use of on-premise energy systems (usually PV) that are smaller than 10 acres. On-bill financing and California Energy Commission (CEC) loans were authorized by the County to fund energy projects
- A retro-commissioning (building tune-up) program was started, and the SDG&E Energy Initiative Partnership Program resulted in energy retrofits for many County facilities. As a result, energy use at County facilities has been reduced by an average 3.7 percent per year between 2009 and 2012.[83]
- More than 800,000 square feet of County buildings have been designed to the USGBC LEED standards since 2009, and all new construction and major renovation projects have met or exceeded the LEED Certified rating since the same year. Significantly, since 2009, all new County construction projects are designed to exceed California Energy Code, Title 24 compliance by 20 percent. ZNE was made a requirement for the Alpine Library project after successful assistance through the SDG&E Direct Design Assistance program. Additionally, three other new facilities were identified where ZNE will be made a requirement once the projects start.[84]
- Education and training of County staff has been a priority, with 15 facilities' personnel having obtained Building Operator Certification and five project managers having achieved LEED accreditation. The County has a goal of retrofitting 15 percent of County buildings (Vista 2014). In 2011, the Board adopted amendments to building and energy codes incorporating the California Green Building Standards.
- In 2009, the Board of Supervisors approved the County of San Diego's participation in the California FIRST program, created to issue bonds to finance property assessed clean energy (PACE) improvements to help homeowners finance renewable energy systems and energy efficiency equipment.
- The County operates a Green Building Incentive Program, which is designed to promote the use of resource-efficient construction materials, water conservation, and energy efficiency in new and remodeled residential and commercial buildings. The program offers incentives of reduced plan check turnaround time and a 7.5 percent reduction in plan check and building permit fees for projects meeting program requirements (standard for many California local governments at this time). Participation is minimal (less than 20 participants in 2013), but the program is important

[83] Ibid.

[84] Ibid.

since it represents a commitment to above-code construction, and it effectively constitutes an infrastructure for rewarding future ZNE projects.

5.13.1.3. Definition

New and existing buildings should be considered not only as energy consumers, but also as valuable electricity producers. The County may consider these individual producers of electricity as important to meet its energy security objectives as well as help the State meet its new Zero Net Energy (ZNE) goals and the Governor's recent call for 50 percent renewables by 2030 (CEC , Governments 2008).

Building energy efficiency standards in California are designed generally to ensure new and existing buildings achieve energy efficiency, and preserve outdoor and indoor environmental quality. Building energy codes cover areas of construction, such as wall and ceiling insulation; window and door specifications; heating, ventilation and air-conditioning equipment efficiency; and lighting fixtures and controls. Energy codes set minimum standards and define the least-efficient buildings (public and private) that should be constructed. These measures are listed in the California Code of Regulations as Title 24, Part 6.

5.13.1.4. Benefits & Costs

California's latest version of the Title 24 energy code (Commission 2013) continues to improve the energy efficiency of buildings.[85] The 2013 version of the statewide standards are projected to reduce energy use by 25 percent for lighting, heating, cooling, and water heating compared to the 2008 standards. Additional upfront costs vary by climate zone, but statewide the standards add approximately $2,000 to the new residential building construction costs, which are more than offset by lower energy costs over the life of the home. Estimated energy savings to homeowners is more than $6,000 over 30 years. In other words, when factored into a 30-year mortgage, the energy efficiency standards will add approximately $11 per month for the average homeowner, but will save $27 on monthly heating, cooling, and lighting bills. For San Diego County, the standards add approximately $2,300 to the cost of constructing a new home, and are expected to save approximately that same amount in energy costs to the homeowner within the first 18 months of occupancy.

5.13.1.5. Potential New County Building Policies

By establishing a stronger suite of programs and policies for the design and construction of County buildings across all sectors, the County can cost-effectively prepare for future State ZNE, energy efficiency, or other regulated regulations and meet its own renewable energy goals. By continuing to adopt advanced energy standards for County facilities, as is already common practice by the County, the County will continue to lead by example by promoting more progressive building construction practices. Policies and standards the County could pursue for its own buildings to increase efficiency and work toward new local, or some of the state ZNE goals mentioned earlier include:

- Attaining an even higher "green building" certification (USGBC LEED or other);
- Achieving new energy-reduction goals;
- Exceeding building code minimum efficiency requirements by more than the 20 percent already specified;
- Mandating the procurement of efficient equipment within County facilities; and

[85] The 2013 Title 24 standards went into effect July 1, 2014.

- Performing a life-cycle cost analysis.

5.13.1.5.1. Lead by Example with County Buildings

The County already is committed to building to USGBC Leadership in Energy & Environmental Design (LEED) standards and energy reduction goals are part of the County's Strategic Energy Plan (SEP). Going beyond these goals through a simple cost/benefit analysis can be relatively straightforward as part of a future CREP process. Many residents may likely expect the County to go beyond minimum efficiency standards so opposition to increasing the percentage above the base code can be expected to be minor (especially given the long expected life of County buildings, perhaps 75 years). Along with any mandate to procure efficient equipment, the County can revisit procurement processes and protocols to ensure that renewables and energy efficiency are treated fairly. The County should consider adopting a formal LCC policy.

Because many County buildings are expected to have a 75-year lifespan, the County can justify a substantial commitment to designing and building superior new structures. Furthermore, because of their size, office buildings and schools are particularly easier to achieve ZNE. The productivity benefits associated with a more comfortable, well-lit, and ventilated area are unarguable after 20 years of research on the subject (Fisk 2000, Kats, Alevantis et al. 2003). Single-digit increases in first costs are outweighed by the productivity benefits gained over the life of the employee. The City of Oakland determined that the integration of green building features into buildings can generate substantial energy, water, and material efficiencies, resulting in reduced operating costs of 20 to 80 percent over the life of the building (Edgerly 2006).

5.13.1.5.2. Beyond Codes

Beyond code ("stretch" or "reach") programs are another voluntary way the County can tap into market forces and architectural and engineering creativity to develop, refine, and perfect the most promising ZNE solutions. Before considering the costs and savings for builders or the County going *beyond* the minimum Title 24 energy code voluntarily, the costs and savings of simply getting to the new code (which is updated every three years) needs to be considered. For San Diego County, the new (2013) standards added approximately $2,300 to the cost of constructing a new home, but are also expected to save approximately that same amount in energy costs to the homeowner within the first 18 months of occupancy (Schneider 2014). This type of analysis should be extended to any voluntary above-code program begun by the County. This allows builders to chart the specific path taken on any given project to get to the County's new ZNE goal(s) while it will almost often result in lower costs than a prescriptive approach.

With respect to private construction (new residential construction), the County can set up a new stretch or reach program that rewards commercial or residential construction that exceeds Title 24 standards with financial incentives and faster turnaround times. Since 1999, this policy has proven to spur more energy efficient construction, and more than 120 local California governments offered these incentives to builders that built 30 percent above Title 24 energy standards in 2007 (Colorado Energy Group 2014).[86] These incentives have proven to be important to builders since it helps distinguish them from others. The County can also create a competition for architects around building performance. Zero Net Energy (ZNE) goals can put pressure on architects, engineers, and builders to incorporate energy modeling from the very beginning, helping the County virtually guarantee emission and renewables goals. If the County embraced ZNE and incorporated related goals into existing regulations, it could promote and help lead building

[86] Colorado Energy Group, Inc. managed the California IOU-funded statewide *Community Energy Efficiency Program (CEEP)*.

training courses for regional builders who need to know how to combine solar and energy efficiency in existing and new construction. A joint project with the local Building Industry Association (BIA) would be a relatively easy action to take.

5.13.1.5.3. Solar Energy Building Requirements

New to Title 24 standards is the requirement that a minimum of 250 square feet of roof space be reserved for future solar PV or solar thermal panel installations. Also known as "solar ready roofs," the requirements apply regardless of climate zone and do not require the installation of mounting hardware, electrical equipment, or any kind of pre-wiring for future use. However, on April 8, 2015, the County adopted a solar- and electric vehicle-ready ordinance that will require new homes to be installed with conduit and junction boxes for future PV and electric vehicle supply equipment beginning July 1, 2015.

5.13.1.5.4. Electric Vehicle Building Requirements

Since EVs both consume and produce electricity and "plug-in" to buildings, the County can consider (new) EV building standards through the CREP. By providing power to buildings, EVs can help the County meet new ZNE goals that ultimately address end-use efficiency in buildings. (For more information on EVs, please see the EV Best Practice in this report.)

San Diego County is at the forefront of plug-in electric vehicle (PEV) deployment with the second highest per capita amount of PEV purchases in the nation. As noted above, it just adopted an ordinance for all new homes to be installed with conduit for future installation of residential PEV chargers. There are 350 EV charging stations installed in the City of San Diego already (SANDAG 2013). This area is one of the most important for Phase II of the CREP.

James Avery, Senior Vice President of Power Supply, San Diego Gas & Electric, recently said,

In San Diego, an electric vehicle on the grid is roughly the equivalent to three-quarters of the electric load of the average home. Every home has one plus cars sitting in the driveway, and if you were to convert all of those vehicles over to electricity, there is potential to more than double the electric load on the grid (Bade 2015).

5.13.2. Who Else Is Doing It

A growing number of local governments, including Boulder, Colorado; Marin County, California; Austin, Texas; and San Francisco, California, have taken building codes a step further by requiring that certain commercial and/or residential construction meet sustainable building standards.[87] Lancaster, Glendale, Los Angeles, and the City and County of San Francisco all implemented their own solar and energy efficiency requirements recently that exceed the minimum Title 24 requirements, and have been deemed energy cost-effective by the California Energy Commission (CEC). The County of San Diego joins Los Angeles and Lancaster in requiring builders to install equipment that readies a new home for solar energy. In addition to require pre-wiring for solar PV, the City of Chula Vista also requires pre-plumbing for solar thermal according to published guidelines.[88]

[87] California became the first state to establish a set of green building standards that apply to commercial and residential construction in addition to state-owned buildings. The standards took effect on a voluntary basis in 2009 and became mandatory in January 2011.

[88] Available through Chula Vista's Sustainable Center.

Please see TABLE 5-12 below for a list of California jurisdictions and their (more aggressive) municipal building standards, and Table B for a list of California jurisdictions and their community reach codes.

TABLE 5-12. Selected Aggressive California Municipal Building Standards

CA Jurisdiction	Municipal Building Standard
County of Alameda	Ordinances adopted in 2003 require new County facilities to meet or exceed LEED-Silver rating.
County of Butte	Climate Action Plan Implementation includes requiring new County buildings to meet CALGreen Tier 1 energy efficiency standards (2014)
City of Chula Vista	New and renovated City buildings over 4,500 square feet must be at least 20 percent more efficient than state code, and all new buildings over 10,000 square feet to meet enhanced green building standards (2014).
City of Pasadena	Amended CALGreen standards in 2013 to mandating minimum "cool roof' requirements new municipal buildings and major renovations.
City of Monte Soreno	General Plan requires all new public buildings to be LEED certified (2010).
County of Ventura	The County's 2010 Energy Action Plan directs the General Services Administration to pursue LEED Silver rating for new County buildings and those undergoing renovations (2012).

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TABLE 5-13. California Jurisdictions and their Community Reach Codes

CA Jurisdiction	Community "Reach Codes"
County of Alameda	Ordinances adopted in 2003 require LEED or Build It Green certification for residential and commercial buildings (2009).
County of Butte	Green Building Ordinance includes requirements that all new construction is 10 percent more efficient than Title 24, new commercial buildings must be LEED certified, and new large commercial and industrial buildings to use on-site renewable generation.
City of Calabasas	Amends CALGreen to require new nonresidential buildings 500-5,000 square feet be LEED certified and larger buildings must achieve at minimum LEED Silver rating (2013).
City of Chula Vista	City Council expected to complete a review by the end of 2015 of the cost-effectiveness of updating its 2009 "solar ready" ordinance (pre-wiring and pre-plumbing of homes for solar PV and solar hot water heating systems), a 2010 Energy Efficiency Ordinance or "reach" code (new residential and commercial buildings) to be at least 15 percent and 20 percent more efficient (in Climate Zones 7 and 10 respectively), and a 2012 "cool roof" ordinance requiring reflective roofs. The City Council will also consider an ordinance this year that would require all new residential and commercial buildings be installed with solar PV systems (2014).
City of Glendale	The City's 2014 Building and Safety Code exceeds 2013 Title 24 with radiant roof barrier requirements in concealed attic spaces for new residential buildings.
City of Lancaster	City Ordinance 994 adopted in 2013 mandates the installation of rooftop solar PV system of at least 1 kW capacity on new homes.
City of Los Angeles	"Cool Roof" Ordinance (2013) mandates minimum thermal emittance and solar reflectance values of roofing materials for new homes.
City of Monte Soreno	General Plan directs new and remodeled homes to exceed Title 24 standards by 25 percent (2010).
City of Pasadena	Amended the local CALGreen standard in 2013 to mandate "cool roof" minimum thermal emittance and solar reflectance values of roofing materials and pre-wiring for electric vehicles and solar PV systems, and electric vehicle charging stations in new homes, commercial, and multi-family buildings (2013).
City and County of San Francisco	Amended Building Standards Code to require LEED or GreenPoint certifications for all new construction and renovations of homes, commercial and multi-family buildings (2013).
City of Santa Barbara	The City has Neighborhood Solar Access and Design Guidelines, and a Residential Built Green Program requirement, with stronger measures for homes over 4,000 square feet (2015).

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5.14. Increase Renewable Energy Education and Outreach Efforts

Definition

Education and Outreach (E&O) programs support and often enable technology-heavy renewable energy programs and policies by educating public policy makers and citizens about what is possible, thus resulting in more exposure (and sometimes more funding) for these practices. E&O efforts are often considered a separate, distinct program under the government operations area since they tend to cut across multiple sectors (e.g., buildings, utilities, transportation, and agricultural). This type of best practice is sometimes overlooked or incorrectly considered "soft," since it is not technology-heavy and singularly focused like other best practices.

E&O programs vary considerably. They can be grouped into five primary categories:

- Meetings and Special Events
- General Renewable Energy Campaigns and Outreach Products
- Internet-based Outreach
- Publications
- Technology and Issue-Specific Campaigns, Including Financing Information

CREP-Related Options for the County:

- Update the County's website and make it a more appealing gateway to renewable energy efforts underway in the County
- Set-up educational renewable energy kiosks at strategic locations across the County to educate employees
- Centralize all County energy-related E&O efforts in one office, such as a new Office of Sustainability recommended in this report
- Design a new E&O program for issues that have traction and meaning for County residents, such as electric vehicles or solar photovoltaics (PV)
- Use the County of San Diego's County News Center for renewable energy education and outreach efforts, focusing on short video stories to begin
- Closely examine the sustainability portions and content of Alameda County and Sonoma County websites
- Consider creating a mobile phone app such as Green Oceanside (Oceanside, CA), or Rethink (Austin, TX), which provides updated sustainability-related information and resources to residents and links to social media. These two-way smart phone applications allow the County to educate the public, while also allowing the public to communicate with the County
- Collaborate with the Center for Sustainable Energy and SDG&E to leverage their marketing, education, and outreach capabilities

5.14.1. Overview

5.14.1.1. Definition

Education and Outreach (E&O) efforts are often considered a separate, distinct program area since they tend to cut across multiple sectors (e.g., buildings, utilities, transportation, and agricultural). E&O programs are frequently buried within program budgets under information dissemination, marketing, or other categories. As a result, this best practice area is sometimes overlooked or incorrectly considered "soft," since it is not technology-heavy and singularly focused like other best practices.

E&O programs vary considerably. They can be grouped into five primary categories:

- Meetings and Special Events
- General Renewable Energy Campaigns and Outreach Products
- Internet-based Outreach
- Publications
- Technology- and Issue-Specific Campaigns, Including Financing Information

5.14.1.2. Value Proposition & Benefits

E&O programs support and often enable technology-heavy renewable energy programs and policies by educating public policy makers and citizens about what is possible, thus resulting in more exposure (and sometimes more funding) for these practices. They may be the most important renewable energy-related program dollars that the County can spend. The benefits of E&O programs are generally well documented, but often qualitative in nature. Greater awareness of renewable energy leads to greater customer uptake, and more renewable energy use, leading to more renewable energy projects, especially when it comes to rooftop solar applications.

5.14.1.2.1. Metrics

Metrics for these programs are surprisingly basic and usually include the number of attendees, number of participants who signed up onsite or via the Internet, or the number of online video views. Due to the prominence of new online E&O programs, Internet analytics are increasingly used to provide metrics to local governments. For example, the number of opened emails or "click-throughs" might be the major metric used for an Internet-based renewable energy outreach program to community businesses or citizens.

5.14.1.3. Types of Education and Outreach (E&O) Programs

E&O programs can be grouped into five different categories. An effective renewable E&O program will often include efforts across all five of these categories. The authors recommend that the County review the programs below to evaluate which ones could be important components of a new CREP-inspired renewable energy E&O strategy:[89]

[89] A State Energy Office (SEO) provides extensive information on these programs. Our team consulted the National Association of State Energy Officials (NASEO) and their SEO members as part of our search for successful renewable energy E&O programs. Our Team looked at E&O programs inside of sustainability budgets of comparably sized counties

5.14.1.3.1. Meetings and Special Events

- County Fairs
- Traditional holiday events
- County meetings
- Piggybacking other County events such as Healthfairs
- "Birthday parties" celebrating annual solar or wind project installation dates
- Annual State of the County celebration
- Renewable energy company ribbon cuttings
- Energy-efficient and solar home tours
- Chamber of Commerce events

5.14.1.3.2. General Renewable Energy Campaigns and Outreach Products

- Posters, flyers, demonstration kits, interactive displays
- Website presence and support
- Prizes, rewards, and recognition within the County for renewable energy or energy efficiency-related leadership
- Stand-alone interactive kiosks and interactive displays
- Media outreach programs
- Billboards (not traditional for a County, but appropriate at times)
- Educational curricula, and onsite kits for grades K-12
- Photovoltaic or wind displays at visitor centers, public agency lobbies, etc.
- Combined fliers with customer water bills
- Video production and distribution
- Educational surveys that inform the consumer or businesses, and also give valuable feedback to the County
- Utility bill stuffers (piggybacking invoices, and (especially) existing energy use statements sent out by SDG&E to residents)
- Direct mail
- Newspaper articles and ads

5.14.1.3.3. Internet-based Outreach

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both in terms of population and budget, in California, and outside the State. Where possible, the authors isolated E&O dollars dedicated only to renewable energy to find general programs for the County's benefit.

- Renewable energy social media campaigns targeted at consumers and businesses
- YouTube and other short videos for the public, segregated by markets (i.e. homeowners, millennials, retired residents, etc.)
- Interactive new Apps that communicate the County's and public's energy use back-and-forth
- Expanded use of Facebook and Twitter
- Digital email newsletters and blasts

5.14.1.3.4. Publications

- Renewable energy County of San Diego Consumer's Guide
- Feature stories for magazine articles
- Renewable Best Practices Guides

5.14.1.3.5. Technology and Issue-Specific Campaigns, Including Financing

- Solar, wind, biomass, and other demonstration and education programs
- Outreach documents describing financing tools, or financing available, including available rebates and incentives for renewable technologies
- Zero Net Energy (ZNE) residential and commercial background information for the public

5.14.1.4. Structure & Budget (Costs)

Varying substantially in cost, E&O programs can range from a $10,000 renewable energy kiosk in a public library, to a $1 million energy awareness project for local governments managed by California's investor-owned utilities (IOUs). E&O program costs are sometimes contained in marketing or outreach budgets, and can amount to as much as 10 percent of total program costs on large multi-year renewable energy projects (Sikemma 2014).

The table below provides information on select California cities and counties with E&O programs and their most recent budgets.[90]

[90] Our team reviewed California City and County websites and interviewed staff in more than two dozen jurisdictions, with guidance from staff at the California State Association of Counties (CSAC).[90] Interviews took place between June 2014 and February 2015. CSAC staff Cara Martinson recommended counties with exemplary sustainability websites in June 2014. The Counties chosen for Table 1 were selected based on many factors, including the likelihood of the County of San Diego implementing similar programs, under comparable budgets.

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TABLE 5-15. E&O Programs and Budgets of CA Cities and Counties

California Jurisdiction or Entity	Program	Most Recent E&O Budget
City of Chula Vista	CLEAN Business Program, Free Resource & Energy Business Evaluation Program, Home Upgrade, Carbon Downgrade Program, and General Community Outreach (Reed 2015)	$150,000 (2015)
City of San Jose	Appropriation for Silicon Valley Energy Watch 2015 with PG&E (Energy efficiency education, outreach and policy coordination) (Jose 2014)	$464,475 (2014)
Sonoma County	Energy Independence Program (Media/Advertising (integrate with existing media/advertising programs, target local newspapers and trade publications), Create Speakers Bureau and target organizations for opportunities to present, Direct Mail, Events and Promotions and local web/call center) (Sonoma 2011)	$55,260 (2011)
Regional Climate Protection Agency (Sonoma County)	Community Public Outreach, Stakeholder Engagement and Local Adoption (workshops and advisory group) (Mersich 2015)	$250,000 (2015)
CaliforniaFIRST	Sample County Budget proposal for financing energy efficiency, energy conservation, renewable energy and related projects and activities (2010)	$258,750 (2010)
California Center for Sustainable Energy (San Diego Region)	2014 Budget for CSI-Solar PV program - Alliances and Co-Promotion, Direct and digital mail, Website content and social media, Interactive outreach, quarterly newsletters, training and education, on-line training, public relations, and administration (CSE 2013)	$95,000 (2013)

5.14.2. Application to SD County (Recommendations)

5.14.2.1. Existing Context

Local government renewable energy E&O programs have been in existence since the early 1970s, when oil overcharge funds were disbursed to state and territorial governments, who in turn doled out dollars to local governments for these programs. As a result, there is a 40-year treasure chest of renewable energy E&O programs spread across the country (Burmeister and Kreith 1992).

The majority of energy E&O programs reviewed for this report were designed to educate the public about government involvement in solar or wind programs. California County-led renewable energy E&O programs typically highlight indigenous renewable energy fuel sources. For example, Imperial County E&O efforts focus on geothermal energy due to rich deposits within the Salton Sea. Los Angeles County highlights the use of solar in the county. The County of San Diego has abundant sunshine along with a budding, vibrant electric vehicle (EV) market. This offers an excellent E&O opportunity for the County to publicize the recently adopted Solar- and Electric Vehicle-Ready ordinance that requires new homes to be pre-wired for future solar PV and electric vehicle charging systems. There is strong SDG&E interest in EV charging stations at this time and a substantial number of EVs in the County. Environment California announced in October of 2014 that California had more than 100,000 EVs on the road. Of those vehicles 20,000 are in San Diego County (CACSE 2012).

5.14.2.2. Next Steps

5.14.2.2.1. Website Opportunity

One of greatest underutilized assets the County owns is its website. An active website presence with renewables distinguishes most of the truly effective and nationally known E&O programs, including in Sonoma County, Los Angeles County, the City and County of San Francisco, and the Cities of Santa Monica, California; Boulder, Colorado; and Austin, Texas. The websites for these counties and cities and others like them invite participation in renewable energy (and sustainability) programs, while educating the public about the issues, usually through the liberal use of photos, graphics, and testimonials. Discussions with representatives from each of these governments indicate that their website drives participation in renewable energy programs; no formal program evaluations exist for the E&O programs mentioned here.

There is significant untapped potential for connecting constituents to the County of San Diego website. For example, when a reader types "County of San Diego Renewables"—a likely search phrase, into the browser on their computer -- the first link provided is to a DGS (Department of General Service) page which only provides information on the County's PV installations at its four facilities..[91] Also on the screen is a small picture of a solar panel. While the County should be commended for having the page in the first place, the authors also believe there is plenty of room for improvement in this area.

Regardless of the CREP, there remains a strong need for E&O programs in the County. The average San Diego County resident has little awareness of local renewable energy potential, that solar energy costs have dropped 80 percent since 2008, or that the region is a national leader in electric vehicle research and infrastructure development (Schneider 2014). The County has the opportunity to use the CREP to help create more educated consumers and businesses, which in turn can create more consumer demand for renewables.

5.14.2.2.2. Behavior Change Programs: Key E&O Opportunity for the County of San Diego

E&O programs are separated from traditional utility-funded resource programs in California generally, which are required to save a specific amount of energy that can be claimed by a utility or similar entity, and subsequently credited where necessary. However, E&O programs are considered important complements to utility-funded resource programs with energy-saving goals. As a "non-resource" program, E&O programs sometimes enjoy more flexibility as a result. New behavior change programs have been considered non-resource E&O programs in many cases, but their recent success is quickly changing this phenomenon.

Behavior change programs came to the surface around a decade ago and are revolutionizing the way utilities and communities deliver traditional energy efficiency and renewable energy programs. Here's how they work. A third-party contractor with expertise in the energy behavior change area is hired by a utility, municipality, governement agency, nonprofit, etc., to influence the energy behavior of a group of energy consumers (i.e., a market segment). The third party designs a program and attempts to influence the energy behavior of this segment by using key messages that appeal to individuals, which in turn will cause them to

[91] As of June 11, 2015.

change their behavior and reduce energy waste (e.g., turning off the lights before leaving a room). Behavior change programs can also be used for uptake of building upgrades and renewable energy generation. Energy behavior change programs are starting to rack up energy savings, and are an important E&O resource to the County. Given recent advances in energy and behavior change science, these programs will become an increasingly important asset to utilities and to counties involved in producing, selling, or supporting the adoption of renewable energy.

The County of San Diego can benefit from building outreach and education programs that use the latest in behaivoral, decision, and social science. These types of programs focus on using trusted messengers to deliver key program asks, thereby, driving both stronger program results through word of mouth diffusion and eventual market transformation/new cultural norms that support renewable and energy efficiency uptake. (Donnelly 2013)

5.14.3. Who Else is Doing It?

Virtually all local governments with major sustainability offices have a strong E&O component worth reviewing. Notable California counties with exemplary renewable energy E&O programs include:

TABLE 5-16. E&O Programs in California Counties

Jurisdiction	Department and internet hyperlink	Distinguishing features
County of Alameda	Alameda County Sustainability http://www.acgov.org/sustain	Comprehensive collection of information of documents departmental activities, consumer information, and news
City of Berkeley	Energy and Sustainable Development http://www.ci.berkeley.ca.us/energy_and_sustainable_development/	Climate Action Plan progress reports, comprehensive residential and business program links, city sustainability policies and resources
City of Sacramento	Sustainability Sacramento http://portal.cityofsacramento.org/General-Services/Facilities/Sustainability	To-the-point information with links to more information on energy, adaptation, engagement, land use, mobility, water, and projects
City and County of San Francisco	San Francisco Department of the Environment http://www.sfenvironment.org/	Extensive information on energy, transportation, waste, buildings, climate change, education and equity with additional topics in each category
City of Santa Monica	Office of Sustainability and the Environment http://www.smgov.net/departments/ose/	Eleven sustainability topic categories, public recognition of City employees and residents
County of Santa Clara	Office of Sustainability http://www.sccgov.org/sites/osp/Pages/Office-of-	Easy to find information on County and community programs

Jurisdiction	Department and internet hyperlink	Distinguishing features
	Sustainability-Home-Page.aspx	
County of Sacramento	Green Sacramento County http://www.green.saccounty.net/Pages/default.aspx	Slideshow of County sustainability achievements, easy-to-use links for community resources
County of Ventura	County of Ventura Sustainability http://www.ventura.org/sustain/	Easy to identify information for employees, business and community; public recognition; sustainable food and healthy eating

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5.15. Starting a Community Solar Initiative

Definition

While California leads the nation in rooftop solar PV installations, many ratepayers are not able to install PV systems because they have limited solar access, they cannot afford the current price of solar with existing financing schemes, or they do not own the roof they live under (e.g., a renter in a multi-family apartment building).

Community Solar is recognized as an innovative approach to reducing greenhouse gas (GHG) emissions and lowering the cost of solar photovoltaics (PV) electricity through economies-of-scale. Community Solar helps avoid the traditionally high upfront costs of solar by spreading the investment among many players.

Community Solar is also sometimes referred to as community shared solar or solar gardens. Community Solar arrays range in size from those small enough to be installed on a building's rooftop to larger ground-mounted systems that may be located on many acres of land. An average single-family home would offset 100 percent of its electricity usage with about 2 to 5 kilowatts of solar power.

CREP-related Options for the County of San Diego:

- Encourage Community Solar electricity rates that are at or below the cost of similarly-sized residential solar PV systems
- Consider how the County can become a subscriber to a Community Solar system and how it could profit from managing Community Solar installations, such as through leasing county land/space to developers or investing in its own Community Solar PV installations
- Allocate/reserve a portion of any new Community Solar project to low-income customers (for example a 5 percent set-aside)
- Get involved in the implementation and regulations discussion stemming from SB 43 in the near future, looking for ways to make Community Solar work in the County

5.15.1. Overview

5.15.1.1. Definition

Community Solar is recognized as an innovative approach to reducing greenhouse gas (GHG) emissions and lowering the cost of solar photovoltaics (PV) electricity through economies-of-scale. Community Solar helps avoid the traditionally high upfront costs of solar by spreading the investment among many players. Community Solar arrays range in size from those small enough to be installed on a building's rooftop to larger ground-mounted systems that may be located on many acres of land.

Millions of Californians are not able to install solar PV systems on their rooftops because of poor rooftop solar orientation, limited or no space, financial restrictions, or an inability to install a system because they live in rental or multi-family housing units (Roth 2015). SDG&E estimates that less than 30 percent of its customers can take advantage of rooftop solar PV installations (SDG&E 2012). In February 2015 the California CPUC began implementation of the Green Tariff Shared Renewables program to expand access to renewable energy resources for consumers like these, and to encourage more community shared renewables programs (CPUC 2015). Community Solar is also sometimes referred to as community shared solar or solar gardens.

5.15.1.2. Value Proposition & Benefits

While California leads the nation in rooftop solar PV installations, many ratepayers are not able to install PV systems because they have limited solar access, they cannot afford the current price of solar with existing financing schemes, or they do not own the roof they live under (for example, a renter in a multi-family apartment building). Apartment renters and businesses that rent or lease their space are often restricted from receiving the benefits of rooftop solar PV, even when they do have adequate space and orientation, and are willing to pay for it. Advocates of Community Solar note that since these same taxpayers and utility ratepayers already pay into solar incentive programs via their utility bills, they deserve access to solar opportunities.

Community Solar helps avoid the traditionally high upfront costs of solar by spreading the investment among many players. Additional benefits of Community Solar are that sites with high solar potential become more viable for development when multiple subscribers are sharing the costs (Postal 2014). It also supports the local solar industry, and can reduce utility transmission and distribution (T & D) costs when placed within the County. It should be noted that a Community Solar initiative can thrive as part of Consumer Choice Aggregation (CCA), and also without it.

5.15.1.3. How Community Solar Functions

A third party developer builds a solar photovoltaic array, and individual electric utility customers ("subscribers") are able to purchase either a set number of panels or a specified amount of solar generated electricity from the third party. The third party works directly with the utility supplying electricity to the grid to coordinate all of the interconnection requirements and ensure that the individuals purchasing solar from the array (either via panels or in a specific amount of electricity generated) are credited appropriately for such purchase by their electric utility. What separates Community Solar from other solar programs is that the solar arrays are tied in to the existing utility grid but are usually not located on the subscriber's property.

FIGURE 5-4. Shared Renewables Configuration of Participants

Source: CleanTechnica.com

Subscribers are able to receive their pro rata share of solar credits to their utility bill through multiple mechanisms. Depending upon the state involved, these mechanisms can include net metering,[92] group billing, joint ownership or Virtual Net Metering (VNM). VNM is the California policy used for Community Solar. VNM is a tariff arrangement that traditionally is used to enable a property owner, such as an apartment building owner,to allocate a solar system's energy credits to other building's residents. In the case of Community Solar, VNM (which is allowed by California regulators) is used instead by a developer of a solar project to allow multiple people to benefit from a solar system.[93] Community Solar essentially expands the application of VNM beyond the traditional application on a single building. This also allows for larger projects, since they are not limited by the size of one building's rooftop.

A Community Solar project in the County of San Diego can be proposed by a third party when the SDG&E Company issues a Request for Proposals (RFP) for a set amount of photovoltaic (PV) power. An RFP must take place for a Community Solar project; it formalizes the amount of power to be generated and purchased, and to whom that power can be sold to in the County. The third party that wins the RFP arranges for the construction of a solar array (for example, in rural, unincorporated eastern San Diego County) that meets the amount of PV power described in the RFP. The SDG&E Company may also offer Community Solar on its own without going through a third party. Again, Community Solar arrays range in size from those small enough to be installed on a building's rooftop to larger ground-mounted systems that may be located on many acres of land. The power generated from this array can then be sold to people or organizations located away from the array (for example, in incorporated western San Diego County, if allowed by regulators).

5.15.1.4. Structure and Budget (Costs)

There are three generally recognized models for a Community Solar project: utility-owned, privately owned, and non-profit sponsored. Depending upon the final regulations following SB 43, all three of these

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[92] Please see the Financing section of this report for more details about net metering. Since Virtual Net Metering is not discussed in detail in the Financing Section, a short description of it is included in this Best Practice.

[93] See http://www.cpuc.ca.gov/PUC/energy/DistGen/netmetering.htm.

models may be available to the County. Table A below provides details on their distinguishing factors.[94] Each has its own set of advantages and disadvantages related to the allocation of costs and benefits, financial considerations, and other legal or regulatory issues. The most common projects are utility-owned and operated because of their existing industry expertise and motivation to meet relevant legislative or regulatory requirements, such as a renewable portfolio standard (RPS) and/or greenhouse gas (GHG) reductions. Municipal and rural electric cooperative utilities in particular are starting to build community solar projects to meet customer demand (Hunt 2014).

Community Solar agreements can be structured to own or lease. These agreements can be incorporated into the design of new developments and communities, and also into long-standing, existing communities. Depending upon the ultimate regulations of SB 43, the County could potentially participate both as an owner, and a purchaser, of solar powered electricity through Community Solar. The Community Solar construction phase creates jobs, as does the maintenance required after construction is complete.

Financial and time-saving permitting incentives can be structured specifically by the County to locate Community Solar projects in unincorporated communities, or elsewhere. People that buy into a Community Solar program tend to come from multi-family housing projects and from dense communities where access to solar has been traditionally limited. Community Solar projects keep energy dollars in the County, which is important to some. It is possible to continue to own one's share in a Community Solar project after moving in some cases (Hunt 2014).

Officials with Sun Share, a for-profit company responsible for multiple Community Solar projects around the country, maintain that 66 construction jobs and 35 ongoing jobs are created for every 3 MW of Community Solar. These same officials say that this same 3 MW of new Community Solar is responsible for an additional $7-10 million in total estimated economic benefit during construction (Postal 2014).

In some projects, there has been a 1kW minimum subscription purchase. In Colorado, where there are many Community Solar projects, no single subscriber can be allocated more than 40 percent of a Community Solar project.[95] Some developers have allocated 5 percent of a Community Solar project to low-income customers. Projects usually take less than a one year to install, depending upon the size (Hunt 2014).

[94] This table is based on information provided in "A Guide to Community Shared Solar," page 9, NREL, 2012.)

[95] The Venetucci Farms Community Solar project in Colorado Springs is a good example of a typical project. It consists of 2,520 panels, with a capacity of 579 kW. It was made available to all customers of the local municipal utility, the Colorado Springs Utilities company. The PV panels cost $550 each and customers were required to lease a minimum of two panels each. The entire array was sold out in 10 weeks to 350 residential customers and two educational institutions. (Venetucci Farm, 2014; Fox News, 2011). Utilities are allowed to recover transmission and distribution costs for Community Solar projects in Colorado, which makes it more attractive to them.

TABLE 5-17. Three Dominant Models for Community Solar

	Utility	Private Investment	Nonprofit Managed
Owned By	Utility or third party	Investors	Nonprofit
Financed By	Utility, grants, ratepayer subscriptions	Member investments, grants, incentives	Memberships, donor contributions, grants
Hosted By	Utility or third party	Third party	Nonprofit
Subscriber Profile	Electricity rate payers of the utility	Community investors	Donors, members
Subscriber Motive	Offset personal electricity use	Return on investment; offset personal electricity use	Return on investment; philanthropy
Long-term Strategy of Sponsor [1]	- Offer solar options - Add solar generation (possibly for Renewable Portfolio Standard)	- Sell system to host - Retain for electricity production	Retain for electricity production for life of system
Examples	- SMUD[96] – SolarShares Program - Tucson Electric Power – Bright Tucson Program (Tucson, AZ)	- University Park Community Solar, LLC (University Park, MD) - Clean Energy Collective, LLC (Carbondale, CO) - Island Community Solar, LLC (Coupeville, WA)	- SDCHC Hacienda Townhomes (San Diego Housing Corporation) - Winthrop Community Solar Project (Winthrop, WA) - Solar for Sakai (Bainbridge, WA)

Source: *A Community Guide to Solar: Utility, Private, and Non-profit Project Development,* National Renewable Energy Laboratory, DOE/GO-102011-3189, January 2011.

5.15.2. Application to SD County (Recommendations)

5.15.2.1. Existing Context

In California, Community Solar requirements are currently going through the CPUC rulemaking process (Renewables 2014). In 2013, California enacted the Green Tariff Shared Renewables Program (SB 43) to allow investor-owned utilities to administer a program that allows utility customers to voluntarily purchase electricity from renewable energy facilities such as a Community Solar installation.[97] SB 43 directs the three largest investor-owned utilities of California, including SDG&E, to build 600 MW of renewables-generated electricity for subscribers, and earmarks 100 MW for disadvantaged communities. Community Solar

[96] In the Sacramento Municipal Utility District (SMUD), customers can already meet 20-40 percent of their electricity use by purchasing .5kW shares in a Community Solar project. In return, the SMUD customer receives a credit on his/her monthly bill in relation to the quantity of output they subscribed to through the program.

[97] Other states that have enacted Community Solar legislation include Colorado, Delaware, Massachusetts, Maine, Minnesota, New Hampshire, Vermont, Washington, and the District of Columbia.

projects could be as large as 20 megawatts (160 acres), which could power over 5,000 average homes. Final program requirements and implementation details are expected to be announced later this year.

The County of San Diego already has one notable Community Solar project. The San Diego Community Housing Corporation (SDCHC), a nonprofit organization partnered with a third party, Everyday Energy, to build and install a 20 kW system on a Hacienda Townhomes property. Everyday Energy installed and owns the system on the 52-unit apartment building, taking advantage of the tax benefits that are not available to the SDCHC. SDCHC signed a 20-year solar services agreement with Everyday Energy under which they will pay a flat fee to cover maintenance and electric services for the installation. An electric meter measures the energy flow directly to the grid, and the SDG&E Company credits the tenants and common areas as directed in the Virtual Net Metering (VNM) agreement. Residents are scheduled to save a projected 30 percent on their electric bills through this Community Solar project. The tenants pay their own electricity bills, and purchase their portion of solar through Everyday Energy on these same bills.

5.15.2.2. Next Steps

The County of San Diego may play a leading role in advancing Community Solar itself by subscribing to SDG&E's Community Solar program once program design is finalized, thereby increasing its own percentage of renewable-generated electricity. The County may also consider a policy to require appropriately sized segments of land (or roof space) at future multi-family projects be dedicated for Community Solar installations. Notably, the County may consider how to lease some of its own land for Community Solar projects, or it may be able to design its own Community Solar program depending on future related CCA rules and regulations, should it decide to pursue CCA.

5.16. Establish a Microgrid and Develop Policies Related to Microgrids

Definition

A microgrid is a self-contained power system set up for a small geographic region. It usually has one or more power sources (often renewable), advanced energy storage, and an intelligent energy management system. Microgrids tend to be cleaner and more efficient than traditional power sources because they often utilize solar, wind, and/or combined heat and power (CHP) to generate power.

A microgrid can operate while connected to the main grid, but can automatically disconnect itself if the main grid goes down. When disconnected, the microgrid can continue to operate, providing electricity, heat, and cooling.

There are several microgrid projects in the San Diego region set up by the U.S. Department of Defense (DOD) and universities in Southern California.

CREP Related Options for the County of San Diego

- Take an active role in the recently announced microgrid project in Borrego Springs and study evolving ownership models.
- Partner with SDG&E and the University of California San Diego on microgrid policy development.
- Identify all potential low-temperature geothermal sites in the County that may be able to be tied-into a microgrid.
- Study expected load growth in the County and identify potential sites where a microgrid may be ideally suited.

5.16.1. Overview

5.16.1.1. Definition of a Microgrid

A microgrid is a self-contained power system set up for a small geographic region. It usually has one or more power sources (often renewable), advanced energy storage, and an intelligent energy management system. Microgrids tend to be cleaner and more efficient than traditional power sources because they often utilize solar, wind, and/or combined heat and power (CHP) to generate power. Furthermore, microgrids provide higher quality power to users because they generate power in close proximity to the demand site.

5.16.1.2. Value Proposition & Benefits

Microgrid benefits are typically classified into four categories: economic, reliability and power quality, environmental, and security and safety (Microgrids at Berkeley Lab, 2015). The primary benefit of a microgrid is reliability and its ability to keep critical infrastructure, such as transportation systems, hospitals, data centers, water treatment facilities, police and fire departments, operating, particularly during times of crisis. Microgrids work well for large institutions like schools, hospitals, and multiple-unit government facilities because of the significant amount of electricity demand concentrated in one geographic area.

Robert Thornton, President & CEO of the International District Energy Association (IDEA), notes, in this post Superstorm Sandy-era, mayors and public officials are actively seeking deployment of more resilient urban energy infrastructure, both for public safety as well as economic and energy security reasons . He further remarks:

> *The authors know from experience that robust CHP/district energy microgrids on our college campuses deliver highly reliable and resilient energy with a lower environmental footprint. It's time that cities and communities had the same access to proven technologies like CHP/district energy microgrids and that arcane statutory restrictions are revisited to enable mayors to allow these cleaner energy efficient options to compete and flourish* (Woods, 2014).

5.16.1.3. Function of A Microgrid

A microgrid can operate while connected to the main grid, but can automatically disconnect itself if the main grid goes down. The microgrid will continue to operate, continuing to provide electricity, heat, and cooling after it has been disconnected from the main grid.

Modern microgrids are "smart" and utilize sophisticated energy management systems. Its "intelligence" allows it to isolate itself from the main grid. If a microgrid anticipates an outage "domino effect" (where power sources go off-line due to a storm or other source, one-by-one) beginning to occur, it can separate and protect itself from the main grid. It will stop relying on the grid's power plants and instead rely only on its own (Wood 2014).

5.16.1.4. Structure & Budget (Costs)

Depending on the size and design of the microgrid, there are significant capital and management expenses. However, once built, the microgrid has the potential to create significant energy savings. Utility Dive surveyed 250 utility executives, finding that the majority of these executives believed that the increased efficiency of microgrids would likely lower customer rates or have little impact on rates (Drive 2014).

5.16.1.4.1 Borrego Springs Demonstration Project

A 4 MW demonstration microgrid project in Borrego Springs cost $15.1 million to build. This project was not 100 percent renewables. The funding for this project was provided by US DOE ($7.5 million), SDG&E ($4.1 million), California Energy Commission ($2.8 million), and ($0.8 million) from other partners (Wood 2014). The project comprised of energy storage (500 kW/1500 kWh), two 1.8 MW diesel generators, three smaller 50 kWh batteries, six 4 kW/8 kWh home energy storage units, 700 kW of rooftop solar PV, a 125 residential home area network system, a supervisory control and data acquisition (SCADA) on all circuit breakers, Feeder Automation System Technologies (FAST), outage management systems, and price-driven load at the customer level. The Borrego Springs project partners included Lockheed Martin, IBM, Advanced Energy Storage, Horizon Energy, Oracle, Motorola, Pacific Northwest National Laboratories, UCSD, SDG&E, California Energy Commission, and a variety of smaller partners (Microgrids at Berkeley Lab, 2015)

5.16.2. Application for County of San Diego (Recommendations)

5.16.2.1. Existing Context

There are several microgrid projects in the San Diego region set up by the U.S. Department of Defense (DOD) and universities in Southern California. The most recent microgrid project was announced in February 2015, also in Borrego Springs. This project, led by SDG&E, will be all renewables and tied into a 26 Megawatt Borrego solar facility, and ultimately linked to 2,800 individual Borrego Springs' meters (Trabish 2015). The California Energy Commission provided $5 million to the project.

While the University of California, San Diego's (UCSD) microgrid is a demonstration or proof-of-concept project, it is one of the larger, premier, state-of-the-art microgrid projects in the world. UCSD's microgrid ensures reliable power to 45,000 people and 450 buildings. It generates 92 percent of the campuses electricity and 95 percent of the heating and cooling requirements. It also saves the university approximately $850,000 per month or $10.2 million per year in retail energy costs. From an energy security perspective, UCSD is SDG&E's biggest demand response customer. UCSD has the ability to shed up to 10 MW of demand when called upon by SDG&E. The University has 4,000 thermostats under remote control (Paulos 2014). Microgrids work well for large institutions like schools, hospitals, and multiple-unit government facilities because of the significant amount of electricity demand concentrated in one geographic area.

5.16.2.2. Next Steps

If the County were to pursue a similar size project, in addition to the capital costs, the County would need to allocate one FTE project manager for up to two years. The position would likely drop to a third or half-time in the third year.

Notably, low-temperature geothermal resources can be tied into microgrids where these sites exist in the County. The County may want to identify these geothermal resources as part of the CREP.

5.16.3. Who Else Is Doing It

In February 2014, Governor Christie announced the creation of a $200 million New Jersey Energy Resilience Bank to fund projects that would ensure a highly reliable power supply to critical public facilities such as water and wastewater treatment plants, hospitals, shelters, and emergency response networks in the event the main grid fails (News 2014).

Microgrids and renewable energy have also become a major part of the U.S. Department of Defense's (DOD) energy strategy. Increasing energy costs, greenhouse gas emissions, energy security, and critical response times are major risks that the DOD needs to mitigate (Marqusee 2012). In 2011, DOD facilities used $4.1 billion worth of energy and were responsible for 40 percent off DOD's GHG emissions. Additionally, with the fragility of the commercial grid, relying on it and/or diesel generators while executing critical missions is seen as an unacceptable risk.

In 2012 and 2013, DOD installed microgrids at 29 Palms Marine Base and at Camp Pendleton. DOD, the Department of Energy (DOE), and the Department of Homeland Security (DHS) are also running three microgrid demonstration projects (Smart Power Infrastructure Demonstration for Energy Reliability and Security, or SPIDERS) using Sandia National Laboratory's Energy Surety Microgrid (ESM) methodology. The goal of this project is to transition the military bases from the overreliance on diesel generators to hybrid systems that integrate solar power, hydrogen fuel cells, and other onsite power sources, and advance energy storage systems. These microgrids projects use 9 percent renewables and ensure secure, reliable, and resilient power generation and distribution. The projects sites include Hickam Air Force Base in Hawaii, Fort Carson in Colorado, and Camp Smith in Hawaii (Casey 2013).

The tables below lists national microgrid projects as well as interest in microgrid projects by various states and cities. The end of the table also includes several microgrid projects being led by the U.S. Department of Defense in collaboration with the Department of Energy and the Department of Homeland Security.

TABLE 5-18. Notable Microgrid Projects in the United States

Microgrid Owner	Year	Status	Power	Notes
University of California at San Diego (Demonstration project)	2008	Established. Expanding EV charging stations	42 MW peak load	1.2 MW of solar PV, 40K ton/hr. thermal energy storage, 30MW NG CCHP plant, 2.8 MW fuel cell, 1.8MW electric energy storage, 2.0 MW PV integrated storage
California	2014	R&D Stage	NA	CEC, DOE, CPUC
Borrego Springs, CA (Demonstration project)	2013	Completed	4MW	Demonstration project. DOE, CEC, and SDG&E sponsored. Incorporated distributed generation, advanced energy storage, price driven load management, switching and isolation technology, and integration between utility controls and microgrid controls
Sacramento, CA (Demonstration project)	2012	Completed	300 kW	Demonstration project. CEC sponsored. Sacramento Municipal Utility District. Linking natural gas generators, CHP, and solar PV
Philadelphia	2014	Pending	NA	DOE ($1.2M) and Philadelphia Water Department
Massachusetts	2014	R&D stage	NA	State releasing $50 million for microgrid development with solar PV, wind, CHP, electrical and thermal storage, fuel cells, and energy management technology
New Jersey	2014	Pending	NA	Five projects to make New Jersey Transit System more resilient (withstand extreme weather events). $1.276 billion in federal monies. USDOE Sandia designing microgrid
Connecticut	2 013	Pending	15 MW	State has put up $18 million for projects in Bridgeport, Fairfield, Groton, Hartford, Middletown, Storrs, Windham, and Woodbridge. An additional $45 million to be spent in next two years
Boston	2014	R&D Stage	NA	Wants widespread adoption
New York	2014	R&D stage	NA	Improve grid resiliency
Maryland	2014	R&D stage	NA	Create grid resiliency. Resiliency Through Microgrids Task Force
University of Texas at Austin	1929	Established	62 MW and 1.2 million/lbs./ hr. steam	Largest and most integrated microgrid in the country. 86 percent efficient, Natural gas plant with Combined Heat and Power (CHP)

TABLE 5-19. U.S. Department of Defense Microgrid Projects in Collaboration with the Department of Energy and the Department of Homeland Security

Public Jurisdiction	Year	Status	Power	Notes
29 Palms Marine Base, CA (Demonstration project)	2012	Completed	NA	Demonstration project. DoD and ESTCP sponsored. Cogen and solar PV
Camp Pendleton, CA (Demonstration project)	2013	Completed	NA	CEC, DoD, DOE Sandia, Contractor sponsored. Incorporates solar PV, energy efficiency, and energy storage technology. $2.8 million project Demonstration project between DoE, DoD, DHS
Joint Base Peal Harbor-Hickman, HI (DOE Sandia's SPIDERS Microgrid project)	2013	Completed	146 kW Solar PV, 50 kW Wind	Demonstration project between DoE, DoD, DHS
(DOE Sandia's SPIDERS Microgrid project)	2014	Pending	2 MW	Solar PV Demonstration project between DoE, DoD, DHS
Camp H.M. Smith (DOE Sandia's SPIDERS Microgrid project)	2014	Pending	5 MW	Solar PV and diesel Demonstration project between DoE, DoD, DHS

5.17. Establish Electric Vehicle Programs (as the first step toward integrating a more complete review of broader transportation services)

Definition

In 2014, more than 47,000 plug-in vehicles (PEVs) were sold in California – a 30 percent increase over 2013 sales – with cumulative statewide sales exceeding 118,000 since 2010. California PEV sales represent more than 40 percent of the national market (CACSE 2012). The market for plug-in electric vehicles is growing every month – and with it, the need for more places to charge. Utilities estimate that 80 to 90 percent of PEV charging occurs at home (California Plug-in Electric Vehicle Collaborative, 2015). With the potential to use as much as 75 percent of the electrical load that the typical home in San Diego County imposes on the grid, EVs are one of the biggest game changers of the last 100 years.

Electric Vehicles (EVs) both consume *and* produce electricity. As such, they are also potential sources of intermittent power, just like a solar photovoltaic (PV) panel, and also a place to store electric power (via batteries). SDG&E is evaluating the interaction of EVs and batteries in their power mix (SDG&E, 2015). EV initiatives and programs can further help the County meet CAP-related and other greenhouse gas (GHG) emission reduction goals, as well as reduce its fuel use and costs as traditional fossil fuels are replaced in the fleet (CaCSE 2012).

EV planning objectives are grouped into four categories for this Best Practice:

- Infrastructure
- Fleets
- Permitting
- Storage

CREP-Related Options for the County of San Diego

EV Infrastructure

- Promote the benefits of the solar- and Electric Vehicle-ready ordinance
- Consider public EV charging stations as a future source of revenue generation, and analyze this possibility in Phase II of the CREP
- Work closely with SDG&E on the optimum future locations for public EV charging stations
- Create and adopt a formal PEV program working with the REVI and SANDAG
- Encourage new multi-family buildings to include pre-wiring for Level 2 EVSE as a percentage of total spaces
- Encourage businesses to install Level 2 EVSE charging systems for their employees.

County fleet

- Increase the number of light duty EVs in the County fleet

Permitting

- Work with incorporated towns and cities to develop standardized permitting and inspection processes as well as installation procedures for builders and contractors.

Storage

- Work with SDG&E on its recently revealed (informal) plans to start energy storage training classes in the future, as a workforce development opportunity.

5.17.1. Overview

California accounts for about 40 percent of all plug-in cars sold in the country, with more than 100,000 units sold through August 2014 (Bloomberg News, 2014). Twenty thousand of those vehicles are in San Diego County. According to a 2015 report, worldwide revenue from electric vehicle charging services is expected to grow from $152.6 million annually in 2015 to $2.9 billion by 2023, while sales of EV charging systems are expected to grow steadily in the coming years, surpassing 2.5 million by 2023 (Navigant Research, 2015). This has important implications for the County as both a user of EVs and as a potential future supplier of renewable-generated electricity.

The County of San Diego already has an extensive EV network in place. Southern California utilities are aggressively pursuing EV development, so local EVs continue to gain market share. In 2012, Governor Brown issued an executive order that established the goal of getting 1.5 million zero-emission vehicles (ZEVs) on California roads by 2025.

In 2012, SANDAG established a Regional Electric Vehicle Infrastructure (REVI) Working Group which published a Regional Plug-In Vehicle Readiness Plan in January 2014 (SANDAG 2014). This final report includes an overview of planning and siting issues and typical barriers encountered by EV proponents including:

- A general lack of knowledge of PEVs and EVSE issues
- The need for ongoing regional collaboration for public Electric Vehicle Supply Equipment (EVSE) siting
- Few PEVs in government fleets

- Lack of EVSE infrastructure and installations
- EVSE permitting/inspection protocols lacking
- Few EVSE at multi-unit dwellings
- Limited commercial and workplace charging
- New zoning and parking rules
- Updating building codes to accommodate EVs
- Training and education for municipal staff and electrical contractors
- On-peak charging and TOU utility rates[98]

The County has done well in addressing many of these barriers, namely installation of EVSE charging stations for County and public use, plans for additional charging station installations, the planned addition of more EVs to the County fleet, and the recently-adopted Solar PV- and EV-Ready ordinance.

5.17.1.1. The Case for Electric Vehicles

Electric vehicles (EVs) can play a very important role in San Diego County's path towards a clean energy economy.[99] Electric vehicles are potential sources of intermittent power, just like a solar photovoltaic (PV) panel, and also a place to store electric power (via batteries). SDG&E is evaluating the interaction of EVs and batteries in its power mix (SDG&E, 2015).[100] Not only do EVs both consume *and* produce electricity, transportation plays a large role in the County of San Diego from an emissions and healthcare perspective. With the potential to use as much as 75 percent of the electrical load that the typical home in San Diego County imposes on the grid, EVs are one of the biggest game changers of the last 100 years.[101]

The benefits of PEVs include improved air quality, reduced greenhouse gas emissions, less reliance on petroleum, significant fuel savings to drivers, and benefits to the local economy. In addition, consumers are beginning to realize that PEVs are fun to drive and can satisfy a large percentage of their daily transportation needs (CEC 2012).

The availability of new vehicle models, greater driving range from improved battery technology, increased availability of charging infrastructure, along with incentives such as carpool lane access, federal tax credits, and state and air district rebates have contributed to an expanding market for PEVs (CaCSE 2012). New

[98] SDG&E offers customers two EV TOU rates: 1) EV TOU 2 combines all electricity consumed by a household on a single meter; all PEV and household electricity would use the same meter and benefit from high electricity usage during off-peak hours, and 2) EV TOU allows households to install a separate meter for their PEV, tracking PEV electricity usage separately from the rest of the home. The following figure reflects SDG&E's TOU rates as of September 1, 2013. For further information, read the Read-in Plug-in Vehicle Readiness Plan.

[99] Due to the scope of work designed by the County, electric vehicles (EVs) are the only transportation-related Best Practice to be considered as part of Phase One of the CREP.

[100] As reported in late February 2015, SDG&E submitted plans to bid a combination of EVs and storage facilities (batteries) as one energy source to the California Independent System Operator's (CAISO) energy markets.

[101] http://www.utilitydive.com/news/6-thought-leaders-on-the-future-of-utility-business-models-regulation/357635/, quote by SDG&E's Chairman, James Avery, February 2015.

PEVs in California are now available at prices of $13,000 after incentives.[102] Many PEVs in 2013 were less expensive than the average new vehicle, at $31,000. Some potential buyers, however, may not have the tax liability to take all of the federal tax credit (CCSE 2012).

Rebate statistics for San Diego County (including all incorporated) from the Center for Sustainable Energy are posted below (CEC, 2013). Please note: BEV is a 100 percent battery-powered electric vehicle and PHEV is a Plug-in Hybrid Electric Vehicle that can also run on gasoline.

TABLE 5-20. Rebates (issued and Reserved) March 2010-February 2015

Rebate Type	Quantity	Funding
BEV	4,993	$13,283,966
PHEV	2,546	$3,815,817
Other	49	$47,800
Total	**7,588**	**$17,147,583**

5.17.1.2. EV Planning at the State and Regional Level

As part of California's strategy to reduce GHG emissions, the California Energy Commission is developing a statewide Plug-In Electric Vehicle Infrastructure Plan that will provide guidance to local government regarding public infrastructure planning. In addition to Governor Brown's Executive Order B-16-2012 that directs the state government to help expand the zero-emission vehicle market in California. He also signed Executive Order B-18-2012 that directs state agencies to "identify and pursue opportunities to provide electric vehicle charging stations and accommodate future changing infrastructure demand" (CSE 2015).

In order to enlist the help of local governments with these goals, the U.S. Department of Energy awarded the California Center for Sustainable Energy (CCSE then, now known as the Center for Sustainable Energy (CSE)) funding to assess regional electric vehicle supply equipment (EVSE) and prepare regional stakeholders for accelerated PEV adoption. As a phase one step, the CCSE in 2012 convened a Regional Electric Vehicle Infrastructure (REVI) Working Group. It published a "San Diego Regional Plug-In Electric Vehicle (PEV) Readiness Plan" in January 2014 which includes a host of recommendations and tools for municipalities to implement to address future planning needs (CaPEV 2014).

The second phase of the project was funded by the California Energy Commission and awarded to the San Diego Association of Governments (SANDAG) and CCSE. The goal of the second phase was to establish the San Diego Regional Electric Vehicle Infrastructure (REVI) Working Group, comprised of representatives from local governments, public agencies, utilities, industry, and nonprofits. The goal of REVI is to facilitate the implementation of the recommendations made in the readiness plan (CaCSE 2012). The

[102] At market launch in 2011, PEVs initially faced a significant barrier of high cost, with MSRPs ranging from $29,000 - $40,000. Price reductions in 2013 lowered prices to MSRPs of $23,000 - $35,000, with Federal and State incentives reducing this cost by approximately $9,000 - $10,000.

County of San Diego is currently an advisory member of the REVI working group (County of San Diego 2012).

According to the San Diego Regional Plug-In Electric Vehicle (PEV) Readiness Plan, written in 2012 by the Center for Sustainable Energy, some of the benefits and considerations of implementing a PEV program include the following:

- Public Health and Environment
- Lower greenhouse gas (GHG) emissions
- Lower particulate pollution
- Lower carcinogens
- Improved energy security
- Improved resilience
- Extra energy storage (in batteries)
- Significant annual fuel savings

County PEV initiatives help it meet CAP-related and other greenhouse gas (GHG) emission reduction goals, as well as reduce its fuel use and costs as traditional fossil fuels are replaced in the fleet (CaPEV 2014).[103] A 2014 RFP sought qualified companies to install an estimated 30 Level 2 or higher (DC Fast Charging) charging stations for public and County use at 10 County facilities. Six charging stations were installed in December 2014 at a parking garage at Waterfront Park.[104]

5.17.1.2.1 Forthcoming Changes (2015)

The CPUC approves an annual credit against utility bills or a one-time vehicle rebate (San Diego Union Urban Tribune 2014). Each utility is considering which incentive to provide before they become effective later in 2015. SDG&E reportedly intends to provide an annual bill credit to customers. The Decision (14-12-083) issued December 23, 2014, directs electric IOUs to "allocate Low Carbon Fuel Standard (LCFS) credit revenue to plug-in electric vehicle (PEV) customers by reducing the purchased cost of a PEV or applying the revenue as a credit against the customer's electric bill annually" (CPUC, 2014).

5.17.2. Components of EV Planning and Developments in San Diego

5.17.2.1. EV Infrastructure: Charging Stations

Whereas more drivers can purchase electric vehicles with the help of tax credits and rebates, the presence of EV infrastructure is just as critical to ensuring further adoption across the region. The market for plug-in electric vehicles is growing every month – and with it, the need for more places to charge. EV demand is

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[103] EVs relate to Goal #4 and #7 of the County of San Diego's Strategic Energy Plan 2013-2015. Goal #4 – Transportation and Land Use: "reduce petroleum demand through reduced vehicle demand and vehicle miles traveled, and by encouraging deployment of alternative fuel vehicles;" and Goal #7 – Fleet Fuel Efficiency and Utilization: "manage County fleet vehicle procurement, maintenance, and utilization to increase fuel efficiency, reduce vehicle emissions, and decrease the impact on the environment. '

[104] http://www.countynewscenter.com/video?v=155740

likely to increase in multi-family buildings. Utilities estimate that 80 to 90 percent of PEV charging occurs at home (CaPEV 2014). To date, much has been done to accelerate installations of charging equipment in single-family homes. However, less progress has been made in multi-unit dwellings (MUDs), where 34 percent of Californians reside (CaPEV 2014).[105]

Two EVSE projects were identified in the City of San Diego that demonstrate what some property owners have already done to meet demand. CityFront Terrace has 320 residents and installed 20 Level 2 EVSE chargers that are metered so that drivers pay directly for use. It costs approximately $4,000 for each of the EV parking spaces (CaPEV 2014). Also, the Towers at Costa Verde has more than 590 residents, with 10 chargers installed and 10 more pre-wired, at a total cost of $21,000 (SDG&E 2011). As the County continues to grow, demand for EVSE installations at smaller complexes will certainly increase as well. Los Angeles and Palo Alto ordinances require new multi-family and commercial buildings to pre-wire a percentage of parking spaces and install a minimum number of operable Level 2 charging stations.

Charging stations beyond residential buildings complete the network of EV infrastructure. EV research dollars have recently been injected into the County. The CEC's Alternative and Renewable Fuel and Vehicle Technology Program, which has also been providing funding to the UC San Diego vehicle charging program (see text box below), invested approximately $90 million in 2013 to encourage the development and use of new technologies, and alternative and renewable fuels, to help the state meet its climate change goals (CEC 2013). According to Commission Chair Weisenmiller,

> *These investments in charging infrastructure are crucial to fulfilling the Governor's executive order to significantly expand the market for zero emission vehicles in California. In addition, they will improve air quality, reduce petroleum use and create jobs (CEC 2013).*

Many new jobs and new opportunities are said to be coming to California through the UC San Diego microgrid and electric vehicle charging projects, which are further explained below (Paulos, 2014).

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[105] The U.S. Green Building Council issues LEED points toward certification when charging equipment is installed in a multi-family home.

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Lessons to Learn:

University of California, San Diego EV Stations

The University of California, San Diego, with support from the California Energy Commission (CEC), is on course to create the largest, most diverse range of electric vehicle charging stations at any university in the world. As of June 2013, the university installed 54 charging outlets, with more than 70 percent of them available for public use – the most of any university in the world (Margoni 2013).

Additional CEC funding will be used to enhance the vehicle-charging network at UC San Diego. Level 2 electric vehicle charging systems are expected to become the most commonly used charging systems. They use 208-240 volt power and typically provide 10 to 20 miles of range for each hour of charging for a passenger vehicle. Level 1 charging systems use 110 volt power, standard in most households, and typically provide 2 to 5 miles of range for each hour of charging. DC fast-charging systems are emerging as a much faster way to charge PEVs, typically providing 60 to 80 miles of range in just 20 minutes of charging. UC San Diego also recently installed "high IQ" chargers with Daimler and RWE that adjusts charging rates based on customers' needs, grid needs, and dynamic pricing.

Electric vehicles are obviously part of the campus plan as well. The university has been phasing in a new plan with Daimler. Students, staff, and faculty are able to lease an electric smart car for only $115 a month, with a plan for on-campus charging. Almost half of UC San Diego's fleet of more than 800 vehicles has been converted to near zero-emission vehicles. Diesel fuel has been replaced with ultra-low sulfur biodiesel, and many buses, street sweepers, cars, and trucks have been converted to compressed natural gas. The fleet also includes five Nissan Leafs and more than 50 hybrid-electric vehicles. The university's "green fleet" was ranked 14th overall in the nation and received the highest ranking of any university by Government Green Fleet in 2012.

5.17.2.2. Electric Vehicle Fleets

In addition to providing charging opportunities through infrastructure, encouraging the use of electric vehicles in public and private fleets is another important pillar of EV planning. The Port of San Diego began adding electric vehicles to its fleet in 2008 and the University of California, San Diego (UCSD) has more than 300 electric vehicles of various sizes for use on campus..[106] Federal Express and Frito Lay are integrating all-electric delivery trucks into their San Diego fleets and elsewhere across the country.

The large rise in Plug-In Electric Vehicle (PEV) adoption in 2011 can partly be attributed to the launch of the rental company, car2go and its fleet of all-electric car sharing vehicles. Now nationwide, the car2go program was launched in San Diego in 2011. The program offers members access to more than 300 two-passenger, all-electric vehicles across 30 square miles of San Diego, with the ability to locate available cars and charging stations through its SmartPhone application. Users pay a one-time registraion fee of $35 and usage rates of $0.41 per mile (max of $14.99 per hour) or no more than $84.99 per day. If the County of

[106] The San Diego region was also part of the U.S Department of Energy's EV Project, which installed 435 nonresidential AC Level 2 PEV charging stations as well as four DCFC units in the San Diego Metropolitan Statistical Area (MSA) (CSE, 2012).

San Diego elects to expand its own fleet of electric vehicles, the aforementioned entities could be seen as potential partners with experience to learn from.

5.17.2.2.1 Value Proposition and Benefits

Continuing to expand its own EV fleet vehicle presence can be fiscally and environmentally beneficial to the County.

The City of Indianapolis's EV project provides one example of quantifiable benefits. This one program[107] is projected to save the City approximately $8.7 million between 2016 and 2026. The first 14 plug-in hybrids deployed in Indianapolis' Freedom Fleet have each saved an average of 53 gallons of gasoline per month. Each of the 500 EVs deployed by the beginning of 2016 will save at least 550-600 gallons of gas annually. Each Freedom Fleet vehicle is expected to save taxpayers about $12,000 per vehicle over the 10-year life cycle of the car.[108] Over the next 10 years, the City of Indianapolis is expected to avoid consuming 2.2 million gallons of expensive gasoline.

Vehicle incentives and rebates exist that the County of San Diego can participate in.

- Local governments and public agencies can take advantage of PEV rebates offered by the Clean Vehicle Rebate Project for up to 20 vehicles per year
- The California Hybrid Truck and Bus Voucher Incentive Program is available to public entities purchasing a hybrid or electric truck or bus. (http://www.californiahvip.org/).

5.17.2.3. Storage Developments

The U.S. Department of Defense, as well as PEV adopters like UCSD are testing PEVs as an energy resource in their renewable energy and energy security strategy. Battery and PEV manufacturers are also teaming with utilities and state governments in an attempt to lower the cost of batteries and create viable storage technologies, long considered the "holy grail" for renewable energy, since the energy produced by solar, wind, and other renewables can be generated, stored, and released when it is the most profitable to do so.

5.17.2.4. Permitting

The Regional Plug-in Electric Vehicle Readiness Plan notes that the region currently has many local permitting processes, which have limited EVSE installations. Adopting a common standard permitting and

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[107] In May 2014, the Cities of Indianapolis and Sacramento signed a Memorandum of Understanding (MOU) to work together and share resources to advance each city's PEV fleet conversion, install public PEV charging stations, promote technologies that improve efficiency and reduce the dependence on fossil fuels, promote economic development in the alternative fuels industries, promote energy efficiency programs, install smart meters, incorporate grid technologies, install renewable energy technology, and promote sustainability policies and programs (Indianapolis, C. o. (2012). "The City Fleet and Energy Security." from http://www.indy.gov/egov/mayor/initiatives/pages/indyenergysecurity.aspx. The County of San Diego can entertain a similar MOU with a number of EV-smart county governments. With no EVs in the current fleet, there is room for advancement.

[108] Fuel costs for the new EVs will be about one-third of the old gas vehicles' costs as a result. Each gasoline-powered sedan in Indianapolis's fleet would have cost taxpayers approximately $9,000 per year over the next decade, including purchase, fuel, maintenance and insurance (Ayre, 2014). Indianapolis is also planning on leading the nation with the adoption of police vehicles that get 40-50 miles per gallon and meet all the power, safety, range, and size needs of a traditional police car. The city anticipates that a transition to this new police fleet could save the city $10 million per year.

inspection process and checklist of requirements will streamline the installation of EVSE systems in residential, commercial, public, and workplace settings even further. Examples provided in the Readiness Plan include items such as electrical load calculations, and manufacturer information.

5.17.3. Next Steps

Based on energy programs included in the County of San Diego Strategic Energy Plan 2013-2015, the adoption of a formal PEV program is a logical next step for the County of San Diego. A successful program will involve guiding the adoption of land use policies (siting charging stations, PEV parking), operations policies (county fleet, employee commuting), PEV incentive policies (rebates), public infrastructure development (PEV charging stations), and ordinances (CALGreen). In order to implement such a program, the County will likely need at least one, possibly two, FTEs to manage the program (Rabago 2014). The purchasing of County PEV fleet vehicles and County charging facilities and public PEV charging stations are capital expenditures that must be budgeted based on technology and implementation costs.

In order to nurture the PEV market, the County, local and regional governments, and public agencies can develop land use policies and transportation plans that incorporate EVSE, specifically 1,500 public charging stations into San Diego's public infrastructure network. Initially, these groups must employ the best methods to determine the location of these optimal PEV charging sites. These charging sites can be located on public sites with the most regional benefits, be in a location that reduces driver anxiety, and be optimally located in an inter-regional network that will also include future charging stations (CCSE 2012).

One potential solution for the County of San Diego is leasing, as manufacturers can take the incentives and offer a more attractive lease offer. The majority of California EV owners are leasing, using the $2,500 California rebate to contribute to the down payment. Lease payments of as low as $200 per month can also facilitate significant gas savings. Future strategies now being considered by vehicle makers include separate financing of the battery, which can be structured with the electricity payment as a "bundled solution" that is still less than the price of gasoline. This strategy is now deployed in Europe (by Renault) and in China. Over the next several years, battery prices are also expected to decline, with DOE projecting price-parity with internal combustion engine vehicles by 2022, based on battery pricing dropping from the current range of $500 - $600 per kWh of capacity to approximately $250/kWh, as well as advances in lightweight design and materials (Schorske, Chiacos et al. 2014).

The County's Interim Fleet Acquistions Coordinator reported that the County does not own or lease any fully dedicated electric vehicles. He did report that the County has one hybrid-electric Ford Fusion (Northup 2015).

The table below lists notable EV projects across the U.S. with time frames and additional notes.

TABLE 5-21. EV Projects in the United States

EV Project	Year	Notes
California	As of 2014	5,965 public electric charging stations
University of California San Diego (UCSD)		Largest and most diverse range of charging stations at an university in the world
LA Air Force Base	2014	First federal facility to replace its entire fleet with EVs (Vehicle to grid demonstration project)
San Diego, CA	2011-2013	DOE EV Project participant and Car2go
Los Angeles, CA	2010-2013	DOE EV Project participant
Bay Area and Monterey Bay Plan	2014-2024	CEC Regional Plan
Ventura, Santa Barbara, and San Luis Obispo Counties Plan	2014-2024	CEC Regional Plan
Southern California Plan	2014-2024	CEC Regional Plan
Sacramento Regional	2014-2024	CEC Regional Plan
San Diego Regional Plan	2014-2024	CEC Regional Plan
San Joaquin Valley Plan	2014-2024	CEC Regional Plan
Indianapolis, IN	2012-2016	City of Indianapolis municipal vehicles. Project will save $8.7 million over 10 years. 500 EV or PHEV non-police vehicles. Also nation's largest EV car sharing program, BlueIndy & Ballore, with 500 PEVs and 1,000 charging stations.
Sacramento, CA		Sacramento signed an MOU with Indianapolis to work together and share resources to convert cities fleet to PEV
Salem, OR	2010-2013	DOE EV Project participant
Corvallis, OR	2010-2013	DOE EV Project participant
Eugene, OR	2010-2013	DOE EV Project participant
Portland, OR	2010-2013	DOE EV Project participant and Car2go
Seattle, WA	2010-2013	DOE EV Project participant
Vancouver, BC	2011	Car2go
Phoenix, AZ	2010-2013	DOE EV Project participant
Tucson	2010-2013	DOE EV Project participant
Dallas, TX	2010-2013	DOE EV Project participant
Fort Worth, TX	2010-2013	DOE EV Project participant
Houston, TX	2010-2013	DOE EV Project participant
Nashville, TN	2010-2013	DOE EV Project participant
Knoxville, TN	2010-2013	DOE EV Project participant
Chattanooga, TN	2010-2013	DOE EV Project participant
Washington, DC	2010-2013	DOE EV Project participant
Austin, TX	2010	Car2go

6. Findings, Conclusions, and Recommendations

The Comprehensive Renewable Energy Plan (CREP) was initiated as a major first step to build renewable energy markets while moving the County of San Diego beyond its historical roots in preservation and a piecemeal approach to renewable energy. The intent was a comprehensive focus on sustainability as it might be driven by the productive use of renewable energy technologies. Yet, there are a half-dozen other critical elements that will thrust energy to the forefront of the County's economic development initiatives.

The first is evidence of a lagging economy that may generate fewer new jobs over the next decades compared to the recent historical trends. This was discussed in Section III of this report. Perhaps even more immediately crucial are the severe water problems now confronting California. In early April 2015, Governor Edmund G. Brown, Jr. directed the first ever statewide mandatory water reductions that will have a dramatic impact on the County.[109] At the same time, evidence of a rapidly changing climate prompted former Governor Arnold Schwarzenegger to issue an executive order that established a 2050 statewide greenhouse gas emissions reduction target of 80 percent below 1990 levels.[110] In addition, the U.S. Environmental Protection Agency's (EPA) Clean Power Plan is designed to build on clean energy policies that states and local governments across the country have adopted and refined, including policies to develop renewable energy, such as a State Renewable Portfolio Standard (RPS). With California already on track to meet its goal of getting 33 percent of its electricity from renewable sources by 2020, Governor Brown announced in January 2015 that he would seek to raise the state RPS target to 50 percent by 2030. All of these initiatives place new responsibilities on the County. The productive use of materials, water, and especially zero-carbon or renewable energy resources can provide a highly effective response to these burdens.

Yet, there are other concerns and uncertainties that may delay immediate actions. These include an aging and outdated transportation infrastructure that requires significant upgrades,[111] even as there are emerging and potentially volatile markets for a variety of new and untested technologies. Some of these new technologies may take hold in significant ways, but others may either peak in very small ways, or they may fizzle altogether.[112] Adding to growing uncertainties about an evolving renewables market, there are also many proposals for new electric utility business models that focus more on providing value-added services rather than the traditional sale of commodities.[113] In the case of energy utilities, for example, rather than limit earnings to the sale of kilowatt-hours of electricity or therms of natural gas, the new, disruptive business models may pull revenues from a varied stream of services—whether leasing in-home technologies that will provide clean on-site energy, or assisting in the financing and construction of new renewable generation technologies located outside of a normal utility service territory.

Fortunately, a smart planning foundation can weave these varied elements into a foundation for a more robust and sustainable economy, while also minimizing the risk associated with new County actions. Risk is always present with any new direction pursued. However, it can be minimized for the County through the introduction of successful and proven renewable technologies, policies, and practices.

The usual presumption among local businesses and municipal agencies is that, given time and the right set of incentives, the economy will swing back to a normal pattern of market activity and job creation. Officials assume

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[109] Executive Order B-29-15 [http://gov.ca.gov/news.php?id=18910].

[110] Executive Order S-3-05 [http://gov.ca.gov/news.php?id=1861].

[111] See the related infrastructure discussion in Section 3-2 of this report.

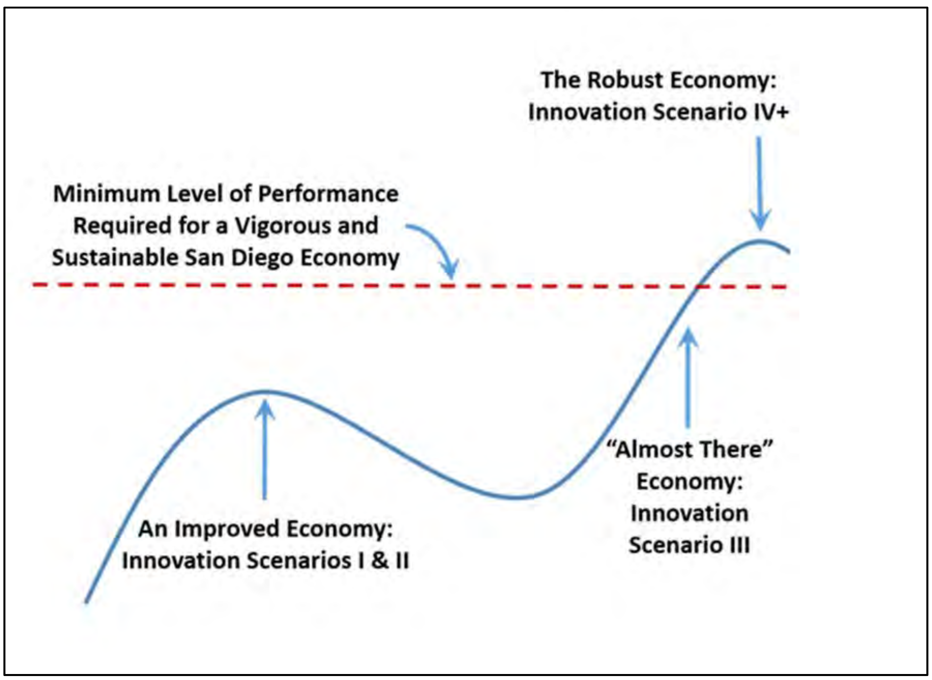
[112] The Box I insert on emerging energy technologies in Section 3-3 highlights this point.

[113] The Box IV insert on business models in Section 4 provides a short background on this topic.

that what has worked in the past will likely work in the future, too. However, the discussion surrounding Figure 3-2 suggests the very strong possibility for a different outcome for San Diego County. The County is in new territory. *Indeed, compared to the historical rates of job creation within the County, there may be 125,000 to 175,000 fewer jobs, on average each year, over the next several decades.* By the year 2040, the employment demand may mean 280,000 to 380,000 fewer new jobs annually compared to the historical rate of development. Clearly, a new level of effort may be required than is normally assumed. Moreover, that new effort may be complicated further by having to simultaneously manage the development of a burgeoning renewable energy market while also confronting the very real issues of water shortages and climate change.

FIGURE 6-1 provides another context in which to understand the level of effort that may be required to ensure a robust and sustainable San Diego regional economy. For purposes of this analysis, the authors limit the discussion to the job creation process along with the need for sharp reductions in greenhouse gas emissions. In this graphic illustration, the dashed red line represents the minimum level of performance needed to meet the desired levels of new jobs as well as to achieve the 80 percent reduction in GHG emissions target by 2050.

FIGURE 6-1. Understanding the Economy-Wide Sustainability Context



Of the four Innovation Scenarios reviewed in Section 3 of this report, and displayed in Figure 6-1, Scenario III is listed as "almost there;" only Scenario IV surpasses the minimum level of performance to ensure a more robust and sustainable economy. Scenario IV is the only Scenario that exceeds the 80 percent reduction in GHG emissions by 2050.[114] It is also the biggest job creation scenario. One important note is that Figure 6-1 highlights not just

[114] It is beyond the scope of this analysis, but to comply with Executive Order S-3-05, the actual reduction target would need to be 80 percent below the 1990 level rather than the 2050 level of emissions. It can be done, but it would mean that, following the more productive use of energy, renewable energy technologies or some other zero-carbon energy

Innovation Scenario IV, but Scenario IV+. The labeling of Scenario "IV+" reflects the need to extend the comprehensive energy planning efforts well beyond the transition for electricity and natural gas. Please recall that all of the Innovation Scenarios only deal with 35 percent of total energy usage (only the unincorporated areas of the County).

In addition, while Scenario IV works through a 100 percent transition to renewable energy technologies for the production of electricity, natural gas consumption continues to generate a small but significant amount of carbon dioxide emissions. Hence, the need to displace natural gas with low-carbon, renewable energy resources to provide heat, hot water, and cooking in area homes and local businesses. On the other hand, energy consumption for transportation services remains the very big elephant in the room; it is so big that it cannot be ignored. This is especially the case with the accelerated transition to electric vehicles, or even the possibility of future transition to hydrogen fuel-cell cars.

Notwithstanding the moderated scale of total energy use reflected in the four Innovation Scenarios, the data still suggest a sufficient impact to warrant immediate steps to secure the first set of benefits. Not only would those first steps help prime the sustainable economy pump, but they would also serve as a useful example of what might be possible—at scale—in other areas of the County, and indeed, throughout the U.S. economy.

To summarize, and looking at key data from FIGURE 3-6 on Innovation Scenario IV, the County must plan for total investments, in constant 2012 dollars, on the order of $3.7 billion over the period 2015 through 2050. That is an average of more than $100 million per year (again in constant 2012 dollars). At the same time, however, this can deliver a cumulative energy bill savings of about $6.9 billion (a net benefit ratio of 1.9), and promote an average net gain of about 1,800 new jobs, or as shown in TABLE 3-9, a net gain of 5,300 net jobs by the year 2050.[115] To get to this new level of economic productivity, job creation, and emissions reductions, incremental wholesale change is required and made possible by key elements of the Comprehensive Renewable Energy Plan (CREP).

6.1. The Key Elements of the Comprehensive Renewable Energy Plan

Long-term capacity building will be a critical element for San Diego County if it is to ensure the development of a robust and sustainable economy. This includes a steady long-term job creation process and greenhouse gas emissions reduction targets through the year 2050. Section 4 on Institutional Arrangements and Financing Mechanisms, and Section 5 on the set of Best Practices that are available to the County, provide a broad mapping of critical next steps. Here the authors summarize five primary recommendations for critical next steps in the Comprehensive Renewable Energy Plan. While the first three recommendations provide the larger economic context, the two remaining elements focus on implementation, and administrative and long-term planning functions.

- First, the County should acknowledge the scale and scope of the transition that will be necessary to ensure the long-term well-being of the economy. In other words, the County should make clear that success will depend on large-scale and more productive investments in the regional energy infrastructure. Here the authors are talking about billons rather than millions of both private and public sector dollars to reinvigorate the County's infrastructure over the next several decades;

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resource would have to substitute for a natural gas energy usage in addition to the displacement of conventional electricity generation.

[115] Again, if done at this level throughout all sectors and energy uses across the entire San Diego County, and estimating the full productivity benefits, the net job creation might be more like 70,000 annual average new jobs within the County.

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- Second, the County should seek to immediately integrate transportation services within the comprehensive renewable energy plan;

- Third, the County should seek the development of opportunities outlined in this report using what the authors refer to as an open architecture system. Box IV highlights the critical perspectives that support the idea of an open architecture system. Through this new system, the County can research and encourage the development of technologies, markets, and institutions with three principal attributes: as multifunctional, as modular, and as decadal assets rather than necessarily long-lived ones;

- Fourth, the County should seize a number of near-term opportunities identified in this report, described here as foundational components (because they provide an important foundation for the future). These opportunities are deemed higher priority, shorter-term items given the status of renewables in the County today and where the County states it wants to go tomorrow; and

- Fifth, the County needs to consider and prioritize the integration of other longer-term planning elements identified in this report. These elements, which include proven policies and programs in other jurisdictions, are to be considered the modular additions that may be added later to the foundational elements.

FIGURE 6-2, on the following page, provides a graphical illustration of the needed synergy and interactions among each of these five key planning elements.

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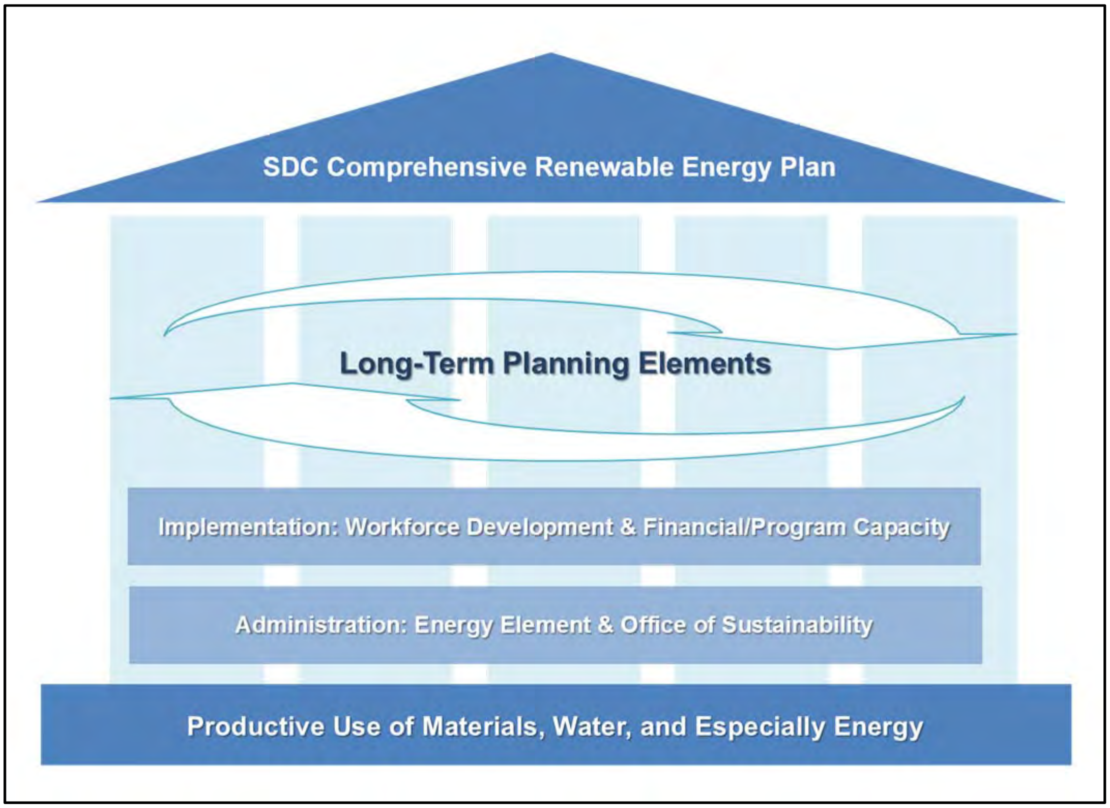
FIGURE 6-2. Planning Elements for a Robust and Sustainable San Diego County



Looking at FIGURE 6-2 from the bottom up, the implication is that the County acknowledges the next steps in the comprehensive renewable energy plan as they might be anchored by an increasing emphasis on the productive use of all resources—whether materials, water, and especially energy. The Figure then provides four immediate foundational components. Administrative components are necessarily first in order, since a new administrative system is needed to scale new programs and policies to the level required for wholesale change in the way the County approaches renewable energy. The implementation components are the top priority items recommended for immediate action, based on achieving County goals espoused in the CREP and elsewhere. These recommendations include:

- **Administrative Priority #1**: Adding a new energy element to the San Diego County General Plan (see Section 5.3 for a more complete discussion of this component);
- **Administrative Priority #2**: From among current activities and resources, create an Office of Sustainability or Energy Resources to motivate, manage, and support staffing, funding, and other resource needs (Section 5.4);
- **Implementation Priority #1**: Engage and/or develop the Community Choice Aggregation model along with other major investment and program capacity mechanisms (Section 5.5); and
- **Implementation Priority #2**: Ensure a proactive workforce development strategy integrated with County renewables and energy efficiency programs (Section 5.6).

Once these four foundational administrative and implementation priorities are in place, the County will be in a much better position to pursue the longer-term Best Practices identified in this report. To be certain, other administrative and implementation priorities can be pursued simultaneously or ahead of these suggestions. However, the authors believe that pursuing this list first will position the County for stronger economic growth over the long-term.

Box IV. Open Architecture and the San Diego County Energy Economy

In the realm of computing, open architecture is a type of computer or software design that is intended to make adding, upgrading, and swapping all components easy and straightforward. In the world of national defense, the idea of open architecture includes enabling the warfighter system to succeed across many different battle space domains, to effectively address emerging and evolving threats to national security, and to rapidly upgrade systems while reducing lifecycle costs. In San Diego County, as the authors begin to think about more robust energy systems, all of these same ideas might apply. At the same time, however, the authors can think of open architecture in three additional ways: as multifunctional, as modular, and as decadal assets rather than necessarily long-lived ones.

Multifunctional—whether buildings, structures, equipment, or appliances, these are devices that accomplish multiple tasks and/or generate multiple forms of energy and services. The plastic housing for a computer, for example, might harvest light to capture energy even as it provides structure and protection for the equipment. It might use both light and heat to supply electricity. Or it might relay information even as it optimizes system operations and maintains a steady flow of power. The same can be said for a County building. This requires a new way of looking at County operations.

Modular—the use of equipment or component design in which constituent parts can be easily replaced as well as used in different kinds of machines or systems. A photovoltaic power source to a wastewater treatment plant may be replaced by a fuel cell, battery, or microgenerator in the future. This plug-n-play, modular approach to energy production using distributed generation technologies essentially reverses 100 years of thinking when it comes to government energy supplies.

Decadal Assets—many of the assets that now support our nation's economy have economic lives of 30 or 40 years. Power plants and transmission lines are prime examples of long-lived assets. Yet, the world of technologies, systems and markets are changing more rapidly than ever. The iPhone was first introduced in 2007, and the Android shortly after. More than a million applications (i.e., mobile apps) have been developed for these devices. There are billions of dollars in revenues from mobile applications that shrink programs that ran at one time only on desktop computers. In less than 10 years, phones, cameras, computers, and calculators have added an amazing amount of functionality, information, and entertainment—even as they all now fit in our pockets. The infrastructure that now supports energy systems may need to transition and be paid for in a similar period of time – perhaps 10 but no more than 15 or 20 years. New technologies need to be quickly cycled, integrated in, and as necessary phased out, and then either reused or recycled.

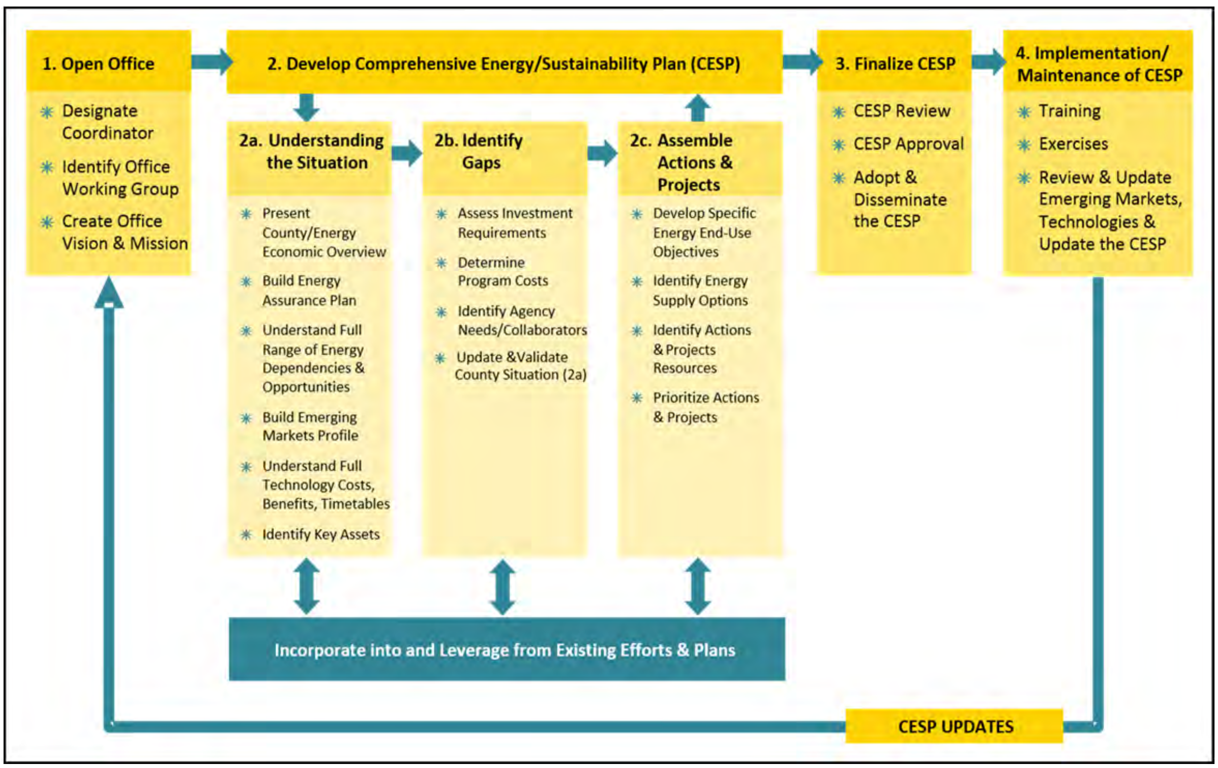
How might San Diego County monitor and encourage the deployment of new technologies and

6.2. Long-Term Best Practice and Planning Elements

With the administrative and initial program capacity in place, and with the functional perspective of an open architecture system (see Box IV), the next steps suggested in FIGURE 6-2 include the integration of the Best Practices highlighted in Sections 5.7 through 5.17. These range from building a new energy resilience plan (ERP) and increasing the County's percentage of energy derived from various renewable energy technologies, to promote the more efficient use of energy through more aggressive building standards (including the significant retrofit of existing buildings), to establishing a more formal Electric Vehicle program (as the first step toward integration of a more complete review of transportation services more broadly).

With the economic imperative of a smart transition to a more productive energy infrastructure anchored by large-scale investments in renewable energy technologies, the County of San Diego cannot afford to wait for future development. Both the urgency and the speed of market transitions require a sooner than later response. FIGURE 6-3 shows the key steps required to build what the authors think of as a truly "Comprehensive" Renewable Energy Plan –referred to here as a Comprehensive Energy & Sustainability Plan (CESP). With the Energy Element and the Office of Sustainability or Energy Resources in place, in Phase II of the CREP the County can develop fiscal notes and plans to ensure the productive and coordinated implementation of other Best Practices, and likely (slowly) bring in each of the remaining Best Practices.

FIGURE 6-3. Steps to Implementing a Comprehensive Renewable Energy Plan



Source: Derived from http://www.caleap.org

If the County is to achieve true scale with renewables and greater energy productivity in the near future, new administrative options need to be considered. These should be collaborative in nature and designed to help the County department or office coordinate the implementation of future energy-related initiatives. Centralizing the renewable energy efforts within a single County entity is one solution to what many local external stakeholders commented to our team is now a piecemeal approach to not only renewables, but to energy in general.

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7. Appendices

A-1. Key Economic and Technology Assumptions

As described in the main part of the comprehensive renewable energy plan, the economic assessment is really an examination of how changed behaviors and investment flows might enable a more productive energy and economic future for San Diego County. The first question that business leaders and policymakers might ask about an alternative energy future is what it might cost. For very understandable reasons they worry that any implied transition will end up costing more. On the other hand, if the authors properly assess all system costs there are many scenarios or alternative futures that may—on a net basis— be able to produce a greater set of benefits than is generally understood.

In a format consistent with a number of other past studies that inform this assessment (see, for example, (Laitner, Ehrhardt-Martinez et al. 2009, Busch, Laitner et al. 2012, Rifkin, Lebot et al. 2013, Laitner and McDonnell 2014, Laitner 2015), this appendix highlights the analytical assumptions that support the assessment described in the main part of the narrative.

The assumptions generally fall into four major categories: (i) energy quantities such as kilowatt-hours (kWh) of electricity or therms of natural gas, (ii) the price of those different quantities, (iii) the needed investment flows to drive a more productive outcome, and (iv) the modeling necessary to evaluate the jobs, income, and other economic impacts. The analytical tool used to evaluate the energy and economic development impacts is the Excel-based DEEPER Modeling System, which is described next. This is then followed by an explanation of the key reference case assumptions that underpin the results summarized in the main body of the report.

The DEEPER Modeling System

The **D**ynamic **E**nergy **E**fficiency **P**olicy **E**valuation **R**outine (DEEPER) is a proprietary-based analytical tool first developed by John A. "Skip" Laitner in 1990. It is a compact 15-sector quasi-dynamic input-output model of a given regional economy.[116] It is essentially a recipe of how the different sectors of the economy buy and sell to each other. Setting up that economic recipe is a first step in exploring the expected future income and job impacts of shifting economic activity and investments toward more productive activities.

The DEEPER model has been used to evaluate the net employment impacts of a comprehensive energy plan for an industrial region of four million people in northeastern France, and for proposed automobile fuel economy standards within the United States.[117] It is most often used to evaluate the macroeconomic impacts of a variety of

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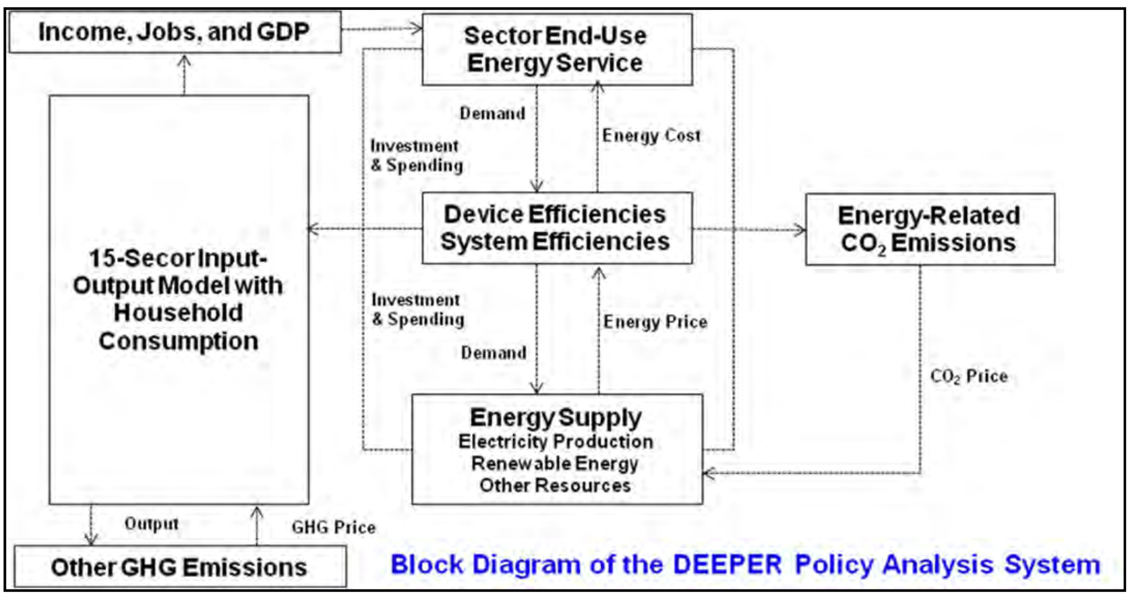
[116] There are two points that might be worth noting here. First, the model solves recursively. That is, the current year set of prices and quantities is dependent on the previous years' results. As the model moves through time, there are both secular and price-quantity adjustments to key elasticities and coefficients within the model. Second, there is nothing particularly special about this number of sectors. The problem is to provide sufficient detail to show key negative and positive impacts while maintaining a model of manageable size. If the analyst chooses to reflect a different mix of sectors and stay within the 15 x 15 matrix, that can be easily accomplished. Expanding the number of sectors will require some minor programming changes and adjustments to handle the larger matrix.

[117] Nord-Pas de Calais Third Industrial Revolution Master Plan – 2013, by Jeremy Rifkin, Benoit Prunel, Solenne Bastie, Francis Hinterman, John Laitner and Shawn Moorhead. Bethesda, MD: TIR Consulting Group LLC. 2013. See also, *Gearing Up: Smart Standards Create Good Jobs Building Cleaner Cars*, by Chris Busch, John Laitner, Rob McCulloch, and Ivana Stosic, Washington, D.C.: BlueGreen Alliance, 2012. Based on this analysis and other evidence, President Barack Obama signed into effect the proposed 54.5 mile-per-gallon fuel economy standards in August 2012.

energy efficiency, renewable energy, and climate policies at the regional, state, and national level. The timeframe of the model for evaluating energy efficiency and renewable energy technology policies and investments is 2012 (the base year of the model) through 2050.

As the authors chose to implement it for this analysis, the model maps the changed spending and investment patterns over the period 2016 through 2050. It then compares that changed spending pattern to the employment and other economic impacts that may be assumed within a standard reference case. The DEEPER Model includes a representation of energy-related CO_2 emissions but it focuses, in particular, on the use of energy in all parts of the economy as well as the prices, the policies, and the programs or best practices necessary to achieve some desired level of economic impacts. Figure A-1 on the following page contains a block diagram of the model that highlights many of the key features discussed in this appendix.

FIGURE A-1. Diagram of the DEEPER Policy Analysis System



The model outcomes are driven primarily by the demands for energy services and alternative investment patterns as they are shaped by changes in policies and prices. A key feature of the model is one that also allows consumer behaviors to also adjust to changing preferences. This follows the logic outlined in (Laitner, DeCanio et al. 2000), and fits within the framework outlined by (Ehrhardt-Martinez 2008). The changes are implemented in what the authors call a price-preference ratio following (Ehrhardt-Martinez and Laitner 2009, Hanson and Laitner 2009, Laitner 2009). The functional form of the price-preference ratio is computed as an index of price divided by the consumer's implicit discount rate. This is a rate that reflects a desired return on investment. For example, if a consumer chooses not to adopt a technology, for whatever reason, unless it pays for itself over a 2-year period, that suggests a 50 percent discount rate; or said differently, a desire to earn at least a 50 percent return on his or her investment in a set of energy efficiency and/or renewable energy technologies. All else being equal, either a doubling of prices or a 50 percent reduction in the implicit discount rate (or some equivalent combination of the two) will have the same impact on the various elasticities within the model.[118]

Although the DEEPER Model is not a general equilibrium model, it does provide sufficient accounting detail to match import-adjusted changes in investments and expenditures within one sector of the economy and balance them against changes in other sectors.[119] As shown in the block diagram above, the demand for energy-related services is the starting point for policy-induced changes. Both price and non-price policies—including energy efficiency or renewable energy portfolio standards, technical assistance programs, financial incentives, research and development (R&D), or general information and labeling programs (e.g., the EPA and DOE ENERGY STAR programs)—can shift consumer preferences and stimulate the availability of alternative technologies. Implementation of these policies, in turn, can induce an array of energy price changes, investments, and expenditures. These changes include program costs and incentives that might be needed to shift behaviors and investments so that some desired energy targets are satisfied. As changing demands confront a shifting mix of investments in different energy resources, overall energy prices (in constant dollars per kilowatt-hour of electricity or per therms of natural gas) are likely to change in response. The combination of new policies, new investments and changed consumer or energy producer behaviors drive the final results that emerge from application of the DEEPER Model.[120] With this preliminary characterization of the model, the sections that follow describe the three major modules within DEEPER.

Energy Module: The DEEPER Model is benchmarked to both the historical record and the most current versions of the Woods and Poole econometric forecasts for San Diego County (Woods and Poole 2014), the California Energy Commission projections for both California and for the San Diego Gas & Electric Company service territory (Kavalec, Fugate et al. 2014), and the *Annual Energy Outlook* projections for the Pacific West (Energy Information Administration 2014), which now extends out through 2040. Based on data available from other sources like the Energy Policy Initiatives Center (Gordon, Silva-Send et al. 2013), which enables estimates of energy use and greenhouse gas emissions for any of the 19 jurisdictions in the San Diego region (including the unincorporated areas of the county), the authors make a reasoned estimate of how the local economy might grow through the year 2050 in a Reference Case scenario, and how that will consequently affect energy use, energy prices, and carbon-dioxide emissions. The key benchmark data for the Reference Case of the unincorporated areas of San Diego County are highlighted in Table A-1, below.

TABLE A-1. Reference Case Data for unincorporated areas of San Diego County

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[118] One nice feature of this functional form is that it is less important to determine the "right" starting implicit discount rate as it is to show what a shift in the size of that rate might matter.

[119] When both equilibrium and dynamic input-output models use the same technology assumptions, both models should generate a reasonably comparable set of outcomes. For a diagnostic assessment of this conclusion, see, "Tripling the Nation's Clean Energy Technologies: A Case Study in Evaluating the Performance of Energy Policy Models," Donald A. Hanson and John A. "Skip" Laitner, *Proceedings of the 2005 ACEEE Summer Study on Energy Efficiency in Industry*, American Council for an Energy Efficient Economy, Washington, D.C., July 2005.

[120] As noted in Hanson and Laitner (2004), a combination of price and non-price policies can generally produce a much more cost-effective policy resolution than either type of policies would induce by itself. The resulting deployment of new technologies depends on the assumed effectiveness of programs that might be implemented and the incentives being offered. Implementation of these policies—along with the resulting deployment of new technologies—strengthens the ability of the market to respond to the price signal. In this context, prices act as a signal for necessary changes, rather than as a punishment for consumers and producers.

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Indicator	2012	2025	2050	Average Annual Growth Rate 2012-2050
Total Population (Thousands)	504.7	591.9	772.1	1.1%
Total Employment (Thousands)	295.4	359.0	519.5	1.5%
Earnings (Millions of 2012 Dollars)	18,216	25,364	47,429	2.6%
Gross Regional Product (Millions of 2012 Dollars)	29,137	40,919	76,397	2.6%
Electricity Consumption (Million kWh)	3,284	3,908	5,579	1.4%
Average Electricity Price (2012 $/kWh)	0.153	0.190	0.249	1.3%
Total Electricity Expenditures (Millions of 2012 Dollars)	503.8	741.8	1,390.9	2.7%
Natural Gas Consumption (Million Therms)	59.7	62.3	71.0	0.5%
Average Natural Gas Price (2012 $/Therm)	0.670	1.260	2.197	3.2%
Total Natural Gas Expenditures (Millions of 2012 Dollars)	40.0	78.5	155.9	3.6%
Total Energy Expenditures (Millions of 2012 Dollars)	543.8	820.3	1,546.8	2.8%

The main Reference Case assumptions shown in the above table are for the key benchmark years of 2012, 2025, and 2050. As measured by Gross Regional Product (GRP), in constant 2012 dollars, the economy is expected to grow at a rate of about 2.6 percent annually. Rising average annual energy prices (with all values also in 2012 dollars) are projected to increase at a rate of about 1.3 percent and 3.2 percent for electricity and natural gas, respectively. Total electricity and natural gas expenditures are estimated to increase 2.8 percent per year. It is the reference case to which the authors compare each of the four Energy Innovation Scenarios. Presumably the scenarios will show a smaller level of energy expenditures and other costs as well as more jobs and income than is suggested in the reference case.

TABLE A-2. Employment Impacts by Sector for San Diego County 2012

Economic Sector	Employment Coefficients (Jobs per $MM)	
	Direct Jobs	Total Jobs
Agriculture	6.7	11.3
Oil & Gas Extraction	3.7	9.2
Mining	5.2	10.1
Electric Utilities	1.1	4.4
Natural Gas Utilities	0.9	3.0
Transportation and Other Utilities	7.7	13.6
Construction	7.0	12.4
Manufacturing	2.3	6.1
Wholesale and Retail Trade	9.1	14.7
Services	8.0	13.6
Finance	5.2	10.3
Government	8.8	15.1

Macroeconomic Module: This part of the model contains the "production recipe" for the San Diego County economy for a given "base year." For this assessment, the base year of the model was 2012, the latest data available for this analysis. The input-output data, or sometimes referred to as the I-O data, currently purchased from the IMPLAN Group (IMPLAN 2014), is essentially a set of economic accounts that specifies how the different sectors of the economy buy (or purchase inputs) from and sell (or deliver outputs) to each other. Further details on this set of linkages can be found in Busch et al. (2012) and Hanson and Laitner (2009).

For this assessment, the model was run to evaluate impacts of the selected policies upon 14 different sectors, including: Agriculture, Oil and Gas Extraction, Mining, Electric Utilities, Natural Gas Distribution, Transportation and Other Public Utilities (including water and sewage), Construction, Manufacturing, Wholesale and Retail Trade, Services, Finance, Government, and Households.[121] To provide the reader with a sense of economic impact for these major sectors in San Diego County, Table A-2, above, provides estimates of both the direct and the total number of jobs per million dollars of sales or revenue generated within each sector. Direct jobs are those employed within a given sector. Total jobs also include the supply-chain impacts and the additional employed induced by the spending of sector revenues within San Diego County.

[121] While there are only 14 sectors shown in the table above, there does not appear to be any coal mining activity in the county, and household spending is allocated to each of the sectors using the personal consumption expenditure data provided with the IMPLAN data set.

The principal energy-related sectors of the U.S. economy are not especially job-intensive. It turns out, for example, that the electric utility industry in 2012 supported only 1.1 direct jobs and 4.4 total jobs for every one million dollars of revenue received in the form of annual utility bill payments. The rest of the economy, on the other hand, supports about 6.8 direct jobs and 12.1 total jobs per million dollars of receipts. *Thus, any productive investment in energy efficiency or renewable energy technologies that pays for itself over a short period of time will generate a net energy bill savings that can be spent for the purchase of goods and services other than energy.* The impact of a one million dollar energy bill savings suggests there may be a net gain of about 7.7 jobs (that is, 12.1 total jobs supported by a more typical set of consumer purchases compared to the 4.4 jobs supported by the electric utilities). Depending on the sectorial interactions, however, this difference may widen or close as the changed pattern of spending works its way through the model, and as changes in labor productivity changes the number of jobs needed in each sector over a period of time.[122]

Based on the scenario data mapped into the energy elements of the DEEPER modeling system, the macroeconomic module translates the selected energy policies into an annual array of physical energy impacts, investment flows, and energy expenditures over the desired period of analysis. Using appropriate technology cost and performance characterization as it fits into the investment stream algorithm discussed below, DEEPER estimates the needed investment path for an alternative mix of energy efficiency and renewable energy technologies. It also evaluates the impacts of avoided or reduced investments and expenditures otherwise required by the electric generation sector. These quantities and expenditures feed directly into the final demand worksheet of the module. The final demand worksheet provides the detailed accounting that is needed to generate the implied net changes in sector spending. Once the mix of positive and negative changes in spending and investments have been established and adjusted to reflect changes in prices within the other modules of DEEPER, the net spending changes in each year of the model are converted into sector-specific changes in final demand. This then drives the input-output model according to the following predictive model:

$X = (I-A)^{-1} * Y$

where:

X = total industry output or sales for each sector of the economy

I = an identity matrix consisting of a series of 0's and 1's in a row and column format for each sector (with the 1's organized along the diagonal of the matrix)

A = the matrix of production coefficients for each row and column within the matrix (in effect, how each column buys products from other sectors and how each row sells products to all other sectors)

Y = final demand, which is a column of net changes in spending by each sector as that spending pattern is affected by the policy case assumptions (changes in energy prices, energy consumption, investments, etc.)

This set of relationships can also be interpreted as

$\Delta X = (I-A)^{-1} * \Delta Y$

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[122] As the authors will see later in this appendix, DEEPER does capture sector trends in labor productivity. That means the number of jobs needed per million dollars of revenue will decline over time.

which reads, a change in total sector output equals the expression $(I-A)^{-1}$ times a change in final demand for each sector.[123] Employment quantities are adjusted annually according to exogenous assumptions about labor productivity in each of the sectors within the DEEPER Modeling System (Bureau of Labor Statistics 2005). From a more operational standpoint, the macroeconomic module of the DEEPER Model traces how each set of changes in spending will work or ripple its way through the regional economy in each year of the assessment period. The end result is a net change in jobs, income, and GDP (or value-added).

For each year of the analytical time horizon (i.e., 2012 to 2050 for the innovation scenarios evaluated in this report), the model copies each set of results into this module in a way that can also be exported to a separate report. For purposes of this separate report, and absent any anomalous outcomes in the intervening years, the authors highlight the five-year impacts in order to focus attention on the differences in results emerging from various alternative policy assumptions. For a review of how an I-O framework might be integrated into other kinds of modeling activities (Hanson and Laitner 2009). While the DEEPER Model is not an equilibrium model, the authors borrow some key concepts of mapping technology representation for DEEPER, and use the general scheme outlined in Laitner and Hanson 2006. Among other things, this includes an economic accounting to ensure resources are sufficiently available to meet the expected consumer and other final demands reflected in different policies.

FIGURE A-2 on the following page offers a diagram that illustrates the way DEEPER tracks changes in expenditures to evaluate the macroeconomic impacts of policy. In this case, the example is drawn from a typical diagnostic run of Innovation Scenario IV for the years 2012 through 2050 for the unincorporated areas of San Diego County. The average annual Reference Case energy expenditures for those years are estimated to be $990 million (in constant 2012 dollars) over that 38 year period. The enhanced energy efficiency and renewable energy investments require an average outlay of $128 million in combined energy efficiency and renewable energy investments together with payments to the market for borrowing the necessary funds. The entire case is driven by an estimated $11 million per year in various public and private program spending to catalyze those investments. The economy-wide energy bill savings are estimated to be $343 million in those years. The bottom line is a net reduction from the Reference Case energy bill expenditures so that businesses and consumers are paying only $786 million for energy as a result of the improved efficiency and renewable energy upgrades. That is an average net savings of $204 million per year over the period 2012 through 2050. For reasons described below, and in the main part of the report, that changed pattern of investment and spending will drive an average annual net gain of 2,000 jobs in the unincorporated areas of the County.[124]

[123] Perhaps one way to understand the notation $(I-A)^{-1}$ is to think of this as the positive or negative impact multiplier depending on whether the change in spending is positive or negative for a given sector within a given year.

[124] Many readers might think that a net gain of just 2,000 jobs is not an especially significant impact. In a hopefully useful thought experiment, if the authors were to expand the suggested Innovation Scenario IV to include the entire region of San Diego County (in other words, looking at impacts across 3.2 million people rather than just one-sixth that size), and if the authors were to include transportation and all other fuels rather than looking only at electricity and natural gas, the average number of jobs might swell to more than 32,000 rather than just 2,000 net new jobs.

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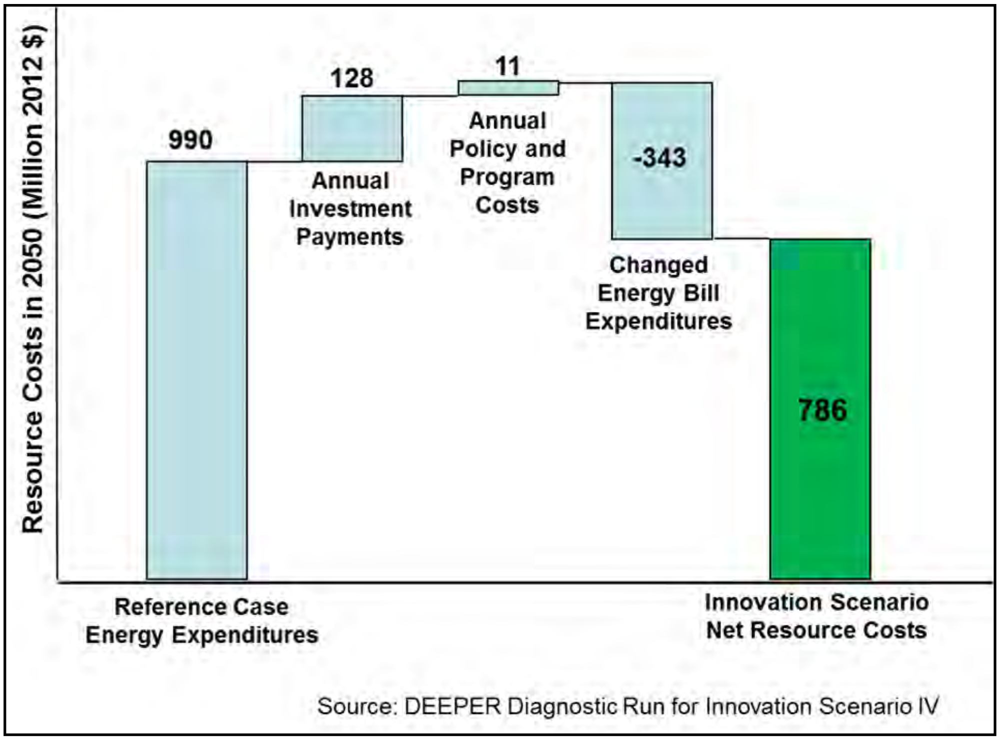
FIGURE A-2. Changes in the Average Annual Energy Resource Costs for the unincorporated areas of San Diego County (2012-2050)



Conventional Energy Prices

The authors generally follow the expected pricing pattern as suggested by Cook 2013, the California Energy Commission (Kavalec et al. 2014a, 2014b), and the Energy Information Administration (2014). The electricity and natural gas prices are typically shaped by the change in demand for energy and any potential cost of both energy efficiency and renewable energy upgrades. As reported in Table A-1, in the 2012 base year dollars of the DEEPER model, the compound average growth rate (CAGR) of electricity prices is projected to be 1.1 percent per year while natural gas prices are projected to be 2.4 percent per year. By 2050, electricity prices are about 50 percent higher than today while natural gas prices are slightly more than doubled.

Technology Investment Streams

In many ways the economic assessment follows the analytical exercises undertaken for the studies, "California's Energy Future: The View to 2050" (California Council on Science and Technology 2011) and "A roadmap for repowering California for all purposes with wind, water, and sunlight" (Jacobson, Delucchi et al. 2014). There are some important differences, however. These relate primarily to estimating technology costs as they evolve over time. Here, investment costs are estimated for two distinct categories of future energy resources options: energy efficiency investments and renewable energy supply technologies. Depending on the mix of these resources, and their impact on conventional energy supply (whether electricity or natural gas) that will change the average cost of energy services over time. For example, as greater levels of renewables and energy efficiency penetrate the market, that may drive down the cost of conventional resources in addition to delivering lower-cost energy services more broadly. In this assessment, however, the authors focus on the anticipated technology costs of renewables and energy efficiency more directly rather than integrate their potential impact on the prices of conventional energy supply. The key set of assumptions for each of these two major sources of investment flows is summarized below.

Energy Efficiency

One critical piece of information needed to evaluate the impact of these different Innovation Scenarios is the cost of investment in energy efficiency technologies. An extensive review of energy efficiency programs across the country by the Lawrence Berkeley National Laboratory, for example, found that the U.S. average total resource cost of saved energy, weighted by energy savings, was $0.044 per kilowatt-hour (kWh) for the period 2009 to 2013 (Hoffman, Rybka et al. 2014). On the other hand, an examination of 45 different utility energy efficiency programs by the American Council for an Energy-Efficient Economy found similar levels of cost-effectiveness. More critically, the ACEEE analysis reported that the total resource cost test (an economy-wide benefit-cost ratio) for long-term savings scenarios ranged from 1.4 to 2.5 with a weighted average (based on annual savings) of 1.8. In other words, for every dollar of program cost, incentives, and other investments, the energy efficiency programs saved an average of $1.80 (Neubauer 2014).

To derive similar information in this current assessment, the authors adapt the structure of the Long-Term Industrial Energy Forecast (or LIEF) model as described in Cleetus, Bernow et al. 2003. The same logic was followed in Rifkin et al. (2013) and Laitner et al. (2012). Indeed, among the earliest use of the LIEF model was for a 1995 assessment for Southern California Gas Company (Mowris, Ross and Kent 1995). The key relationship in this model is the current gap between average and best energy efficiency technology or the best efficiency practice. In this case, the authors "bundle" energy efficiency as an aggregate investment stream so as not to pick winners or emphasize a particular set of technologies at this point in time.

The assumption in the LIEF model is that as a sector moves closer and closer to best practice or best technology (sometimes referred to as the production frontier), the cost of efficiency investment per unit of energy saved will increase. The rate of that potential cost increase depends on the energy prices, the elasticity of the efficiency supply curve, and the discount rate. It also depends on how innovations and R&D policies might shift the best technology or best practice frontier. As used in this exercise, the investment cost is shown as:

Investment per Unit Energy Savings = $$\left[\frac{1-G_0}{1-S}\right]^{(1/A)} * \left[\frac{P}{C}\right]$$

where:

P = price of energy in the base year

C = capital recovery factor (CRF) or sector implicit discount rate for the given year

A = an elasticity that reflects the magnitude of investment in response to changes in price levels or the capital recovery factor

S = percent of sector energy savings in current year compared to base year consumption

G_0 = the energy intensity gap, or the difference between best and average practice

In many ways this can be thought of as the energy savings that should be economically viable in the base year, but which have not yet been realized.

By way of example, based on the California Energy Commission (CEC) report which suggests an additional achievable energy efficiency (AAEE) beyond the normal rate of improvement (Kavalec et al. 2014b), the data might suggest that today there is a current energy intensity gap of 14 percent based on the potential for long-term efficiency gains through the year 2014. Following Rifkin et al. (2013) and Laitner et al. (2012) who both document potential primary energy savings of 50 percent by 2050, the authors suggest an efficiency gap of only 25 percent for electricity use in San Diego County, also by 2050. With an energy efficiency gap now established, the authors then look to estimate the rate over time by which homes and businesses might substitute more energy efficiency for the more conventional use of energy. In this case, the assumption for a "substation elasticity" of 0.6, and an implicit discount rate of 20 percent. [125] If energy prices of a given sector are, by way of example, $0.15 per kilowatt-hour in 2015, these assumptions suggest an average payback of about 3.7 years for a 10 percent efficiency gain based on prices in 2012. This rises to a 10-year payback for a 50 percent efficiency gain by 2050. These results are broadly consistent with results summarized in Hanson and Laitner 2004, Laitner, Nadel et al. 2012.[126]

Using estimates from Laitner, Partridge et al. 2012, McKinsey & Company (Granade 2009), among others, each of the cost curve functions was adjusted by sector to reflect both the current and anticipated technology costs and performance reflected in those various studies. In the modeling characterized in this assessment for San Diego County, the payback periods typically begin at about 2.5 to 3 years in 2015, and depending on the individual scenarios and how quickly efficiency is "used up," the payback periods in 2050 might range from 5 to 9 years. On the other hand, to the extent that that are innovations and economies of scale and scope that tend to lower technology costs, the authors might expect to see paybacks that remain closer to five years. For this working assessment, however, the authors generally allow DEEPER to move toward the higher technology costs since the authors are more interested in highlighting the potential of energy efficiency rather than evaluating a specific set of policies over time. In this regard the authors are then maintaining a conservative (i.e., higher cost) focus in completing this particular assessment for 2050.

Renewable Energy Technologies

Again, in the spirit of not choosing a particular bundle of renewable energy technologies, the DEEPER Model characterizes an aggregate to provide insight rather than precision (Huntington, Weyant et al. 1982). That is to say, rather than integrate different class of renewable technologies – whether utility-scale photovoltaics, residential-scale PV systems, and wind or geothermal energy systems, the authors characterize them here as a bundle. In general the authors look broadly to the current extensive deployment of renewable energy technologies – especially geothermal, wind, and both utility-scale and rooftop PV systems in Imperial County and San Diego County. An historical review of 136,000 data points of photovoltaic installations in California over the period 2007 through mid-

[125] This adaptation of the LIEF equation ignores the autonomous time trend component. In other words, as used here, the assumption of an efficiency gap remains static and there is only movement toward best practice or best technology rather than improvement in the base year representation of best practice or best technology. As the historical record suggests, the gap may actually grow to 35 to 50 percent—if the U.S. as a whole chooses to invest in greater innovation and energy productivity improvements. Hence, the use of a fixed 25 percent gap for purposes of estimating investment costs will tend to overstate the cost of the new efficiency gains. See, Rifkin's book, Zero Marginal Cost Society, for a good discussion on greater rates of innovation and lower technology costs over time (Rifkin 2014).

[126] Although this is not emphasized in either the report or appendix, DEEPER also can explore changes in costs needed to drive a final result. For example, as it is now configured, if investments cost 20 percent less than now projected for the year 2050, the net gain in jobs shown in the main report increase by about 3.5 percent. On the other hand, if the investments run about 50 percent more than now suggested, the net increase in jobs might decline by about 9 percent. But this would continue to be a highly positive net gain in 2050. The significance of this finding is that the Innovation Scenarios—especially if they include a greater emphasis on energy productivity benefits—is likely to generate a robust outcome for the San Diego economy for all the reasons described earlier in the report.

2014 showed that installation costs (in nominal dollars) declined by more than half over that period of time (Laitner 2015).

The authors conservatively assume a bundled renewable energy investment cost of $3,000 per kW in 2012 dollars (which is, again, the base year of the model). Lazard suggests that wind resources are in the range of $1,400 to $1,800 per kW, utility scale PV resources range from $1,500 to $1,750 per kW, commercial and industrial rooftop systems are $2,500 to $3,000 per kW, and finally, residential rooftop systems are from $3,500 to $4,500 per kW (Lazard 2014). At the same time, the authors integrate findings from studies as Lazard (2014), Jacobson et al. (2014), the Electricity Reliability Council of Texas, and others, which suggest a cost function that will decline by perhaps one-half or better as the result of new materials, electronics, and design (Faeth 2014). In the assessment here, that rate of decline depends on the growth of renewable energy systems and the larger market dynamics over the years 2015 through 2050, which the authors capture as:

$\text{Cost}_{2050} = \$3000/\text{kW}_{2015} \times (\text{total GWh}_{2050}/\text{Initial GWh}_{2015})^{-0.6} = \$/\text{kW in } 2050$

Depending on the growth of total sales or production of renewables-powered electricity by 2050, this cost function suggests that new systems may decline by one-half. But to this the authors must add costs of distribution and storage as well as an assumption of what percentage of time these systems operate over the year. Here the authors assume an initial capacity factor of 20 percent in 2015 that increases slowly to 30 percent by 2050. This means that, based on an average of 8,760 hours in the year, such systems will operate a total of 1,752 hours in 2015 and slowly increase to 2,628 hours by 2050. Finally, both storage and distribution costs to each MWh of electricity generated by renewable energy systems, starting at $25 per MWh in 2015 and declining to $15 per MWh by 2050. This set of assumptions provides costs that begin at about $205 per MWh in 2015 and then decline to perhaps $120 per MWh or lower by 2050. This, of course depends on the continued rate of market dynamics, technology innovation, and other policy drivers and incentives. One further note merits attention. Based on a series of ongoing assessments in the need to upgrade the nation's infrastructure from a very low score of D up to a grade of B, the American Society of Civil Engineers has suggested the United States will have to spend as much as $3.6 trillion over the period 2012 through 2020, and there may be a shortfall in funding of as much as $1.6 trillion. Laitner and Keller have developed a working memo suggesting that for San Diego County to move its infrastructure from a somewhat better initial grade of C to also a B level by 2020, San Diego County may face a funding shortfall of $16 billion to $26 billion by 2020. Presumably many of the infrastructure upgrades envisioned in this Comprehensive Renewable Energy Assessment will be made as part of the larger upgrade to improve the quality of the regional infrastructure (Laitner and Keller 2015).

Policy and Program Costs

One of the key working assumptions in this assessment is that that policies, programs, and best practices are needed to drive the requisite investments in the different innovation scenarios. In short, a dedicated workforce is needed to plan, promote, and carry out programs to ensure the desired technology deployment. Staff are also needed to ensure the training of people who will install and maintain the new technology systems as well as evaluate the actual success of the next policies and programs. To generate an estimate of what these incremental program costs might look like, the authors borrow from a variety of studies including Wolfe and Brown 2000, Laitner and McDonnell 2012, Hoffman, Rybka et al. 2014. In this analysis the authors assume that program and policy expenditures might require about 15 percent of the scale of technology investment beginning today, but declining to just 8 percent by 2050.

A-2. Bibliography

Borrego Springs. Microgrids, Berkeley Lab.

(2002). Electrical restructuring: aggregation. Public Utilities Code Section 366.2.

(2010). A Resolution of the City Council of the City of Coronado, California Authorizing Sacramento County to Apply for State Energy Program Funds on Behalf of the City of Coronado. City of Coronado: 6.

(2011). Charles McGlashan Community Choice Aggregation Act. Public Utilities Code Section 366.2, 331.1, 365.1, 381.1, 395.5, 396.5, 707.

(2014). Climate Action Plan. City of San Diego, City of San Diego.

(2015). "Clean Renewable Energy Bonds (CREBs) | Department of Energy." from http://energy.gov/savings/clean-renewable-energy-bonds-crebs.

(2015). "IRS to Allocate Nearly $1.4 Billion in New CREBs Volume Cap." from http://www.mcguirewoods.com/Client-Resources/Alerts/2015/2/IRS-Allocate-New-CREBs-Volume-Cap.aspx.

(2015). "NetGreen." Retrieved February 15, 2015, 2015, from http://sonomacleanpower.org/netgreen/.

(2015). "ProFIT Program." Retrieved February 15, 2015, 2015, from http://sonomacleanpower.org/profit/.

Abt Associates (2013). User's Manual for the Co-Benefits Risk Assessment (COBRA) Screening Model. Washington, DC, U.S. Environmental Protection Agency.

Aghassi, S. (2014). Options to Amend the County Building Code to Support Energy Efficiences and Green Building Technology, County of San Diego.

Alameda, County of (2010). Alameda County Cliamte Action Plan: 187.

Alameda, County of (2010). Resolution of the Board of Supervisors of the County of Alameda Adopting Commitments to Climate Protection, Climate Action Plan, and Greenhouse Gas Emissions Reduction Targets for Government Services and Operations. A. County Board of Supervisors, State of California: 3.

Alex, K. and S. Morgan (2012). Annual Planning Survey Results, Governor's Office of Planning and Research: 382.

AMECO. (2014). "Solar Hot Water FAQs." from http://solarexpert.com/solar-education/solar-faqs/solar-hot-water/.

American Society of Civil Engineers (2012). California Infrastructure Report Card: A Citizen's Guide - 2012. Reston, VA, American Society of Civil Engineers.

American Society of Civil Engineers (2013). Report Card for America's Infrastructure 2013. Reston, VA, American Society of Civil Engineers.

Anders, J. K. a. S. J. (2014). Residential and Commercial Property Assessed Clean Energy (PACE) Financing in California Rooftop Challenge Areas, Energy Policy Initiatives Center (EPIC), University of San Diego School of Law; Center for Sustainable Energy.

ASCE San Diego Section (2012). San Diego County Infrastructure Report Card 2012. El Cajon, CA, American Society of Civil Engineers San Diego Section.

Ayres, R. U. and B. Warr (2009). The Economic Growth Engine: How Energy and Work Drive Material Prosperity. Northampton, MA, Edward Elgar Publishing, Inc.

Bade, G. (2015). "6 thought leaders on the future of utility business models & regulation." from http://www.utilitydive.com/news/6-thought-leaders-on-the-future-of-utility-business-models-regulation/357635/.

Bloede, C. (2014). Sustainability Program Manager. County of Alameda. G. Burmeister.

Brock, J. (2014). San Diego Gas & Electric. G. Burmeister.

Bruce Kaneshiro, S. L.-U., Tim Drew, Rajan Mutialu, Dorris Chow, Paula Gruendling, Taaru Chawla, Jennifer Caron, Alan Meck (2013). Lessons Learned From Summer 2012 Southern California Investor Owned Utilities' Demand Response Programs, California Public Utilities Commission.

Bureau of Labor Statistics (2005). Employment and Output by Industry, 1994, 2004, and Projected 2014. Washington, D.C., Department of Labor.

Burmeister, G. and F. Kreith (1992). Energy Management and Conservation, National Conference of State Legislatures.

Burmeister, G., R. Mosley and S. Foute (2011). Local Government Energy Assurance Guidelines, Public Technologies Institute.

Busch, C., J. A. S. Laitner, R. McCulloch and I. Stosic (2012). Gearing Up: Smart Standards Create Good Jobs Building Cleaner Cars. Washington, D.C., American Council for an Energy-Efficient Economy.

Byrne, J. C., Martinez (2009). Delaware's Sustainble Energy Utility. Delaware Lawyer.

CACSE (2012). California Plug-in Electric Vehicle Owner Survey, CaCSE Air Resources Board**:** 15.

CaCSE (2012). San Joaquin Valley: Plug-In Electric Vehicle (PEV) Readiness Plan, CaCSE**:** 48.

CaLEAP. (2014). "California Local Energy Assurance Planning." from http://caleap.org/.

California Council on Science and Technology (2011). California's Energy Future: The View to 2050. Sacramento, CA, California Council on Science and Technology.

California, G. S. (2015). "Net Energy Metering in California." Retrieved February 3, 2015, 2015, from http://www.gosolarcalifornia.ca.gov/solar_basics/net_metering.php.

CALSEIA. (2015). "California's Solar Industry Job Growth Outpaces Rest of State." from http://www.calseia.org/index.php?option=com_content&view=article&id=231:california-s-solar-industry-job-growth-outpaces-rest-of-state.

Campbell, N., L. Ryan, V. Rozite, E. Lees and G. Heffner (2014). Capturing the Multiple Benefits of Energy Efficiency. Paris, France, International Energy Agency.

CaPEV (2014). California Plug-In Electric Vehicle Collaborative 2014 Annual Report, CaPEV**:** 6.

CaPEV (2014). Charging Plug-In Electric Vehicles at Multi-unit Dwellings, California PEV Collaborative.

Cart, J. (2015). Gov. Brown's renewable energy plan could boost solar, wind industries. Los Angeles Times, @latimes.

Casey, T. (2013). "In First Test, U.S. Military's SPIDERS Microgrid Uses 90% Renewable Energy." Power, from http://cleantechnica.com/2013/02/12/u-s-militarys-new-spiders-renewable-energy-microgrid/.

CEA. (2010). "What is a Megawatt and a Megawatt-Hour." Solar Resources, from http://www.cleanenergyauthority.com/solar-energy-resources/what-is-a-megawatt-and-a-megawatt-hour/.

CEC California's 2030 Climate Commitment: Renewable Resources for half of the State's Electricity by 2030, California Energy Commission.

CEC. (2007). "Nonresidential Building Energy Use Disclosure Program (AB 1103)." from http://www.energy.ca.gov/ab1103/.

CEC (2013). Energy Commission Awards More Than $3 Million in Renewable Energy Grants to Five Counties, California Energy Commission: 1.

CEC. (2014). "Waste to Energy & Biomass in California." Biomass, from http://www.energy.ca.gov/biomass.

CEC. (2015). "California Biomass and Waste-To-Energy Statistics & Data." Energy Almanac, from http://energyalmanac.ca.gov/renewables/biomass/index.php.

CEC, C. (2013). Appendix A. Concurrent Policy Activities Relevant to ZNE Goals, California Energy Commission, California Public Utilities Commission: 35.

CEC, C. (2013). (DRAFT) CA: Energy Efficiency Strategic Plan, New Residential Zero Net Energy Action Plan 2014-2020, California Energy Commission, California Public Utilities Commission: 44.

CEC, C. (2015). "Welcome to California Solar Statistics." from http://www.californiasolarstatistics.ca.gov/.

CEG. (2014). "Colorado Energy Group." from http://www.coloradoenergygroup.com./.

Clark, J. (2014). Center for Sustainable Energy. G. Burmeister.

Cleetus, R., S. Bernow, R. N. Elliott, A. Shipley and E. Brown (2003). Explorations with the LIEF 2002 Model. 2003 ACEEE Summer Study on Energy Efficiency in Industry. Asilomar, CA, American Council for an Energy-Efficient Economy.

Cluett, R. and J. Amann (2013). Residential Energy Use Disclosure: A Review of Existing Policies, American Council for an Energy-Efficient Economy: 59.

Cohan, W. D. (2014). "Bypassing the Bankers." Business, 2015, from http://www.theatlantic.com/magazine/archive/2014/09/bypassing-the-bankers/375068/.

Colorado Energy Group, I. (2014). Community Energy Efficiency Program. G. Burmeister.

Commerce, Department of (2011). Energy Overlay Zones, A Report Prepared to Support the 2010/2012 State Energy Strategy, Washington State.

Commission, California Energy (2013). Local Ordinances Exceeding the 2013 Building Energy Efficiency Standards. ca.gov, California Energy Commission.

Commission, California Public Utilities (2015). "Renewable Energy Credits." Retrieved February 15, 2015, 2015, from http://www.cpuc.ca.gov/PUC/energy/Renewables/FAQs/05REcertificates.htm.

Cook, J. (2013). The Future of Electricity Prices in California: Understanding Market Drivers and Forecasting Prices to 2040. Davis, CA, UC Davis Energy Efficiency Center.

County, K. (2014). "Renewable Fuel Production." Energy, from http://www.kingcounty.gov/environment/wastewater/ResourceRecovery/Energy/Renewable.aspx.

County of San Diego (2013). County of San Diego Strategic Energy Plan 2013-2015. San Diego, CA, County of San Diego.

County, San Diego (2012). Climate Action Plan.

County, San Diego (2013). Strategic Energy Plan.

CPUC (2008). CSI-Thermal Program Energy Division Staff Proposal for Solar Water Heating Program, CPUC**:** 80.

CPUC (2014). Decision Adopting Low Carbon Fuel Standard Revenue Allocation Methodology for the Investor-Owned Electric and Natural Gas Utilities. 14-12-083. CPUC, CPUC. **11-03-012:** 55.

CPUC (2014). Review of the Incentive Levels and Progress of the California Solar Initiative-Thermal Program, CPUC**:** 21.

CPUC (2015). Decision Approving Green Tariff Shared Renewables Program for San Diego Gas & Electric Company, Pacific Gas and Electric Company, and Southern California Edison Company Pursuant to Senate Bill 43, California Public Utilities Commission**:** 185.

CPUC, C. (2014). Promoting Efficiency for the Long Term. Energy in California.

CSE. (2015). "Clean Vehicle Rebate Project." from https://energycenter.org/clean-vehicle-rebate-project.

CSE. (2015). "Solar Electric for Homeowner." from https://energycenter.org/california-solar-initiative/homeowners.

CWEA. (2014). "Wind in the Big Picture." from http://www.calwea.org/bigPicture.html.

Davignon, L.-J. (2014). Interstate Renewable Energy Council. G. Burmeister.

Department, I. C. P. Summary of Inyo County Renewable Solar and Wind Energy General Plan Land Use Diagram Overlay Department.

Diego, County of San (2012). County of San Diego Climate Action Plan**:** 73.

Domagalski, J. (2014). "Potential New Opportunity for California Direct Access." Retrieved February 16, 2015, 2015, from http://blogs.constellation.com/energy4business/2013/03/04/potential-new-opportunity-for-california-direct-access/.

Donalds, S. (2014). "A Model of Collaborative Solar Purchasing: The Alameda County Renewable Energy Procurement Project." from http://www.cesa.org/projects/states-advancing-solar/solar-resource-library/resource/a-model-of-collaborative-solar-purchasing-the-alameda-county-renewable-energy-procurement-project.

Drive, U. (2014). 2014 Survey: The Utility View of Microgrids, D Utility Drive.

Dunn, J. (2014). Petaluma joins Sonoma Clean Power. The North Bay Business Journal.

Dunn, J. (2014). Sonoma Clean Power plugs in big geothermal, solar deals. The North Bay Business Journal.

Economist, T. (2014). "Without the banks' baggage, shadow banks find it easier to oblige customers." News, from http://www.economist.com/news/special-report/21601625-without-banks-baggage-shadow-banks-find-it-easier-oblige-customers-we-try-harder.

EDC, S. D. R. (2014). 2014 Economic Outlook.

Edgerly, D. (2006). 2006 Annual Report on Sustainability Programs, City of Oakland**:** 17.

Ehrhardt-Martinez, K. (2008). Behavior, Energy, and Climate Change: Policy Directions, Program Innovations, and Research Paths, American Council for an Energy-Efficient Economy**:** 72.

Ehrhardt-Martinez, K. and J. A. S. Laitner (2009). Breaking Out of the Economic Box: Energy Efficiency, Social Rationality and Noneconomic Drivers of Behavioral Change. ECEEE 2009 Summer Study: Act! Innovate! Deliver! Reducing Energy Demand Sustainably, La Colle sur Loup, France, European Council for an Energy-Efficient Economy.

Energy Information Administration (2014). Annual Energy Outlook 2014 With Projections to 2040. Washington, D.C., U.S. Department of Energy.

EPA. (2014). "Sources of Greenhouse Gas Emissions." Commercial and Residential, from http://www.epa.gov/climatechange/ghgemissions/sources/commercialresidential.html.

EPA, C. (2014). "California Greenhouse Gas Emission Inventory." from http://www.arb.ca.gov/cc/inventory/inventory_current.htm.

Faeth, P. (2014). Solar Capital Costs Assumed by the Electricity Reliability Council of Texas. J. A. S. Laitner. Arlington, VA, CNA Institute for Public Policy Research.

FHFA Statement on Certain Energy Retrofit Loan Programs (2010).

Fisk, W. J. (2000). "Health and productivity gains from better indoor environments and their relationships with building energy efficiency." Annual Review of Energy and the Environment **25**: 30.

Fitzer, E. and T. Smith. Gila Bend Planning and Economic Development Office. G. Burmeister.

Golding, S. (2014). Discussion regarding City of San Diego CCA Feasibility Analysis. M. McDonnell.

Gordon, C., N. Silva-Send and S. J. Anders (2013). Community-Scale Greenhouse Gas Emissions Model: San Diego Region: Technical Documentation and Methodology Version 1.0. San Diego, CA, University of San Diego Energy Policy Initiatives Center.

Gordon, M. (2014). CCA and Microgrids: Community Driven, Private Enterprise Models for Smart Grid Innovation.

Governments, San Diego Association of (2008). 2030 Regional Growth Forecast Update: Process and Model Documentation, SANDAG**:** 118.

Granade, H. C. (2009). Unlocking Energy Efficency in the U.S. Economy, McKinsey & Company.

Grattidge, B. and A. Lawler (2003). State of California General Plan Guidelines. State of California, Governor's Office of Planning and Research**:** 290.

Group, M. C. (2012). Benchmarking and Disclosure: Lessons from Leading Cities, Boston Green Ribbon Commission's Commercial Real Estate Working Group**:** 16.

Hall, A. (2014). San Diego Workforce Partenership. G. Burmeister.

Hanson, D. A. and J. A. S. Laitner (2004). "An Integrated Analysis of Policies that Increase Investments in Advanced Energy-Efficient/Low-Carbon Technologies." Energy Economics **26**(4): 739-755.

Hanson, D. A. and J. A. S. Laitner (2009). Input-Output Equations Embedded within Climate and Energy Policy Analysis Models. Input-Output Economics for Industrial Ecology. S. Suh. Dordrecht, Netherlands, Springer.

Heavner, B. (2014). California Solar Energy Industries Association. Policy Director. G. Burmeister.

Heeter, J. and J. McLaren (2012). Innovations in Voluntary Renewable Energy Procurement: Methods for Expanding Access and Lowering Cost for Communities, Governments, and Businesses, NREL, DOE**:** 35.

Hoffman, I. M., G. Rybka, G. Leventis, C. A. Goldman, L. Schwartz, M. Billingsley and S. Schiller (2014). Customer-Funded Energy Efficiency Programs: National, Sector- and Program-Level Estimates and Issues. L. B. N. Laboratory. Berkeley, CA.

Houck, J. a. R., Wilson (2009). "The Sustainable Energy Utility (SEU) Model for Energy Service Delivery." Bulletin of Science, Technology & Society **29**(2).

Hunt, T. (2014). Director of Research & Government Affairs, Clean Energy Collective.

Huntington, H. G., J. P. Weyant and J. L. Sweeney (1982). "Modeling for Insights, Not Numbers: The Experiences of the Energy Modeling Forum." Omega: The International Journal of Management Science **10**(5): 449-462.

IMPLAN (2014). IMPLAN Data for California 2012. Huntersville, NC, IMPLAN Group LLC.

Indianapolis, City of (2012). "The City Fleet and Energy Security." from http://www.indy.gov/egov/mayor/initiatives/pages/indyenergysecurity.aspx.

IREC. (2014). "Interstate Renewable Energy Council." from http://www.irecusa.org/.

Jacobson, M. Z., M. A. Delucchi, A. R. Ingraffea, R. W. Howarth, Guillaume Bazouin, B. Bridgeland, K. Burkart, M. Chang, N. Chowdhury, R. Cook, G. Escher, M. Galka, L. Han, C. Heavey, A. Hernandez, D. F. Jacobson, Dionna S. Jacobson, B. Miranda, Gavin Novotny, M. Pellat, P. Quach, A. Romano, D. Stewart, L. Vogel, S. Wang, H. Wang, L. Willman and T. Yeskoo (2014). "A roadmap for repowering California for all purposes with wind, water, and sunlight." Energy **73**(14 August 2014): 875-889.

Jose, City of San (2014). "Reports & Publications." from http://www.sanjoseca.gov/index.aspx?NID=2839.

JVSV. (2015). "Renewable Energy Procurment (REP)." from http://www.jointventure.org/index.php?option=com_content&view=article&id=1108&Itemid=727.

Kats, G., L. Alevantis, A. Berman, E. Mills and J. Perlman (2003). The Costs and Financial Benefits of Green Buildings**:** 120.

Kavalec, C., N. Fugate, B. Alcorn, M. Ciminelli, A. Gautam, K. Sullivan and M. Weng-Gutierrez (2014). California Energy Demand 2014-2024 Final Forecast Volume 2: Electricity Demand by Utility Planning Area. Sacramento, CA, California Energy Commission.

Kavalec, C., N. Fugate, B. Alcorn, M. Ciminelli, A. Gautam, K. Sullivan and M. Weng-Gutierrez (2014). California Energy Demand 2014-2024 Final Forecast, Volume 1: Statewide Electricity Demand, End-User Natural Gas Demand, and Energy Efficiency. Sacramento, CA, California Energy Commission.

Keller, R. and J. A. Laitner (2014). Photon-Enhanced Thermionic Emission, Economic and Human Dimensions Research Associates.

Keller, R. and J. A. Laitner (2014). Pumped Heat Electricity Storage (PHES), Economic and Human Dimensions Research Associates.

Keller, R. and J. A. Laitner (2014). Solar Roadways, Economic and Human Dimensions Research Associates.

Keller, R. and J. A. Laitner (2015). The Emergence of Energy Harvesting Technologies, Economic and Human Dimensions Research Associates.

Kelly, K. and K. Delfino (2012). Smart from the Start: Responsible Renewable Energy Development in the Southern San Joaquin Valley. Central Valley Renewable Energy Project, Defenders of Wildlife**:** 16.

Koch, W. (2014). "U.S. Solar Projects get left from online tool." Money, 2015, from http://www.usatoday.com/story/money/business/2014/06/17/web-tool-crowdfunds-community-solar-projects/10658629/.

Kümmel, R. (2011). The Second Law of Economics: Energy, Entropy, and the Origins of Wealth. New York, NY, Springer.

Kümmel, R. (2013). "Why energy's economic weight is much larger than its cost share." Environmental Innovation and Societal Transitions **2013**(9): 33-37.

Lagos, J. C. a. M. (2014). Mayor Lee proposes gutting CleanPowerSF energy program. SFGate.

Laitner, J. A. S. (2009). The Positive Economics of Climate Change Policies: What the Historical Evidence Can Tell Us. Washington, D.C., American Council for an Energy-Efficient Economy.

Laitner, J. A. S. (2014). "Climate and Economic Storms of Our Grandchildren." Journal of Environmental Studies and Sciences **14**(4): 99-109.

Laitner, J. A. S. (2014). The Link between Energy Efficiency, Useful Work, and a Robust Economy. Green Energy Economies: The Search for Clean and Renewable Energy. J. Byrne and Y.-D. Wang. New Brunswick, NJ, Transaction Publishers.

Laitner, J. A. S. (2014). "Linking energy efficiency to economic productivity: recommendations for improving the robustness of the U.S. economy." Wiley Interdisciplinary Reviews: Energy and Environment.

Laitner, J. A. S. (2015). Working Assessment of the Cost of Photovoltaic Systems in California 2007-2014. Tucson, AZ, Economic and Human Dimensions Research Associates.

Laitner, J. A. S., ", S. J. DeCanio and I. Peters (2000). Incorporating Behavioral, Social, and Organizational Phenomena in the Assessment of Climate Change Mitigation Options. Society, behavior, and climate change mitigation. E. Jochem, J. Sathaye and D. Bouille. Dordrecht, The Netherlands, Kluwer Academic Press. **8:** 1-64.

Laitner, J. A. S., K. Ehrhardt-Martinez and V. McKinney (2009). Examining the Scale of the Behaviour Energy Efficiency Continuum. ECEEE 2009 Summer Study: Act! Innovate! Deliver! Reducing Energy Demand Sustainably, La Colle sur Loup, France, European Council for an Energy-Efficient Economy.

Laitner, J. A. S. and D. A. Hanson (2006). "Modeling Detailed Energy Efficiency Technologies and Technology Policies within a CGE Framework." Energy Journal **Special Edition, Hybrid Modeling of Energy-Environment Policies: Reconciling Bottom-Up and Top-Down**: 151-169.

Laitner, J. A. S. and R. Keller (2015). A Note on the Needed Infrastructure Costs in San Diego County. Tucson, AZ, Economic and Human Dimensions Research Associates.

Laitner, J. A. S. and M. T. McDonnell (2012). Securing Nebraska's Energy and Economic Future: Creating Jobs, New Economic Opportunities and Health Benefits through Productive Investments in Wind Energy and Energy Efficiency. S. Club. Lincoln, NE.

Laitner, J. A. S. and M. T. McDonnell (2014). Energy Efficiency as a Pollution Control Technology and a Net Job Creator under Section 111(d) Carbon Pollution Standards for Existing Power Plants. Washington, D.C., Environmental Defense Fund.

Laitner, J. A. S., S. Nadel, R. N. Elliott, H. Sachs and A. S. Khan (2012). The Long-Term Energy Efficiency Potential: What the Evidence Suggests. Washington, D.C., American Council for an Energy-Efficient Economy.

Laitner, J. A. S., B. Partridge and V. Vittore (2012). Measuring the Energy Reduction Impact of Selected Broadband-Enabled Activities within Households. Washington, D.C., American Council for an Energy-Efficient Economy.

Laitner, S. (2014). Economic and Human Dimensions Research Associates. G. Burmeister.

Lazard (2014). Levelized Cost of Energy Analysis: Version 8.0. New York, NY, Lazard.

Lee, M. (2014). Borrowing from taxman to buy solar. San Diego Union-Tribune.

Lee, M. (2015). Solar loan competition heats up in Southern California. San Diego Union-Tribune.

Margoni, L. (2013). "California Energy Commission Awards More Than $1.8 Million for UC San Diego Microgrid Projects." from http://ucsdnews.ucsd.edu/pressrelease/california_energy_commission_awards_more_than_1.8_million_for_uc_san_diego.

Marqusee, J. (2012). Microgrids and DoD Facilities, SERDP/ESTCP.

Marshall, S. (2014). Community Choice Aggregation: A Local Energy Model to Green the Grid, Boost Local Economics and Offer Consumers a Choice. CSAC Annual Conference.

McHale, C. and S. Leurig (2012). Stormy Future for U.S. Property/Casualty Insurer: The Growing Costs and Risks of Extreme Weather Events. Boston, MA, Ceres.

Meis, K. (2012). Regional Energy Network Overview.

Meisen, P. and J. Black (2010). San Diego Regional Plan for 100% Renewable Energy, GENI: 33.

Mersich, M. (2015). Clmate Action Planner, Regional Climate Protection Agency. RCAP. G. Burmeister.

Mieux, Y. M. L. (2014). Direct Testimony on behalf of San Diego Gas & Electric Company. CPUC, Sempra Energy.

Mishra, A. (2014). "TOP 5 Renewable Energy Crowdfunding Platforms." 2015, from http://www.solarplaza.com/article/top-5-renewable-energy-crowdfunding-platforms.

Miskowiak, D. and L. Stoll (2005). Planning Implementation Tools: Overlay Zoning, Center for Land Use Education: 5.

Morgan, S. (2014). Office of Planning Reserch. G. Burmeister.

Mosley, R. (2014). Public Technology Institute. G. Burmeister.

Murray, D. (2012). San Francisco Mayor's Renewable Energy Task Force Recommendations Report, San Francisco Department of Environment: 90.

NACO (2014). A Workforce that Works: County Innovations in Workforce Development, National Association of Counties: 16.

Navigant, C. (2005). Community Choice Aggregation, Base Case Feasibility Evaluation. County of San Diego, County of San Diego.

Network, B. A. R. E. (2015). Program Update Report | Jan 2015, Bay REN.

Neubauer, M. (2014). Cracking the TEAPOT: Technical, Economic, and Achievable Energy Efficiency Potential Studies. Washington, D.C., American Council for an Energy-Efficient Economy.

News, M. (2014). "NJ Transit Receives Federal Funding for Microgrid Project," from http://microgridnews.com/nj-transit-receives-federal-funding-for-microgrid-project/.

Northup, B. (2015). San Diego County Interim Fleet Acquisitions Coordinator. G. Burmeister.

NREL (2010). Property-Assessed Clean Energy (PACE) Financing of Renewables and Efficiency, NREL.

Office of the Comptroller of the Currency (2010). Supervisory Guidance: Property Assessed Clean Energy (PACE) Programs. Department of the Treasury.

Oliver, N. (2014). The Center For Sustainable Energy. G. Burmeister.

Oliver, N. (2015). Center For Sustainable Energy. G. Burmeister.

Opalka, B. (2013) "How the unheralded water heater is on the cutting-edge of demand response." Utility Dive.

empower devices

Overton, T. (2015). "California Governor Wants to Raise State's RPS Target to 50%." Renewables, from http://www.powermag.com/california-governor-wants-to-raise-states-2030-rps-target-to-50/.

Paulos, B. (2014). "UC San Diego Is Building the 'Motel 6' of Microgrids." Grid, from http://www.greentechmedia.com/articles/read/byrom-washom-master-of-the-microgrid.

Petrow, A. and R. Mosley (2013). California Local Energy Assurance Planning, California Local Energy Assurance Planning: 2.

PG&E (2012). Appendix A: Motion for Consideration of the San Francisco Bay Area Regional Energy Network: 129.

Postal, J. (2014). Sun Share. Vice President. G. Burmeister.

Quarles, D., A. Bastian and R. Norton. (2014). "About the Office of Sustainability." from http://www.atlantaga.gov/index.aspx?page=153.

Rabago, K. (2014). G. Burmeister.

RAP (2013). G. Burmeister, Regulatory Assistance Project.

Reed, B. (2015). Chula Vista Environmental Resourse Manager. G. Burmeister.

Renewables, S. (2014). "States with Shared Renewable Policy." from http://www.sharedrenewables.org/.

Rifkin, J. (2011). The Third Industrial Revolution: How Lateral Power Is Transforming Energy, the Economy, and the World. New York, NY, Palgrave MacMillan.

Rifkin, J., B. Lebot, J. A. S. Laitner, S. Bastie, F. Hinterman and S. Moorhead (2013). Third Industrial Revolution Master Plan Nord-Pas de Calais, France. Bethesda, MD, TIR Consulting.

Riverside, County of (2015). "Green Action Plan." from http://www.greenriverside.com/about-green-riverside/green-action-plan.

Roth, S. (2015). "New Policy to help renters, apartment dwellers go solar." USA Today, from http://www.desertsun.com/story/tech/science/energy/2015/01/14/new-policy-help-renters-apartment-dwellers-go-solar/21783551/.

Sabatini, J. (2015). CleanPowerSF back on track with anticipated job creation, mayor support. San Francisco Examiner.

Sabatini, J. (2015). CleanPowerSF supporters demand aggressive launch schedule. San Francisco Examiner.

SANDAG (2013). San Diego Regional Plug-In Electric Vehicle (PEV) Readiness Plan: Appendix A: 26.

SANDAG (2014). San Diego Regional: Plug-In Electric Vehicle (PEV) Readiness Plan, California Center for Sustainable Energy: 37.

Sarrubi, J. (2014). U.S. Department of Energy's Solar Instructor Training Network (SITN). G. Burmeister.

Schneider, M. (2014). G. Burmeister.

Schorske, R., M. Chiacos, S. Cowen, A. A. Genet, M. Guise, R. Tan and M. Pearson (2014). Electric Vehicle Readiness Plan for Ventura, Santa Barbara, and San Luis Obispo Counties (Central Coast), EV Communities Alliance: 171.

SDG&;E. (2015). "Notice of Intent | San Diego Gas & Electric." Retrieved February 15, 2015, from http://www.sdge.com/customer-choice/electricity/notice-intent.

SDG&E (2011). Prepping for Plug-In Vehicles, SDG&E.

SDG&E (2012). SDG&E To Expand Local Solar Market, Increase Customer Access, SDG&E.

SDICCCA (2011). San Diego and Imperial Counties Community Colleges Association, SDICCCA: 151.

SEIA. (2015). "California Leaders Press Forward on Climate Action." News, from http://www.seia.org/news/california-leaders-press-forward-climate-action.

Sikkema, E. (2015). G. Burmeister.

Snelling, T. (2014). Butte County California Planning Director. G. Burmeister.

SoCalREN (2014). 2013-2014 Energy Efficiency Portfolio, Southern California Regional Energy Network: 266.

Soitec. (2014). "Soitec CPV Advantages." from http://www.soitec.com/en/markets/solar-energy/cpv-advantages/.

Solar, C., H. Solar, O. S. Racking, Q. M. PV and S. M. Group (2014). Solar Panels Last 25 Years - But Will They Stay Safely Attached to Your Roof? The Importance of Reliable Solar Mounting Systems, Cinnamon Solar, Solar Marketing Group LLC: 25.

Sonoma, C. o. (2011). Sonoma County Energy Independence Program: Marketing Education and Outreach (MEO) Plan, Nonresidential, County of Sonoma.

Sonoma County Water Agency, County of Sonoma G. S., Dalessi Managment Consulting LLC, MRW & Associates (2011). Report on the Feasibility of Community Choice Aggregation in Sonoma County.

Stoner, P. (2007). Community Choice Aggregation, Local Government Commission.

Trabish, H. K. (2015). "SDG&E lands $5M grant to expand all-renewables microgrid." News, 2015, from http://www.utilitydive.com/news/sdge-lands-5m-grant-to-expand-all-renewables-microgrid/365802/.

Turner, B. (2015). SDG&E Energy Innovations Center Manager. G. Burmeister.

Vista, C. o. C. (2014). 2014 CAP Update - Energy Sector Planning Matrix. CCWG, chulavista.gov.

Wolfe, A. and M. Brown (2000). Estimates of Administrative Costs for Energy Efficiency Policies and Programs. Scenarios for a Clean Energy Future. M. Brown, W. Short and M. Levine. Oak Ridge, TN, Oak Ridge National Laboratory.

Wood, E. (2014). "Microgrids 101: A Non-geek Definition of Microgrid." from http://microgridknowledge.com/microgrids-101-non-geek-definition-microgrid/.

Wood, E. (2014). "Of Mice and Microgrids: A Profile of the US' Largest Microgrid." from http://microgridknowledge.com/mice-microgrids-profile-one-us-largest-microgrids/.

Woods and Poole (2014). Economic Projections Data for the United States, California, and San Diego County. Washington D.C., Woods and Poole Economics LLC.

Yeager, L. (2014). Sonoma County Energy and Sustainablility Division. E. Sikkema.

Yee, B. T. (2012). "Welcome to the Government Compensation in California (GCC) Website." from http://publicpay.ca.gov/.

Attachment D – Executive Summary Report (Ascent 2016)

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Phase I Comprehensive Renewable Energy Plan Executive Summary Report

September 2016

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County of San Diego Planning & Development Services

Phase I Comprehensive Renewable Energy Plan

Executive Summary Report

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ACRONYMS AND ABBREVIATIONS

AFV	Alternative fuel vehicle
ARB	California Air Resources Board
BMP	Best management practices
Board	County of San Diego Board of Supervisors
CALGreen	California Green Building Standards
CAP	Climate Action Plan
CCA	Consumer Choice Aggregation
CEC	California Energy Commission
CO_2	Carbon dioxide
County	County of San Diego
CREB	Clean Renewable Energy Bond
CREP	Phase I Comprehensive Renewable Energy Plan
DA	Direct Access
DOE	Department of Energy
DRECP	Desert Renewable Energy Conservation Plan
EAP	Energy Assurance Plan
ECR	Enhanced Community Renewables
Empower Report	Phase I Comprehensive Renewable Energy Plan Report
EPAct	Energy Policy Act of 1992
EPAct 2005	Energy Policy Act of 2005
ESP	Electric service provider
ESCo	Energy Service Company
EVSE	EV supply equipment
FHFA	Federal Housing Finance Agency
FIT	Feed-in-Tariff
GHG	Greenhouse gas
GTSR	Green Tariff Shared Renewables
HERO	California Home Energy Renovation Opportunity
IEPR	Integrated Energy Policy Report
IOU	Investor-owned utility
kW	Kilowatt
kWh	Kilowatt per hour

LCE	Lancaster Choice Energy
MCE	Marin Clean Energy
MW	Megawatts
NEM	Net energy metering
OPR	Governor's Office of Planning and Research
P2P	Peer-to-peer
PACE	Property Assessed Clean Energy
PG&E	Pacific Gas and Electric
PPA	Power Purchase Agreement
PTC	Production tax credit
QECB	Qualified Energy Conservation Bond
REN	Regional energy network
SCE	Southern California Edison
SCEF	Sonoma County Efficiency Financing
SCP	Sonoma Clean Power
SDG&E	San Diego Gas and Electric
SEU	Sustainable Energy Utility
TAC	Technical Advisory Committee
WIOA	Workforce Innovation and Opportunity Act
ZEV	Zero-emission vehicles
ZNE	Zero net energy

1 EXECUTIVE SUMMARY

In July 2015, the Phase I Comprehensive Renewable Energy Plan (CREP) Report (Empower Report) was prepared in response to the County of San Diego (County) Board of Supervisor's (Board) direction to research and develop renewable energy options in the County. This summary report presents the key points from the Empower Report. The Empower Report can be found in Attachment A.

Covering the residential, commercial, and industrial sectors of the County, with a particular focus on unincorporated areas, the CREP presents a comprehensive approach to renewable energy and energy efficiency. The Empower Report considers technology, appropriate zoning and development standards; and fiscal and financial impacts and community benefits, including costs to consumers.

This summary highlights the most pertinent information from the Empower Report, beginning with a review of existing conditions, which includes an updated energy-related regulatory settings section, and a preliminary overview of existing renewable energy resources within the County (see Section 2). Section 3 of this summary report analyzes the most commonly used alternative energy models that provide customer options beyond the traditional investor-owned utility (IOU) model that the County could pursue: Community Choice Aggregation (CCA), Direct Access (DA), and Sustainable Energy Utility (SEU). It also provides an overview of the financing mechanisms the County could use to implement these models. Section 4 summarizes the various programs, policies, and efforts that constitute best management practices (BMPs) for promoting sustainable renewable energy development in other jurisdictions. The County could choose to focus on a mix of these BMPs in its renewable energy planning effort. Section 5 summarizes the results of the economic analysis performed in the Empower Report, which explores the current patterns of economic activity and energy consumption. Finally, Section 6 summarizes key conclusions from the Empower Report.

1.1 SUMMARY OF CREP AND CLIMATE ACTION PLAN RELATIONSHIP

The County's CREP and Climate Action Plan (CAP) efforts are separate, but related projects. Increasing renewable energy use is one of many actions the County can take to reduce greenhouse gas (GHG) emissions and is one component of climate action planning. The County is currently in the outreach phase of drafting a new CAP. The purpose of the CAP will be (1) to address issues related to growth and climate change and (2) work alongside objectives in the CREP.

Integration of CREP BMPs, including identification of alternative energy models, can be pursued through CAP reduction measures and actions. By integrating objectives of the CREP with renewable energy components of the CAP, commitments can be tied to a plan and specific GHG reductions associated with renewable and energy efficiency projects. More information on the relationship between the CREP and CAP can be found in the CAP Alignment Memo. Initial recommendations for BMPs that can better align with the County CAP are summarized below.

1.2 RECOMMENDATIONS

The Empower Report provides a thorough assessment of BMPs to provide a variety of potential programs, policies, and models that the County could later adopt and implement as part of the CREP. Determining which mix of BMPs will work best for the County depends on a number of social, economic, and political factors. Each BMP is analyzed in Sections 4 and 6 of this report, with summary tables that more thoroughly consider the costs and benefits of implementation (i.e., advantages, disadvantages, financing options, and implementing body), along with the overall return on investment to the County. A ranking system, based on overall return on investment was used to determine the mix of BMPs anticipated to be most effective for the County. A low, medium, or high return on investment ranking was assigned based on a number of social, economic, and political factors. For more information on how rankings were determined, see Section 4 of this summary report.

- **Focus on BMPs with Medium or High Return on Investment Rankings.** While all of the BMPs can arguably provide value and promote more renewable energy development in the County, it is important for the County to focus on the BMPs that will provide the highest return on investment, or the most benefit for the money spent. The summary tables and analyses in Sections 4 and 6 of this report provide an initial ranking of the cost and benefits. For further consideration in the CREP process, the County should focus on the BMPs that have medium or high return on investment rankings.

- **Top BMP Recommendations for Phase II of the CREP.** Based on an assessment of cost, financing options, advantages, disadvantages, and overall opportunity to increase renewable energy development, the following four BMPs have been identified as the top recommendations for the County to pursue in Phase II of the CREP.

  - **Develop a CCA Feasibility Study (BMP #3).** Compared to other alternative energy models proposed (i.e., Direct Access (DA), Sustainable Energy Utility (SEU)), pursuing development of a CCA through a feasibility study would be the best use of County resources. Given current restrictions, the ability for a DA program to increase renewable energy development is limited. The County could lobby both the California Public Utilities Commission (CPUC) and/or the State legislature to open up DA beyond its current limits, but this could be time extensive and results are not guaranteed. Regarding an SEU, a CCA could provide a similar energy integrator role and financing opportunities. The County could explore developing an SEU if it doesn't choose to pursue a CCA program, but it is important to keep in mind that SEUs still require legislative action in order to implement.

    There are a number environmental, economic, and administrative advantages to creating a CCA. Given the significant amount of investment, resources, and staffing needed to establish, run, and operate a CCA, it is important that the County conduct a feasibility study before arriving at a decision. However, to avoid duplicated efforts and to ensure more unified results, the County should consider other CCA feasibility studies being prepared in the region before drafting its own study. The City of Solana Beach recently completed a feasibility study in April 2016. Also, the City of San Diego is in the beginning stages of drafting a citywide CCA feasibility study. The County should coordinate and work with the City of San Diego on these efforts to determine ways to supplement information on a county-wide level.

    The County's feasibility study should be clear in its objectives for the program, sources of funding, and economic viability. The study should consider San Diego Gas and Electric (SDG&E) load data and renewable resource assessments to identify potential projects; assess the potential size of the program in terms of number of customers and electricity sales; develop a financial and cash-flow model; predict the overall return on investment; quantify the jobs created under various procurement scenarios; and outline how start-up costs would be financed. If the feasibility study finds that a CCA program would be viable for the County, the benefits could well outweigh the costs.

  - **Create a Renewable Energy Overlay (BMP #10).** By reducing planning process time and by providing more certainty to investors, a renewable energy overlay zone can save both the developer and the government money. It also sends a signal to investors that the County wants to see renewable energy in specific locations in the County. While it may be difficult to secure funding for an overlay zone, the potential benefits for creating an overlay zone are worth considering. The County could better direct renewable energy development and identify opportunity areas that consider current and proposed land uses and environmental conditions.

  - **Track Community Solar Initiative Legislation (BMP #14).** Because many people are not able to install solar photovoltaic (PV) systems on their rooftops for a number of reasons (i.e., limited or no space, financial restrictions, living in a rental or multi-family unit, or poor rooftop solar orientation), Community Solar can help consumers gain access to solar opportunities. It also minimizes the usual high upfront solar costs and supports the local solar industry. Community Solar could also promote the development of more solar developments in the County. The County should be involved in tracking the regulatory decisions established by Senate Bill (SB) 43 and consider how it could implement a Community Solar initiative in the future. The county should also look to other cities that have implemented Community Solar (e.g., City of Carlsbad).

- **Establish a Microgrid and Develop Policies Related to Microgrids (BMP #15).** Microgrids, which are self-contained power systems that have on or more power sources (often renewable), offer a number of economic, environmental, power quality, and security benefits. The primary benefit of a microgrid is reliability and its ability to keep critical infrastructure, such as transportation systems, hospitals, data centers, water treatments facilities, police and fire departments, operating, particularly during times of crisis. As an example, Borrego Springs was funded through a variety of agencies and partners (i.e., Department of Energy [DOE], SDG&E, California Energy Commission [CEC], IBM, Motorola), suggesting that microgrids are an important asset and worth investing in. The County could begin by partnering with SDG&E and University of California San Diego (UCSD) on microgrid policies and identifying potential sites in the County where microgrids would be ideally suited.

- **Additional Recommendations with a Medium or High Return on Investment Ranking.** A high return on investment ranking, was given to BMPs that the County could most feasibly finance and gain support on at a political or organizational level. BMPs that had a clear path to implementation, or clear action items to determine feasibility, were also given a high ranking. Finally, BMPs with the highest potential to increase renewable energy opportunities in the County, were given a higher ranking, even if associated costs were high. A medium return on investment ranking was given to BMPs where some uncertainty existed as to whether the County could feasibly finance and gain support at a political or organizational level. BMPs with high start-up costs, and/or with less certain potential to increase renewable opportunities, were also given a medium ranking.

  The following BMPs with a medium or high return on investment ranking should also be considered by the County:

  - BMP #4: Establish Financing Capacity (i.e., Property Assessed Clean Energy [PACE] and Bonds)
  - BMP #5: Develop a Solar Energy Workforce Development Initiative
  - BMP #7: Increase the County's Percentage of Energy Derived from Various Renewable Energy Technologies
  - BMP #13: Increase Renewable Energy Education and Outreach
  - BMP #16: Establish Electric Vehicle Programs
  - BMP #17: Develop a Legislative Strategy to Support Renewable Energy Programs

- **Avoid Costly BMPs That Require Too Many Existing Resources or New Staffing.** A low return on investment ranking was given to BMPs that had more disadvantages than advantages and/or required a significant amount of additional research to determine feasibility of implementation. BMPs that were costly (or costs were undetermined) and had low potential to increase renewable energy opportunities in the County were also given a low ranking. A number of BMPs presented in this summary were ultimately given a low return on investment rating due to the level of new and existing staff time and resources needed for implementation and execution. These include:

  - BMP #2: Establish a New Office of Sustainability
  - BMP #8: Establish a Renewable Energy Group Procurement Initiative

- BMP #9: Participate in the Creation of a New Regional Energy Network
- BMP #11: Develop a Building Energy Disclosure Program

A number of these BMPs are administrative in nature and also require large operating budgets that may prove difficult to fund. For example, the expenditures required to keep an Office of Sustainability (BMP #2) in operation are extensive and would put additional pressure on existing staff and resources that oversee it. Not only is a significant amount of research needed to determine whether a Group Procurement Initiative (GPI) would be feasible for the County (BMP #8), it may not be the best use of current staff time and resources due to the high level of coordination needed to implement a GPI. The same is true for creating a new regional energy network (REN) (BMP #9); the administrative burden placed on current staff as a result of extensive coordination and time needed to get a REN up and running makes it a less desirable option for the County to pursue. Finally, the actual coordination and manpower needed to create, implement, and oversee a Building Energy Disclosure Program (BMP #11) is quite high for the overall end gain.

- **Some BMPs are Better Addressed in the County's CAP.** A number of the BMPs address ways the County can increase renewable energy opportunities by creating additional planning documents. While plans help to consolidate policies and convey a unified approach to an issue, they can also be costly and hard to finance (i.e., unless the County can secure grant money). Because the County is already working on a CAP, the same objectives proposed in certain BMPs can be addressed in the CAP. For example, rather than prepare an Energy Element for the County's General Plan (BMP #1), it would be better to align renewable energy directives with the upcoming CAP and to ensure its consistency with the General Plan. While an Energy Assurance Plan (EAP) addresses energy security (BMP #6), other planning documents (e.g. Hazard Mitigation Plan and the County's CAP) may be better positioned to begin to outline key assets and ways to increase energy supply resiliency.

  Additionally, certain policy and program BMPs should be addressed in the CAP to ensure their implementation and GHG reduction potential. The advantages associated with increasing the renewable energy mix in the County are important environmentally and will also help towards achieving legislative targets. Because the County is currently using a relatively small amount of renewable energy, there is an opportunity to increase this percentage mix by implementing changes (BMP #7). The exact percentage reduction should be aligned with Renewable Portfolio Standard (RPS) requirements and should also help achieve GHG reduction targets identified in the CAP. Also, the establishment of additional Electric Vehicle (EV) programs (BMP #16) have important implications to the reductions of GHGs in the County. Programs should be included in the County's CAP to quantify their GHG reduction potential.

- **Focus on Partnership and Collaborations.** Some BMP programs would be more effective if the County chose to partner and collaborate with other agencies, entities, and organizations. Identifying appropriate partnership and collaboration opportunities will not only help implementation of certain BMPs, but strengthen existing programs that currently exist. The County should continue to support PACE programs (BMP #4) and help educate residents about the availability of these programs and encourage participation as a means to help reduce the region's electricity demand. The County should also explore how it might support efforts to create a PACE district in San Diego administered by the Ygrene Energy Fund or a similar entity. Regarding whether the County should develop a Solar Energy Workforce Development Initiative (BMP #5), there are already a number of other organizations providing workforce development in the County. Rather than developing an entirely new initiative, it may be more beneficial to build upon existing programs and partner with other agencies and organizations who are already offering similar services. Furthermore, the County could also look to partner with other agencies and organizations that are already focused on renewable energy education and outreach to further success with BMP #13. Finally, the County could take advantage of legislation that supports renewable energy programs by working with the Office of Strategy and Intergovernmental Affairs (OSIA) to develop a legislative strategy that builds upon their existing legislative review process (BMP #17).

1.3 NEXT STEPS

The CREP marks an important step in identifying the most effective tools to promote renewable energy. The County needs to consider which mix of renewable energy policy options outlined in the BMPs would garner the highest returns on investment and most effectively promote renewable energy development in the County. Information gathered from the Empower Report, this Summary Report, and feedback from the CREP's Technical Advisory Committee (TAC) will inform the County's Staff Report to the Board. The Board will provide policy direction for the CREP in late 2016 or early 2017.

2 EXISTING CONDITIONS

2.1 REGULATORY SETTING

2.1.1 Federal

ENERGY POLICY ACT OF 1992

The Energy Policy Act of 1992 (EPAct) was passed to reduce the country's dependence on foreign petroleum and improve air quality. EPAct includes several parts intended to build an inventory of alternative fuel vehicles (AFVs) in large, centrally fueled fleets in metropolitan areas. EPAct requires certain federal, state, and local government and private fleets to purchase a percentage of light duty AFVs capable of running on alternative fuels each year. In addition, financial incentives are included in EPAct. Federal tax deductions will be allowed for businesses and individuals to cover the incremental cost of AFVs. States are also required by the act to consider a variety of incentive programs to help promote AFVs.

ENERGY POLICY ACT OF 2005

The Energy Policy Act of 2005 (EPAct 2005) was signed into law on August 8, 2005. EPAct 2005 provides for renewed and expanded tax credits for electricity generated by qualified energy sources, such as landfill gas; provides bond financing, tax incentives, grants, and loan guarantees for a clean renewable energy and rural community electrification; and establishes a federal purchase requirement for renewable energy.

2.1.2 State

GREENHOUSE GAS LEGISLATION

In September 2006, Governor Schwarzenegger signed Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006. AB 32 establishes regulatory, reporting, and market mechanisms to achieve quantifiable reductions in GHG emissions and a cap on statewide GHG emissions. AB 32 requires that statewide GHG emissions be reduced to 1990 levels by 2020. This reduction will be accomplished through an enforceable statewide cap on GHG emissions and is being implemented through the California Cap-and-Trade regulation starting in 2012, along with other regulations and programs.

In December 2008, the California Air Resources Board (ARB) adopted its Climate Change Scoping Plan, which contains the main strategies California will implement to achieve GHG reductions of approximately 22 percent from the State's projected 2020 emission levels under a business-as-usual (BAU) scenario. In 2014, ARB adopted the First Update to the Climate Change Scoping Plan to identify the next steps in reaching AB 32 goals and evaluate the progress that has been made between 2000 and 2012. According to the update, California is on track to meet the near-term 2020 GHG limit and is well positioned to maintain and continue reductions beyond 2020. The update also reports the trends in GHG emissions from various emission sectors.

In September 2016, Governor Brown signed Senate Bill (SB) 32 and AB 197 to extend California's GHG reduction programs beyond 2020. SB 32 authorizes ARB to achieve a statewide GHG emission reduction of at least 40 percent below the AB 32 2020 limit by no later than December 31, 2030. SB 32 codified the target established by Executive Order (EO) B-30-15 for 2030, which sets the next interim step in the state's continuing efforts to pursue the long-term target of 80 percent below 1990 emission levels by 2050. SB 32 does not include an authorization to extend the Cap-and-Trade program beyond the existing 2020 targets; this program is currently continuing under existing statutory authority in AB 32. AB 197 was written to accompany SB 32 and establishes new statutory directions, including creating a six-member Joint Legislative Committee on Climate Change Policies to make recommendations to the Legislature. ARB is required to appear before this committee annually to present information on sectors covered by the Scoping Plan. AB 197 also requires ARB to consider social costs when adopting emission reduction rules and policies; prioritize direct emission reductions at large stationary sources and mobile sources; and identify ranges of GHG and air pollution reductions for every emissions reduction measure identified in subsequent Scoping Plan updates.

ADVANCED CLEAN CARS PROGRAM

In January 2012, ARB approved the Advanced Clean Cars program which combines the control of GHG emissions and criteria air pollutants, as well as requirements for greater numbers of zero-emission vehicles (ZEV), into a single package of standards for vehicle model years 2017 through 2025. The new rules strengthen the GHG standard for 2017 models and beyond. This will be achieved through existing technologies, the use of stronger and lighter materials, and more efficient drivetrains and engines. The program's ZEV regulation requires battery, fuel cell, and/or plug-in hybrid electric vehicles to account for up to 15 percent of California's new vehicle sales by 2025. The program also includes a clean fuels outlet regulation designed to support the commercialization of zero-emission hydrogen fuel cell vehicles planned by vehicle manufacturers by 2015 by requiring increased numbers of hydrogen fueling stations throughout the state. The number of stations will grow as vehicle manufacturers sell more fuel cell vehicles. By 2025, when the rules will be fully implemented, the statewide fleet of new cars and light trucks will emit 34 percent fewer GHG emissions and 75 percent fewer smog-forming emissions than the statewide fleet in 2016 (ARB 2011).

SENATE BILL 1389, INTEGRATED ENERGY POLICY REPORTS

SB 1389 requires CEC to prepare a biennial integrated energy policy report that contains an assessment of major energy trends and issues facing the state's electricity, natural gas, and transportation fuel sectors and provides policy recommendations to conserve resources; protect the environment; ensure reliable, secure, and diverse energy supplies; enhance the state's economy; and protect public health and safety (Public Resources Code § 25301[a]). The CEC prepares these assessments and associated policy recommendations every two years, with updates in alternate years, as part of the Integrated Energy Policy Report (IEPR). Preparation of the IEPR involves close collaboration with federal, state, and local agencies and a wide variety of stakeholders in an extensive public process to identify critical energy issues and develop strategies to address those issues. (CEC 2012a).

ENERGY IMPROVEMENT AND EXTENSION ACT OF 2008

The Energy Improvement and Extension Act of 2008 provides a one-year extension of the production tax credit (PTC) for wind energy, keeping the credit in effect through 2009. The bill also provides a two-year PTC extension, through 2010, for electricity produced from geothermal, biomass, and solar energy facilities, as well as trash-to-energy facilities, small hydropower facilities using irrigation water, capacity additions to existing hydropower plants, and hydropower facilities added to existing dams. In addition, the bill creates a new PTC for electricity produced by marine and hydrokinetic renewable energy systems (also called advanced water power systems) with a rated capacity of at least 150 kilowatt (kW) and placed in service by 2011. To help on the financing end, the bill authorizes $800 million in new Clean Renewable Energy Bonds for all of the above technologies.

CALIFORNIA LONG-TERM ENERGY EFFICIENCY STRATEGIC PLAN

On Sept. 18, 2008, the CPUC adopted California's first Long Term Energy Efficiency Strategic Plan, presenting a single roadmap to achieve maximum energy savings across all major groups and sectors in California. This comprehensive Plan for 2009 to 2020 is the state's first integrated framework of goals and strategies for saving energy, covering government, utility, and private sector actions, and holds energy efficiency to its role as the highest priority resource in meeting California's energy needs. The plan was updated in January 2011 to include a lighting chapter.

CALIFORNIA BUILDING ENERGY EFFICIENCY STANDARDS (TITLE 24, PART 6)

Buildings in California are required to comply with California's Energy Efficiency Standards for Residential and Nonresidential Buildings (i.e., Title 24, Part 6 of the California Code of Regulations), established by the CEC to institutionalize energy conservation standards. The standards were first adopted in 1978 and are updated approximately every three years. All buildings for which a building permit is submitted on or after July 1, 2014 must follow the 2013 standards (CEC 2012b). The CEC Impact Analysis for California's 2013 Building Energy Efficiency Standards estimates that the 2013 Standards are 23.3 percent more efficient than the previous 2008 standards for multi-family residential construction and 21.8 percent more efficient for non-residential construction (CEC 2013:3). CEC adopted the 2016 Building Energy Efficiency Standards in 2015. The 2016 Title 24 standards will go into effect on January 1, 2017. For single-family residences, the 2016 Title 24 standards will result in about 28 percent less energy use for lighting, heating, cooling, ventilation and water heating than the 2013 Title 24 standards (CEC 2015a). For non-residential land uses, the 2016 standards would result in 5 percent less energy use than those built to 2013 standards (CEC 2015b).

CALIFORNIA GREEN BUILDING STANDARDS (TITLE 24, PART 11)

The California Green Building Standards (CALGreen) feature regulations for energy efficiency, water efficiency and conservation, material conservation and resource efficiency, and environmental quality. CALGreen has mandatory provisions for commercial, residential, and public school buildings, along with appendices with voluntary provisions. Mandatory provisions for nonresidential buildings require that buildings facilitate future installation of EV supply equipment (EVSE), by including the proper wiring and electrical components needed for EV charging stations. Provisions further dictate the number of required EV charging spaces that are required, based on number of actual parking spaces.

CALIFORNIA ZERO NET ENERGY BUILDING GOALS

In 2007, the CPUC set a goal that all new residential construction in California will be zero net energy (ZNE) by 2020, and all new commercial construction will be ZNE by 2030. The CPUC reiterated its commitments to these goals when it adopted the California Long Term Energy Efficiency Strategic Plan in 2008. The California Energy Commission adopted the goal to achieve zero net energy building standards by 2020 for homes and 2030 for commercial buildings in its 2007 Integrated Energy Policy Report (IEPR), and reaffirmed that goal in its 2011 IEPR. The Zero Net Energy Building goals have also been supported in the California Energy Action Plan, the AB 32 Scoping Plan, the Governor's Clean Energy Jobs Plan, and the Clean Energy Futures Vision. In order to effectively implement each of the California Long Term Energy Efficiency Strategic Plan's goals, the CPUC has initiated individual goal area Action Plan efforts to create work plans and to continue the stakeholder engagement process that was used in the strategic plan. In 2011, the CPUC launched a ZNE Commercial Building Action Plan, which is designed to help commercial building owners in the state take advantage of the latest technologies and financial incentives to help reduce building energy use to "net-zero" through greater efficiency and on-site clean energy production. CPUC and CEC drafted the Zero Net Energy Action Plan in June 2015 specifically for new residential construction. The Action Plan provides a foundation for the development of a robust and self-sustaining ZNE market for new homes over the next five years, supports future codes and standards for ZNE, and inspires voluntary actions to meet California's goal.

ASSEMBLY BILL 758, COMPREHENSIVE ENERGY EFFICIENCY PLAN FOR EXISTING BUILDINGS

AB 758 (Skinner, Chapter 470, Statutes 2009) requires the CEC, in collaboration with the CPUC and stakeholders, to develop a comprehensive program to achieve greater energy efficiency in the state's existing buildings. The Existing Buildings Energy Efficiency Action (EBEE) Plan was released in 2015 and provides a 10-year framework to focus state and local governments, the building, contracting industries, and real estate industries, financial market actors, and other key stakeholders on achieving much greater energy and water efficiency in existing residential, commercial, and public buildings. The EBEE Action Plan covers all existing buildings in the single-family, multifamily, commercial, and public buildings sectors

SENATE BILL X1-2, THE CALIFORNIA RENEWABLE ENERGY PORTFOLIO STANDARD

SB X1-2 of 2011 requires all California utilities to generate 33 percent of their electricity supply (portfolio) from renewables by 2020. SB X1-2 sets a three-stage compliance period requiring all California utilities, including independently owned utilities, energy service providers, and community choice aggregators, to generate 20 percent of their electricity from renewables by December 31, 2013; 25 percent by December 31, 2016; and 33 percent by December 31, 2020. SB X1-2 also requires the renewable electricity standard to be met increasingly with renewable energy that is supplied to the California grid from sources within, or directly proximate to, California. SB X1-2 mandates that renewables from these sources make up at least 50 percent of the total renewable energy for the 2011-2013 compliance period, at least 65 percent for the 2014-2016 compliance period, and at least 75 percent for 2016 and beyond. The CPUC and the CEC jointly implement the statewide RPS program through rulemakings and monitoring the activities of electric energy utilities in the state.

SENATE BILL 350, THE CLEAN ENERGY AND POLLUTION REDUCTION ACT OF 2015

In consideration of the approaching expiration of SB X1-2 goals, SB 350 of 2015 calls for 1) a new objective for procure 50 percent of the state's electricity from renewables by 2030 and 2) a doubling of statewide energy efficiency savings in electricity and natural gas final end uses of retail customers by January 1, 2030 with annual targets established by the CEC.

CALIFORNIA QUALIFYING FACILITY AND COMBINED HEAT AND POWER PROGRAM SETTLEMENT

In December 2010, the CPUC approved California's Qualifying Facility and Combined Heat and Power (CHP) Program Settlement, which established a CHP framework for the state's investor-owned utilities. The settlement established a near-term target of 3,000 megawatts (MW) of CHP for entities under the jurisdiction of the CPUC, although this target includes not just new CHP, but capacity from renewal of contracts due to expire in the next three years. The CPUC has also adopted a settlement agreement that includes reforms to the Electric Rule 21 interconnection process to provide a clear, predictable path to interconnection of distributed generation while maintaining the safety and reliability of the grid. Electric Rule 21 is a tariff that describes the interconnection, operating, and metering requirements for generation facilities to be connected to a utility's distribution system, over which the CPUC has jurisdiction (CEC 2013).

ALTERNATIVE AND RENEWABLE FUEL AND VEHICLE TECHNOLOGY PROGRAM

AB 118 (Statues of 2007) created the CEC's Alternative and Renewable Fuel and Vehicle Technology Program. The statute, subsequently amended by AB 109 (Statutes of 2008), authorizes the CEC to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change policies. The statute allows the CEC to use grants, loans, loan guarantees, revolving loans, and other appropriate measures. Eligible recipients include: public agencies, private businesses, public-private partnerships, vehicle and technology consortia, workforce training partnerships and collaboratives, fleet owners, consumers, recreational boaters, and academic institutions. The CEC must prepare and adopt an Investment Plan and convene an Advisory Committee to assist in preparing the Investment Plan.

SENATE BILL 43, THE GREEN TARIFF SHARED RENEWABLES PROGRAM

SB 43, passed in 2013, directed the CPUC to implement the Green Tariff Shared Renewables (GTSR) program to expand customer access to "all eligible renewable energy resources to all ratepayers who are currently unable to access the benefits of onsite generation." The law sets a sunset date of January 1, 2019 for the GTSR program, unless extended. The GTSR program applies to the three largest IOUs (i.e., Pacific Gas and Electric [PG&E], Southern California Edison [SCE], and SDG&E) and mandates that they administer the GTSR program in their service territory. The GTSR program allows both a Green Tariff Option and Enhanced Community Renewables (ECR) option to facilitate shared solar in California. SB 43 does not mandate how procurement should be divided between the Green Tariff and ECR programs. In 2015, the CPUC approved GTSR programs for SDG&E, PG&E, and SCE (EPIC 2015).

SAN DIEGO GAS & ELECTRIC INDEPENDENT MARKETING DIVISION COMPLIANCE PLAN (CPUC RESOLUTION E-4874)

In July 2016, the CPUC approved SDG&E's proposal to form an Independent Marketing Division (IMD) to lobby or market against CCAs. Under SB 790 (signed in 2011), the CPUC was required to create a Code of Conduct, which prohibited utilities from lobbying against CCAs, unless it forms an IMD that is funded exclusively by its shareholders. The IMD must also be functionally and physically separate from ratepayer divisions. SDG&E chose to house its IMD inside an already existing affiliate, Sempra Services Corporation (SSC). SDG&E is the first utility in the state to apply for approval from the CPUC for such a division (CPUC 2016a).

GUIDANCE FOR INITIAL ENERGY EFFICIENCY ROLLING PORTFOLIO BUSINESS PLAN FILINGS (CPUC DECISION 16-08-019)

In August 2016, the CPUC passed a decision addressing next steps for RENs, the appropriate baselines to be used to measure energy savings for specific programs and measures, transition for statewide and third-party programs, and changes to the evaluation and shareholder incentive frameworks. The decision states that RENs will retain their designation status as pilots and are requested to submit business plans in coordination with the other energy efficiency program administrators. REN proposals will also need to be vetted through the stakeholder process at the California Energy Efficiency Coordinating Committee (CAEECC) prior to submission to the CPUC. REN programs, and therefore administrative expenses, will only be funded to the extent that they are determined by the CPUC to provide value (or the promise of value) to ratepayers in terms of energy savings and/or market transformation results for energy efficiency (CPUC 2016b).

2.1.3 Local

SAN DIEGO COUNTY GENERAL PLAN

The Conservation Element of the San Diego County General Plan (2011) contains policies related to energy efficiency and renewable energy development. Policies range from encouraging development projects to use renewable energy (COS-14.7); requiring County facilities to meet "green building" programs (COS-15.3), requiring development to meet Title 24 Energy Standards (COS-15.4); encouraging energy efficiency audits (COS-15.5); incentivizing low- and zero- emission vehicles and equipment (COS-16.3); and exploring the development of alternative fuel sources (COS-16.4).

SAN DIEGO COUNTY STRATEGIC ENERGY PLAN

The Strategic Energy Plan provides high-level energy and sustainability objectives and goals in the areas of energy and water conservation and efficiency, sustainable design, energy supply, distributed generation, vehicular transportation, energy and sustainability education and outreach, energy consumer choice, recycling and landfill diversion, and GHG emissions reductions. The Strategic Energy Plan applies to County municipal operations only and is based on a three to five-year cycle with updated plans developed to address regulatory, technical, economic and societal changes. The latest Strategic Energy Plan was released in 2015 and covers priorities for 2015-2020.

SAN DIEGO GAS & ELECTRIC CONNECTED TO THE SUN PROGRAM

San Diego's Connected to the Sun Program allows business and residential customers to have the option to purchase 100 percent renewable energy. This program was approved by the CPUC on January 29, 2015 and is administered through SDG&E. The Program includes two pilot program options: Share the Sun and SunRate. Share the Sun allows bundled customers to work directly with solar providers to acquire rights to a portion of the energy produced by a specific solar power facility and receive a bill credit for the value of that energy. SunRate allows bundled customers to buy some or all of their energy from local solar projects already under contract with SDG&E through a "green tariff." SunRate implementation is targeted for early 2016 and Share the Sun will take a couple years after signing an agreement with a solar provider.

DESERT RENEWABLE ENERGY CONSERVATION PLAN

Initiated in 2008 by Executive Order S-14-08, the Desert Renewable Energy Conservation Plan (DRECP), includes 22.6 million acres across seven California counties, with the eastern portion of San Diego County included in the impact area. The general purpose of the DRECP is to streamline siting and construction of renewable energy power facilities and transmission lines through streamlined environmental review and permitting, while conserving and managing plant and wildlife communities in the desert regions. This desert conservation and renewable energy and transmission focus will be covered through three separate components of the DRECP: A U.S. Bureau of Land Management Land Use Plan Amendment; a U.S. Fish and Wildlife Service General Conservation Plan; and a California Department of Fish and Wildlife Natural Communities Conservation Plan. Proponents of the DRECP are looking for a comprehensive, landscape approach that considers an entire region for development versus the project-by-project approach that tends to dominate planning efforts in many California counties today. The DRECP was driven early in part by the intent to meet the State's 33 percent by 2020 RPS. DRECP proponents plan to develop 20,000 MW of renewable energy power over the next 25 years, which is a significant undertaking.

2.2 EXISTING RENEWABLE ENERGY RESOURCES

2.2.1 County-Owned Facilities

As of 2016, the County is supplying 2.5 percent of its annual electricity needs through a number of small photovoltaic (PV) systems at local parks and recreation centers as well as through a Power Purchase Agreement (PPA) completed in 2011. Construction was completed on the new Alpine Library, the County's first ZNE building. As a ZNE building, the total amount of energy used by the Alpine Library on an annual basis is roughly equal to the amount of renewable energy created on the site. The Imperial Beach Library is currently under construction to be the next ZNE County facility.

Table 2-1 shows the list of renewable energy systems at County facilities installed since 2009.

Table 2-1 List of Renewable Energy Systems at County Facilities Installed Since 2009

Facility	City/Community	Completed	Nominal Output (kW)	Annual Output (kWh)
Spring Valley Community Center	Spring Valley	2009	10	15,000
Lakeside Community Center	Lakeside	2010	45	67,500
Fallbrook Community Center	Fallbrook	2010	25	37,500
Ramona Library	Ramona	2011	50	75,000
Sheriff Crime Lab	San Diego	2011	45	67,500
Wilderness Gardens Preserve	Pala	2012	5	6,750
Sweetwater Regional Park	Bonita	2012	185	277,500
Guajome Regional Park	Oceanside	2013	100	150,000
Lincoln Acres	Lincoln Acres	2013	30	45,000
COC Conference Center	San Diego	2013	18	26,400
Alpine ZNE Library[1]	Alpine	2016	N/A	N/A
Imperial Beach ZNE Library[2]	Imperial Beach	2016	N/A	N/A
Older Systems (pre-2009)			285	427,500
Sub-Total			**661**	**916,500**
Photovoltaic System Power Purchase Agreement				
East Mesa Detention Facility-Juvenile Detention	San Diego	2011	1,000	1,500,00
TOTAL SYSTEMS SERVING COUNTY FACILITIES			**1,661**	**2,416,500**
Hosting SDG&E PV System				
COC Parking Structure A	San Diego	2011	425	637,500
Owned Solar Thermal Systems				
COC Conference Center	San Diego	2012		1,050[3]

Notes: kW = kilowatt, kWh = kilowatt-hour, PV = photovoltaic, ZNE = zero net energy, N/A = Not Available

[1] In 2016 construction was completed on the new Alpine Library, the County's first zero net energy building. As a zero net energy building, the total amount of energy used by the Alpine Library on an annual basis is roughly equal to the amount of renewable energy created on the site.

[2] The Imperial Beach Library is currently under construction to be the next zero net energy County facility.

[3] Amount reported is in therms.

Source: San Diego County (2009)

2.2.2 Non-County Owned Facilities

From fiscal years 2014 to 2016, there was an average of 6,555 PV permits issued each year in the unincorporated area of the County, with a 90 percent increase from 2014 to 2016. In 2015 the County Board of Supervisors approved ordinances amending County Building Code to promote photovoltaic, wind energy and electric vehicle charging systems and to streamline processing of small, residential, rooftop solar energy permits. The County has permitted more than 189 Mega Watts of renewable energy in the unincorporated area, saving approximately 133 Metric Tons of greenhouse gas emissions from entering the atmosphere

3 ALTERNATIVE ENERGY MODELS

There are a number of alternative energy models that provide consumers options beyond the traditional investor-owned utility model. This chapter summarizes these institutional arrangements, along with potential financial mechanisms that could help the County diversify its energy mix. For more specific information regarding alternative energy models, see Section 4 of the Empower Report. BMP #4 (Establish an Institutional and Financing Capability), described below in Chapter 4.3, assesses the costs and benefits of each model and financing mechanism.

3.1 COMMUNITY CHOICE ALTERNATIVES

Alternative energy models, or institutional arrangements, are organizational and administrative entities that help foster investment in renewable energy and overall energy efficiency.

3.1.1 Community Choice Aggregation

CCA allows city and county governments to aggregate or pool electricity customers to purchase and develop power, while also allowing them to administer energy programs on behalf of their residents and businesses. A CCA works in partnership with a region's existing utility, which continues to deliver power, maintain the grid, and provide consolidated billing and other customer services. Considered to be a hybrid-approach to the provision of energy services, a CCA is part IOU and part municipal public utility. This alternative energy model allows a local community to shape the CCA program to prioritize desired benefits, including but not limited to, increased investment in renewable energy sources and energy efficiency, economic development, carbon reduction strategies, and workforce development efforts. It is important to note that only the electricity portion of energy services can be provided by a CCA entity. To date, CCAs have been established by law in six states (California, Illinois, Massachusetts, New Jersey, Ohio, and Rhode Island).

REGULATORY BACKGROUND

In 2002, the California Legislature passed AB 117, which enacted legislation permitting the creation of CCA programs. Under the legislation, a city, county, or Joint Powers Authority (JPA), comprised of two or more cities and counties, may implement a CCA program. Governor Jerry Brown signed California SB 790 in October 2011, which also allowed a CCA to be formed by the Kings River Conservation District, the Sonoma County Water Agency, and any California public agency possessing authority to generate and deliver electricity at retail within its designated jurisdiction. In January 2012, the authority to form a CCA was furthered expanded by SB 4, which allows special districts to also become community choice aggregators. For additional detail on how a CCA functions, see Section 4.2.1 of the Empower Report.

ADVANTAGES OF COMMUNITY CHOICE AGGREGATION

CCA programs offer a number of local, economic, environmental, and social benefits. Advantages include, but are not limited to the following:

- **Revenue-Based Financing.** CCAs are not reliant on tax dollars or public funds and are financed from revenues received from customers.

- **Community-Based Investment.** CCAs redirect revenue streams previously under IOU control and place them under local control, allowing for reinvestment back into the community and for targeted renewable energy and energy efficiency investments and programs.

- **Economic Benefits.** An entity could enjoy significant economic benefits due to the reduction in electricity consumption and a resource mix that drives down costs on electricity services. These savings could also lead to job creation in renewable energy for the region.

- **Increased Choices.** CCAs increases customer choice, by allowing the option to receive electricity from a CCA or an IOU.

- **Centralized Energy Services.** Through public-private partnerships, a CCA can leverage private capital and coordinate efforts of third-party programs for more centralized community energy services.

- **Reduced GHGs.** CCAs can substantially reduce GHGs associated with electricity consumption.

- **Rate Stability.** By increasing the amount of power obtained from long-term contracts or self-owned generation facilities, a CCA program may be able to lock-in electricity prices and provide improved stability to its customers.

DISADVANTAGES OF COMMUNITY CHOICE AGGREGATION

Despite the number of advantages that a CCA program provides, there are also risks associated with CCA program development. Risks can be divided into the following three categories:

- **Planning and Implementation Risks.** Establishing a CCA requires a number of political, engineering, legal, and financial steps. A detailed implementation plan, which often requires technical consultants, also needs to be submitted and certified by the CPUC. Start-up costs could range between $1 to $3 million. Funds expended from these start-up costs are not always recoverable.

- **Operational Risks.** If CCA energy costs exceed that of IOU rates, customers may choose to opt out of the program. If this occurs, there is a risk that the CCA will have contracted more electricity than it can sell to residents, and will have to sell excess electricity to a third party at a loss. Furthermore, customer rates are subject to the prevailing market price of electricity, but if the CCA has locked in electricity prices, customers could end up paying higher rates than what the market dictates. Changes in rules and tariffs administered by the CPUC could also adversely affect rates.

- **Regulatory Oversight Risks.** In contrast to the high-degree of regulatory oversight that IOUs face, the CPUC has limited oversight of CCA programs. Rather than have rate increases determined at a CPUC proceeding, CCAs rely on a Board of Directors to make such decisions. Therefore, it is critical that the CCA Board be made up of knowledgeable professionals that will conduct CCA-related matters in an open and transparent way.

STATEWIDE USE

Since its passing in 2002, a number of CCA programs have been proposed in the State, including programs in San Francisco (CleanPowerSF), the East Bay (Oakland, Berkeley, and Emeryville), and the San Joaquin Valley (San Joaquin Valley Power Authority). The first CCA program to operate in California, Marin Clean Energy (MCE), was formed in Marin County and began serving customers in May 2010. Sonoma County launched Sonoma Clean Power in 2014 and the City of Lancaster, through Lancaster Choice Energy (LCE), began offering service to select customers in May 2015, with broad public enrollment in late 2015.

REGIONAL USE

Locally, the cities of San Diego, Encinitas, Del Mar, Solana Beach, and Carlsbad are considering the formation of a CCA to provide an alternative energy source than what is provided by SDG&E. For Del Mar, the option to join a CCA is an option outlined in its CAP, which was adopted by City Council in June 2016 (Del Mar 2016). Also, the City of San Diego CAP has a goal to achieve 100 percent renewable electricity by 2035 city-wide, with a commitment to complete a city-wide CCA Feasibility Study (City of San Diego 2014). The City is currently in the beginning stages of drafting a feasibility study. Solana Beach in April 2016 completed a technical report analyzing the feasibility of a CCA. The report concluded that a CCA could be feasible, but that additional research is needed if the City decides to pursue a CCA (Solana Beach 2016). Most recently, the CPUC approved SDG&E's proposal to form an independent district to lobby or market against CCAs. Under State law, utilities are prohibited from lobbying against CCAs unless it forms an independent district that is funded by shareholders, not ratepayers. SDG&E is the first utility in the State to apply for approval from the CPUC (KPBS 2016).

Summaries of the most prominent CCAs currently operating in California are provided below. For a more extensive review of CCA examples, see Section 4.2.7 of the Empower Report.

Marin Clean Energy

MCE offers its customers three different product offerings: Light Green, Deep Green, and Local Sol. Customers in the MCE service territory are automatically enrolled in Light Green, which provides customers with 50 percent renewable energy from sources such as solar, wind, bioenergy, geothermal, and small hydroelectric power facilities. In addition to the three product offerings, MCE also serves as a platform for several local energy programs that encourage the development of distributed energy resources, which are described below:

- **Net Energy Metering.** Net energy metering (NEM) is a billing arrangement that provides credit to customers with solar PV systems for the full retail value of the electricity their system generates. Under NEM, the customer's electric meter keeps track of how much electricity is consumed by the customer and how much excess electricity is generated and sent back to the utility grid. MCE pays its customers a $0.01/kWh premium over the retail rate paid by the local IOU, PG&E.

- **Feed-in-Tariff.** The Feed-in-Tariff (FIT) program is a wholesale renewable energy purchase program designed to provide competitive, predictable energy prices for local small-scale renewable energy developers over a 20-yr contract term. This standard agreement provides a high level of certainty with respect to the revenue stream generated by the project and eliminates the need for contract negotiations, keeping transaction costs low. MCE's first FIT-supported project was at the San Rafael Airport in October 2012. This project created three new locally-based full-time employees, used materials manufactured in the area, and was financed locally.

- **Energy Efficiency Programs.** MCE manages energy efficiency programs for residential and commercial customers, integrating diverse program offerings under one umbrella. These programs are designed to maximize investments in a property, reducing energy use, water use, and GHGs. They also provide participants with a single point of contact from initial contact to project completion. Rebates and financing options are also available.

- **Workforce Development Program.** MCE's workforce development program provides workers, including those in disadvantaged communities, with a broad spectrum of transferrable skills to work in a variety of "green" jobs. MCE also works with local experts to align, leverage, and influence existing training programs and markets in the MCE service territory.

Sonoma Clean Power

Sonoma Clean Power (SCP) participants include the cities of Windsor, Cotati, Sebastopol, Santa Rosa, Sonoma, Cloverdale, Rohnert Park, Petaluma, and the unincorporated area of Sonoma County. As of December 2014, service is provided for 20,000 commercial customers and 200,000 residential customers, with an 89 percent retention rate.

SCP provides two product offerings to its customers: CleanStart and EverGreen. CleanStart is SCP's default service and provides 33 percent renewable power from sources such as geothermal, solar, and wind. EverGreen is 100 percent local renewable energy initially comprised of geothermal power sourced from facilities in northeastern Sonoma County. By 2018, 23 percent of SCP's resource portfolio will come from geothermal power. To help stimulate local energy projects and use, SCP offers NetGreen, which is a NEM program that is structured similarly to MCE'S NEM program. ProFIT is SCP's feed-in tariff renewable energy purchasing program which sets the rules and price for SCP to purchase electricity from small-scale wholesale renewable electricity projects within SCP's service territory. Similar to MCE's feed-in tariff program, standard 10- or 20-year contracts are offered to keep costs low.

Lancaster Choice Energy

LCE is the latest CCA program in California starting May 7, 2015. Phase one of the program roll-out encompassed more than 850 accounts including all municipal accounts as well as residents and businesses that have elected to enroll early in the program. Phase two began in November 2015 with small commercial accounts joining the program, with the remaining customers enrolling in Early Spring 2016. Lancaster's City Council will oversee the program and be responsible for various elements of the program, including rate setting. Customers still receive their bills from SCE. Under LCE's default program, Clear Choice offers customers 35 percent renewable energy and an on average 3 percent savings on their monthly bill. LCE's Smart Choice rate plan offers customers the option of choosing a 100 percent renewable energy option. Currently, renewable energy generated is from wind sources, but LCE has plans to add solar and hydroelectric into their renewable energy mix (City of Lancaster 2016).

3.1.2 Direct Access

Through DA, eligible retail customers have the choice to purchase electric power directly from an independent electric service provider (ESP) rather than through an IOU exclusively. While similar to a CCA program, DA is different in that it is: (1) not available to residential customers; and (2) by law (i.e., SB 695) is capped to a set number of gigawatt-hour (GWh) ESPs from which an individual commercial or industrial customer can purchase its power. This limits the County's ability to ensure that a DA program could deliver increased levels of renewable energy and energy efficiency, as well as reduced levels of GHGs. The County currently participates in a DA program, in which it contracts with a third party to provide electricity on the open market. The County's contractor provides the cheapest electricity, which may not always include renewable energy. To date, DA has saved the County approximately $3 million, freeing up Department of General Service (DGS) funds for use in other energy-related projects.

REGULATORY BACKGROUND

DA was first instituted as an option for retail electric service in 1998, as part of an electric industry restructuring program to bring retail competition to the California electricity market. However, in 2001 DA transactions were suspended due to the electricity crisis. Subsequently, in 2009, SB 695 was signed into law, reauthorizing the DA program. This allowed only individual retail non-residential end-use customers to acquire electric service from other providers in each electrical corporation's (i.e., all providers) distribution service territory, up to a maximum allowable total kWh annual limit. This limit, or cap, is currently managed through a wait list process by the CPUC that is reset each calendar year. The CPUC also currently sets rates for DA (SDG&E 2016).

ADVANTAGES OF DIRECT ACCESS

There are a number of advantages to a DA program, which include, but are not limited to the following:

- Customer Savings. Through a DA program, participating customers have an opportunity to save money by procuring electricity from an ESP instead of through a bundled IOU. Between 2009 and 2012, the County saved $3.7 million, or approximately 9 percent, average savings for County facilities over bundled service from SDG&E using DA electricity procurement.

- **Increased Choice.** DA programs offer participating customers more choices for their energy sources.
- **Reduced GHGs.** DA programs can reduce GHGs associated with electricity consumption by providing renewable energy options.

DISADVANTAGES OF DIRECT ACCESS

While DA programs offer more choice and savings to customers, there are a number of downsides that are described below:

- **Limited Customers.** Currently DA is only available to nonresidential customers and due to current caps, the number of customers that can participate is limited.
- **Small Portion of Electricity Consumption.** Given current restrictions, DA accounts for a relatively small portion of electricity consumption. The capped load allowance only permits ESPs to serve approximately 13 percent of the total IOU load in California.
- **Less Certain Focus on Renewables.** Current restrictions provide little incentive to drive investment in renewable energy and energy efficiency.

3.1.3 Sustainable Energy Utility

An SEU is an independent and financially self-sufficient entity responsible for delivering energy efficiency, energy conservation, and customer-sited renewable energy to end users. SEUs target all sectors and fuels, including electricity, transportation, and heating. Through an SEU, energy users throughout a city or state can build a relationship with a single organization whose direct interest is to help residents and businesses use less energy and generate their own clean energy. As a nonprofit umbrella entity at a city, county, or state level, an SEU relies on a third-party management model, competitive contracting, and performance incentives to deliver sustainable energy services across all sectors and customer classes. As such, an SEU is publicly accountable and can be financially self-sufficient. It also has access to a range of potential funding sources and revenue streams, and can achieve energy savings without raising taxes or utility rates.

A typical SEU would capitalize a fund with relatively low-interest state or municipal bonds and use that capital to contract with private Energy Service Companies (ESCos) to conduct energy audits and perform building energy efficiency and renewable energy upgrades. Once the project is completed, the energy customer would share the savings resulting from lower energy costs with the SEU to repay the bond and to fund the SEU's activities. Because it can aggregate a large amount of demand for ESCo services, the SEU can help lower costs further by standardizing offerings, negotiating bulk discounts, and otherwise streamlining the process of identifying and executing cost-effective energy efficiency and renewable energy upgrades

REGULATORY BACKGROUND

The State of Delaware first adopted the SEU model along with bond financing structure in 2007 as an independent, non-profit organization to foster a sustainable energy future. Development of the SEU model began in 2006. In 2011, Delaware's SEU issued the Energy Efficiency Bond Series. This financing created over $145 million in guaranteed dollar savings to enable a host of state buildings and higher education facilities.

ADVANTAGES OF SUSTAINABLE ENERGY UTILITY

There are a number of advantages to an SEU program, which include, but are not limited to the following:

- **Central Coordination.** An SEU provides a single point-of-contact for efficiency and self-generation in the same way that conventional utilities are the point of contact for energy supply.
- **Comprehensive Programs.** Programs target efficiency, conservation, and renewable energy across all fuels (e.g., electricity, heating, transportation) and customer classes (e.g., low-income, government, industrial, commercial, residential), regardless of utility service territory.
- **Flexible Incentives.** Sustainable energy services are not constrained by strict programmatic criteria that might exclude, or inadequately serve, certain customer groups.
- **Financial Self-Sufficiency.** A financing plan ensures long-term self-sufficiency by generating revenue through the supply of customer-sited sustainable energy services.
- **Competitive Procurement.** A governance system is based on competitive contracting of independent management services.
- **Job Creation.** An SEU can facilitate increased investments in energy efficiency and customer-sited renewable systems, which in turn, can help facilitate a more robust regional economy. The Delaware SEU created nearly 980 jobs in construction, project engineering, and building management.
- **Economic Growth.** The SEU model can continuously organize investments, creating significant potential for the model to meaningfully impact the regional energy economy. At the same time, an SEU keeps value in the local economy due to the employment of local contractors and its emphasis on local production of the equipment used to meet energy needs.

DISADVANTAGES OF SUSTAINABLE ENERGY UTILITY

While there are a number of advantages to starting an SEU program, there are also some disadvantages to consider:

- **Legislative Action Needed.** Forming an SEU requires legislative action in order to implement, which can require a large amount of time, money, and resources to build political consensus and support.
- **Few SEU Examples.** Since few SEUs have been established since the Delaware SEU was created in 2007, there are not a lot of examples of SEUs to consider for BMPs.
- **High Costs.** Start-up and implementation costs to create an SEU program could be high and may not be recovered (Katz 2011).

STATEWIDE USE

Sonoma County Efficiency Financing Program

The Sonoma County Water Agency partnered with the Foundation for Renewable Energy & Environment to develop the Sonoma County Efficiency Financing (SCEF) Program. The SCEF is a scaled-down model that does not require legislative action and under this program participating organizations contract with a private ESCo to complete energy and water conservation measures. Improvements can include street lighting, building lighting, system controls, water pumps, heating, ventilation and air condition (HVAC) systems; boilers, chillers, and others. The participating organizations receive substantial utility cost-savings, including a contractual guarantee sufficient to cover the full cost of all retrofit work. The program uses tax-exempt bonds to finance projects. For more details on financing a SCEF, see Section 4.4.3.5 of the Empower Report.

3.2 FINANCING MECHANISMS

This section describes the financing mechanisms that are most often used to direct capital for investment and subsequent deployment of energy efficiency and renewable energy systems. An alternative energy model could be financed through one or more of the mechanisms described below.

3.2.1 Property Assessed Clean Energy Financing

Property Assessed Clean Energy (PACE financing is a loan alternative designed to encourage the installation of distributed renewable energy systems and energy efficiency measures by helping property owners overcome the barrier of high up-front energy equipment and installation costs. Under PACE programs, jurisdictions form special tax districts that allow property owners to finance efficiency (i.e., energy and water) and renewable energy projects on existing and, in some cases, new residential and commercial structures through a voluntary special tax assessment. These energy efficiency or renewable energy assessments are tied directly to the house or commercial property and repaid via the property owner's tax bill. Because the assessment and lien are tied directly to the property, they can be transferred upon sale. PACE assessments are not legally considered loans. Property owners who invest in energy efficiency measures and small renewable energy systems typically repay these assessments over 15 to 20 years via additional payments on their property tax bills. During the repayment period, the property owner realizes reduced electric utility bills as a result of the energy investment. Not unlike a mortgage, homeowners receive a tax deduction for the interest on a PACE assessment, but not for the principal.

PACE financing can help state and local governments address two major roadblocks to clean energy development at both the commercial and residential level: (1) lack of capital and (2) reluctance to make long term energy efficiency and/or renewable energy investments. PACE assessments are transferable, which provides property owners the opportunity to recoup their investment upon sale.

A critical design element of the PACE financing model is the use of special tax districts known as clean energy assessment districts. These districts are regularly used in the financing of traditional local government projects (e.g., sewers and streetlights), and they provide two benefits for jurisdictions. First, the special district shields the jurisdiction from risk, ideally helping to protect its overall debt rating. Second, the special district allows the additional assessment to be placed only on properties whose owners opt to participate in the program.

REGULATORY BACKGROUND

PACE financing programs can be established and administered under two different statutory frameworks: The Improvement Act of 1911 (as amended by AB 811) or the Mello-Roos Act (under a city's charter authority or as amended under SB 555). Both acts authorize creation of special tax districts, voluntary contractual agreements for financing between an authorized entity and the property owner, use of available funding from any source including existing bond issuing statutes and attachment of the assessment for payment of the assessment to the property (as opposed to the individual owner). For more information on the differences between the Mello-Roos Act and the Improvement Act see Section 4.5.3.1 of the Empower Report.

Residential PACE financing has faced opposition as early as 2009 from the Federal Housing Finance Agency (FHFA), which regulates Fannie Mae and Freddie Mac. In 2010, the FHFA issued a determination that PACE programs presented significant safety and soundness concerns to existing mortgages and therefore to the entities that underwrite or insure those mortgages. In 2011, FHFA affirmed that Fannie Mae and Freddie Mac would no longer purchase mortgages secured by a property with an outstanding PACE assessment that originated after July 6, 2010. This effectively stopped residential PACE financing programs in California and only recently have programs begun offering residential financing again. For more information regarding the obstacles facing residential PACE financing, see Section 4.5.3.2 of the Empower Report.

PACE IN SAN DIEGO COUNTY

There are several different PACE programs currently available to the County residents and businesses, which are determined by the County's Finance and General Government Group. In 2013, The County Board of Supervisors approved the expansion of the County's commercial PACE Program. CaliforniaFIRST, California Home Energy Renovation Opportunity (HERO), and Figtree's OnDemand program all offer PACE financing for commercial properties in the County. In July 2014, HERO financing was extended to residential properties in the San Diego area. As of July 2014, the HERO program has funded 206 residential projects, worth $4.9 million, in cities within the County. The program continues to show signs of accelerating and has received over 1,200 loan applications from the area since inception.

Clean Energy San Diego is a coalition of business leaders, environmentalists, and San Diego citizens working with Ygrene Energy Fund to create a PACE district in San Diego. Ygrene is already operating in Chula Vista, with 50 projects worth $4.5 million completed or under construction in 2014. In January 2015, Ygrene announced that local governments can join its program in as little as 30 days, under a new arrangement with a local housing finance authority in Sacramento named Golden State. Ygrene is the only PACE lender in California offering 30-year solar loans to homeowners at this time. The loan carries an interest rate of 8.49 percent. Ygrene's interest rate on a five-year loan is 5.99 percent while that on a 20-year loan is 8.25 percent.

3.2.2 Bonds

QUALIFIED ENERGY CONSERVATION BONDS

A Qualified Energy Conservation Bond (QECB) is a bond that enables qualified state, tribal, and local government issuers to borrow money at attractive rates to fund energy conservation projects. QECBs are taxable bonds, which means investors must pay federal taxes on QECB interest they receive. Most QECBs are issued as direct subsidy bonds and are among the lowest-cost public financing tool because the U.S. Department of the Treasury subsidizes the issuer's borrowing costs. The U.S. Congress authorized $3.2 billion of QECB issuance capacity, which has been allocated to jurisdictions based on population.

CLEAN RENEWABLE ENERGY BONDS

Clean Renewable Energy Bonds (CREBs) are primarily used in the public sector to finance renewable energy projects. The bondholder receives federal tax credits in lieu of a portion of the traditional bond interest, resulting in lower effective interest rate for the borrower. The issuer remains responsible for repaying the principal on the bond. CREBs differ from traditional tax-exempt bonds in that the tax credits issued through CREBs are treated as taxable income for the bondholder. The tax credit may be taken each year the bondholder has a tax liability as long as the credit amount does not exceed the limits established by the federal Energy Policy Act of 2005.

Through allocations by the Energy Improvement and Extension Act of 2008 and the American Recovery and Reinvestment Act of 2009, $2.4 billion are available for CREBs. With close to $1.4 billion in volume cap for new CREBs remaining, in February 2015, the IRS announced a March 5, 2015 opening of the rolling volume-cap application window for governments.

MUNICIPAL BONDS

A municipal bond is issued by a local government or its agencies. There are two basic types of municipal bonds: General Obligation Bonds and Revenue Bonds. General obligation bonds often require voter assent and tend to have lower interest rates than revenue bonds. This is because the principal and interest are secured by the credit of the issuer and usually supported by the issuer's taxing power. With revenue bonds, the principal and interest is secured by revenues derived from tolls, charges, or rents from the facility built with the proceeds of the bond issuance. Revenue bonds typically do not require electorate assent.

3.2.3 Peer-to-Peer Lending/Crowdfunding

Over the past ten years, Crowdfunding and peer-to-peer (P2P) lending organizations have emerged as financing mechanisms that offer easy, efficient, and low-cost sources for capital investments, loan repayment, and project funding. Crowdfunded projects use large groups of people pledging money to their cause to reach a monetary goal, without the promise of repayment. P2P lending is geared towards individuals seeking financing for investments, loans, and new businesses, with the promise that the lenders will get their money paid back to them in a timely manner.

Everybody Solar was created in Santa Cruz in 2011 to help nonprofits use solar energy to lower their operating costs. Everybody Solar is involved from the beginning stages of raising funds to the installation of the solar panels (through a partnership with a nonprofit solar installer). Everybody Solar, which uses a crowdfunding model, solicits donations online. While donations can come from anywhere, much of the fundraising outreach is focused in the communities where projects are proposed. Besides protecting the environment, Everybody Solar provides additional benefits. By lowering nonprofits operating expenses those organizations have more resources to put towards meeting their stated objectives (Mosaic 2012). In 2009, a renewable P2P lending company named Mosaic was launched in Oakland and has since become the third largest renewable specific lender in the world. Since its public launch in 2013, Mosaic has helped finance $7 million for 20 solar energy projects with a combined capacity of 18 MW. Mosaic gets investments from people or companies who want to finance solar energy projects, and give that money to the borrowers who want to construct a project. The typical payback period to investors is 10 years with a 5 percent return on investment.

4 BEST MANAGEMENT PRACTICES

The Best Management Practices (BMPs) summarized below are meant to provide a range of potential programs and policies that could later be adopted and implemented as part of the CREP. The programs, policies, and financial mechanisms presented have been proven to be innovative and effective tools and strategies for supporting renewable energy and energy efficiency advancement across several jurisdictions the nation. Each BMP is outlined below, with summary tables that consider overall advantages and risks of implementation. Where possible, more detail regarding costs, financing options, and responsible parties are provided. A ranking system, based on overall return on investment, was used to determine which mix of BMPs are anticipated to be most effective for the County. A low, medium, or high return on investment ranking was assigned based on a number of social, economic, and political factors:

- **High Return on Investment.** Top priority, or a high return on investment ranking, was given to BMPs that the County could most feasibly finance and gain support on at a political or organizational level. BMPs that had a clear path to implementation, or clear action items to determine feasibility, were also given a high ranking. Costs of implementation were also considered in rankings, but BMPs with a high potential to increase renewable energy opportunities in the County were given a higher ranking, even if associated costs were high.

- **Medium Return on Investment.** A medium return on investment ranking was given to BMPs where some uncertainty existed as to whether the County could feasibly finance and gain support at a political or organizational level. A medium ranking was also given to BMPs that might require additional collaboration or partnerships for proper implementation. BMPs with high start-up costs, and/or with less certain potential to increase renewable energy opportunities, were also given a medium ranking.

- **Low Return on Investment.** A low return on investment ranking was given to BMPs that had more disadvantages than advantages and/or required a significant amount of additional research to determine feasibility of implementation. BMPs that were costly (or costs were undetermined) and had low potential to increase renewable opportunities in the County were also given a low ranking.

See Section 5 of the Empower Report for more in-depth discussion of each BMP.

4.1 BMP #1: AMEND THE GENERAL PLAN AND ADD AN ENERGY ELEMENT

The General Plan expresses the County's development goals and embodies public policy relative to the distribution of future land uses, both public and private. The County's General Plan was last updated in 2011. Under State law, every local general plan must include seven elements: land use, circulation, housing, conservation, open space, noise, and safety. The Governor's Office of Planning and Research (OPR) recommends adding an eighth element in General Plans that cover energy (OPR 2003).

4.1.1 Costs and Benefits

Table 4-1 BMP #1: Amend the General Plan and add an Energy Element

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Planning	Planning & Development	Varies	CEC Grant Funding	Pursue Grant Funding with CEC	- Consolidation of Policies - Commitment to Renewable Energy	- Staff Time and Resources - Start-Up and Implementation Costs	Low

Notes: CEC = California Energy Commission

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-1 summarizes the key components of BMP #1. While adding an Energy Element to the County's General Plan has a number of advantages (i.e., consolidates major energy production and consumption policies, and reflects a commitment to renewable energy), preparation costs will vary depending on staff availability and the need to hire a consultant to do the work. Other timing considerations also include time and resources associated with developing a proposal, cost to prepare environmental documentation for the General Plan Element, expected time for public review and comment, and other actions associated with amendments to a General Plan. The CEC, through Assembly X1 13, has already awarded $3.3 million in renewable energy planning grants to five counties in 2013. Considered one of the 15 qualified counties to receive this grant funding, the County is eligible to receive any remaining funds (CEC 2016). The grant money can be applied to preparing an Energy Element, but can also be used to revise policies, ordinances, and to create streamlining programs.

4.1.2 County Actions and Recommendations

Although an Energy Element could provide a clear vision for energy-related decision-making, without further research and funding, an Energy Element could remain vague and lack specificity. If the County wants to pursue adding an Energy Element to the General Plan, it would be advisable to apply for grant funding through the CEC, or other grant funding that is available. However, because the County's current General Plan does include policies that support renewable energy (see Section 2.1.3), it may be more worthwhile to align renewable energy directives with the upcoming Climate Action Plan and to ensure its consistency with the General Plan rather than prepare a new, potentially redundant Energy Element.

4.2 BMP #2: ESTABLISH A NEW OFFICE OF SUSTAINABILITY

A local Office of Sustainability is a centralized authority responsible for developing and implementing sustainability programs and policies that advance energy, economic, and environmental priorities. The presence of an Office of Sustainability is now a prerequisite for many federal, state, and private funders, as many prefer to see a centralized office to execute their funded initiatives.

4.2.1 Costs and Benefits

Table 4-2 BMP #2: Establish a New Office of Sustainability

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Administrative	- DGS - Planning & Development - Executive's Office	- $595,000 (Wages) - $400,000–$3.5M (Budget) - 1-6 FTEs	- General Fund - Special Fees - EECBG - Grants	- Office Could Implement CREP - CREP TAC Could Advise New Office	- Commitment to Renewable Energy - Centralized Data Collection, and Consolidation - Attention from Funding Entities	- Staff Time and Resources - Start-Up, Implementation, and Operating Costs - Reorganization of County Departments/ Structure	Low

Notes: DGS = Department of General Services, EECBG = Energy Efficiency and Conservation Block Grant, FTE = Full-Time Equivalents, TAC = Technical Advisory Committee, M = Million

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-2 above summarizes the main features of BMP #2. Establishing an Office of Sustainability has a number of advantages attributed to consolidation and centralization of data, programs, resources, information, outreach, and funds. It would also demonstrate a commitment to a comprehensive approach to sustainability and would potentially increase attention from funding entities. However, samples from other Offices of Sustainability around California demonstrate that not only are there high costs associated with start-up and implementation, but ongoing operation and staffing would be expensive as well. Furthermore, a new centralized office does not fit within the County's current organizational structure and could dismantle or cause confusion on current interdepartmental coordinated sustainability efforts.

4.2.2 County Actions and Recommendations

While there are a number of advantages to creating a new Office of Sustainability, the expenditures required to keep such an office running are extensive and finding the right funding mechanism would be critical. Creating a new office would also put additional pressure on staff and resources that oversee it if it not appropriately staffed and funded. The County has an opportunity to build upon and formalize interdepartmental coordination already occurring on sustainability efforts, without restructuring the County's organizational framework. A sustainability task force or working group can be formalized to promote, track, and report on department-wide sustainability efforts. A task force has the opportunity to achieve the intended advantages of a new Office of Sustainability without the high costs associated with establishing an entirely new office.

4.3 BMP #3: ESTABLISH INSTITUTIONAL CAPACITY

Institutional arrangements can be described as the organizational and/or administrative entities that help foster investment in renewable energy and energy efficiency. It may also include increasing the number of renewable energy sources and/or providers, which provides additional choices for consumers.

4.3.1 Costs and Benefits

The institutional arrangements, or alternative energy models, examined in the CREP are CCA, DA, and SEU. These models are described in additional detail in Section 3 of this document and are summarized below in Table 4-3.

Table 4-3 BMP #3: Establish an Institutional and Financing Capability

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Community Choice Aggregation (CCA)							
Organizational/ Institutional	- JPA - County - Special District	- $400,000 (Feasibility Study) - $1-3M (Start-Up) - 21 FTEs	- Loans - Revenue	Authorize Development of a CCA Feasibility Study	- Increases Renewable Energy Sources - Reduces GHGs - More Consumer Choice - SDG&E Continues Services	- High Start-Up Costs - Relies on High Customer Participation - Vulnerable to Market Risks	High
Direct Access (DA)							
Organizational/ Institutional	CPUC	Varies	Varies	- Support Enhanced Customer Choice Through and Expanded DA	- Reduces GHGs - More Consumer Choice	- Staff Time and Resources - Implementation Costs - N/A to Residential Customers - Capped Enrollment - Limited Control	Medium
Sustainable Energy Utility (SEU)							
Organizational/ Institutional	- Nonprofit - Water Agency	Varies	- Tax-Exempt Bonds - Other Bond Financing Structures	- Explore the Formation of a Down-Scaled SEU Model	- Creates Jobs - Localized Economic Investment - Increases Investments in Energy Efficiency - Single Point of Contact	- Requires Legislative Approval - Staff Time and Resources - Start-Up and Implementation Costs	Medium

Notes: JPA = Joint Powers Authority, CPUC = California Public Utilities Commission, SDG&E = San Diego Gas & Electric, M = Million, N/A = Not Applicable

Source: Empower Devices (2015) and Ascent Environmental (2016)

4.3.2 County Actions and Recommendations

CCA. As outlined in Section 3 of this summary and in Table 4-3 above, there are a number of environmental, economic, and administrative advantages to creating a CCA. Given the significant amount of investment, resources, and staffing needed to establish and operate a CCA, it is important that the County conduct a feasibility study before arriving at a decision. However, to avoid duplicated efforts and to ensure more unified results, the County should consider other CCA feasibility studies being prepared in the region before starting to draft their own. The City of Solana Beach recently completed a feasibility study in April 2016. Also, the City of San Diego is in the beginning stages of drafting a citywide CCA feasibility study. The County should coordinate and work with the City of San Diego on these efforts to determine ways to supplement information on a county-wide level.

This feasibility study should be clear in its objectives for the program, sources of funding, and economic viability. The study should also use SDG&E load data and renewable resource assessments to identify potential projects; assess the potential size of the program in terms of number of customers and electricity sales; develop a financial and cash-flow model; predict the overall return on investment; quantify the jobs created under various procurement scenarios; and outline how start-up costs would be financed. The plan could also determine staffing requirements and examine the risks associated with establishing a CCA and how those risks would be mitigated. Feasibility studies could cost about $400,000 to complete. If the feasibility study finds that a CCA program would be viable for the County, the benefits could very well outweigh the costs.

DA. Given current restrictions, DA accounts for a small percentage of the electricity consumed in the County (i.e., 3 percent) and the ability for customers to participate is limited. The County could consider lobbying both the CPUC and/or the State legislature to open up the DA beyond its current limits.

SEU. Although a CCA program could provide a similar energy integrator role and financing opportunities, the County may wish to further explore how an SEU model can help it attain its climate goals, particularly if the County does not pursue the formation of a CCA program. Because forming an SEU requires legislative action in order to implement, The County may wish to replicate a scaled-down version of an SEU (e.g., SCEF).

4.4 BMP #4: ESTABLISH FINANCING CAPACITY

A financial mechanism is a tool for directing capital for investment and subsequent deployment of energy efficiency and renewable energy systems.

4.4.1 Costs and Benefits

PACE, Bonds, and P2P Lending/Crowdfunding are mechanisms that could be used to finance renewable energy and energy efficiency projects. These financing mechanisms are examined in detail in Section 3 of this document and are summarized below in Table 4-4.

Table 4-4 BMP #4: Establish an Institutional and Financing Capability

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Property Assessed Clean Energy (PACE)							
Financial	- JPA - COGs - Private Companies - County	N/A	- Private - Municipal Bonds - Revenue Bonds - Banks	Continue to Support PACE Programs	- Accessible Renewable Energy and Energy Efficiency Programs for County Residents - Reduces High Up-Front Costs	- Staff Time and Resources - Implementation Costs	Medium
Bonds							
Financial	Lenders	Amounts Vary	- Federal - Revenue	Use Various Bonds to Help Finance Energy Projects	- Tax Exemptions - Lower Interest Rates - Electoral Assent Not Required - High Impact - Repayment Through Savings	Staff Time and Resources	Medium
Peer-to-Peer (P2P) Lending/Crowdfunding							
Financial	Private	N/A	- Private - Individuals	Explore a PPP with a P2P Lending Entity to Establish a RE and EE specific P2P Lending Program	- Low Cost - Distributes Capital Throughout the Region - Residents Have Ownership in Energy Investment	- Start-Up and Implementation Costs - Staff Time and Resources	Low

Notes: JPA = Joint Powers Authority, COG = Council of Government, N/A = Not Available, PPP = Public Private Partnership,

Source: Empower Devices (2015) and Ascent Environmental (2016)

4.4.2 County Actions and Recommendations

PACE. Despite the challenges with FHFA over the lien priority of PACE assessments, PACE financing in the residential sector is experiencing a resurgence in California. Commercial PACE financing, not having faced the same hurdles, has continued to prove successful. The County currently has an opportunity to help educate residents about the availability of these programs and encourage participation as a means to help reduce the region's electricity demand. Increased competition among the various PACE programs should result in better product offerings for County residents. As such, the County should explore how it might support efforts to create a PACE district in the County. With additional research to determine feasibility, a PACE district could be administered by Ygrene Energy Fund, another qualified entity, or by the County.

Bonds. The County should investigate harnessing revenue bonds to help finance energy projects. In the context of renewable energy systems, revenue streams from the sale of electricity would be tied to the repayment of the bonds. In the context of energy efficiency, the bonds would be repaid via energy savings achieved through the project.

P2P and Crowdfunding. Given that P2P and Crowdfunding are relatively new, and most examples are focused on solar energy, successful models for all types of renewable energy are still uncertain. Continued research is needed to identify additional applications of Crowdfunding and P2P renewable energy projects to help determine County feasibility and its role in the process. In regards to P2P, the County could explore a public-private partnership with Mosaic, or a similar P2P lending entity, to establish a renewable and energy efficiency specific P2P lending program. Such a program could harness distributed capital throughout the region while also allowing residents to have a sense of ownership in the region's energy investments. The County could also explore a partnership with Everybody Solar, to help crowdfund solar projects in the County.

4.5 BMP #5: DEVELOP A SOLAR ENERGY WORKFORCE DEVELOPMENT INITIATIVE

The County could use Workforce Innovation and Opportunity Act (WIOA) funds to develop an initiative to create more renewable energy jobs. As part of a larger Solar Energy Workforce Development Initiative, the County could work with local partners on a major sector-driven approach to workforce development that focuses on the needs of regional employers within the renewable energy industry.

4.5.1 Costs and Benefits

Table 4-5 BMP #5: Establish a Solar Energy Workforce Development Initiative

BMP Type	Responsibility	Duration	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Programmatic	- DGS - Office of Education - Partner Organizations	- 1-3 Years (Implementation) - 3-6 Months (Start-Up)	$500,000 to $8.5M (Budgets)	WIA, via the WIOA	Determine Workforce Needs in Phase II of the CREP	- Creates Jobs - Reduces Industry Costs - County Could Partner with Organizations	- Staff Time and Resources - Start-Up Costs - High Cost of Training Programs - Time to Build Support	Medium

Notes: DGS = Department of General Services, WIA = Federal Workforce Investment Act, WIOA = Workforce Innovation and Opportunity Act, M = Million

Source: Empower Devices (2015) and Ascent Environmental (2016)

As outlined above in Table 4-5, near-term costs associated with starting a Solar Workforce Initiative are high, with significant staff time required to generate support from existing and new foundational partners for the initiative. Building support at the local, regional, state, and federal levels for redirecting money for such an initiative can also take time and requires careful organizing.

4.5.2 County Actions and Recommendations

Ultimately, more research is needed to determine whether a separate Solar Energy Workforce Development Initiative is needed in the County. The County in Phase II of the CREP could identify more specific renewable energy workforce needs and opportunities, while also determining how WIOA funds could help fund these efforts. There are also a number of other organizations providing workforce development in the County. SDG&E works with the County and nonprofits on a number of market and skill building programs and the County's Office of Education works with trade schools, community college network and four-year colleges on workforce development efforts. Rather than developing an entirely new initiative, it may be more beneficial to build upon existing programs and partner with other agencies and organizations who are already offering similar services. The County should investigate how WIOA funds could help support existing programs and how they could be expanded to support clean-sector jobs.

4.6 BMP #6: BUILD AN ENERGY ASSURANCE PLAN

An Energy Assurance Plan (EAP) is an emergency management plan that ensures that key assets within the community will remain operational in the event of a power outage. An EAP would explore how energy is used across the County and would identify key assets and mitigate negative impacts to energy disruption on these assets. It could also help the County discover ways to reduce its energy demand and make its energy supply more resilient.

4.6.1 Costs and Benefits

Table 4-6 BMP #6: Build an Energy Assurance Plan (EAP)

BMP Type	Responsibility	Duration	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Planning	- Planning & Development - DGS	6 months (Draft EAP)	- $250,000 (Budget) - 1 FTE	Potential Grant Opportunities	- Prioritize Development of an EAP - Identify Projects That Could Increase Energy Resilience	- Furthers Direction on HMPs, CAPs, EEPs, or COOPs - Addresses Energy Disruption - Increases Energy Supply Resiliency - Reduces Energy Demand - Supports Public Health - Identifies Key Assets	- Staff Time and Resources - Start-Up and Implementation Costs - High Overall Costs	Low

Notes: DGS = Department of General Services, FTE = Full-Time Equivalents HMP = Hazard Mitigation Plan. CAP = Climate Action Plan, EEP = Energy Emergency Plan, COOP = Continuity of Operations Plan

Source: Empower Devices (2015) and Ascent Environmental (2016)

Developing an EAP would identify ways to address energy disruption in the event of a crisis and increases energy supply resiliency. An EAP would also further direction on a number of planning documents, including CAPs. Similar to other planning documents, an EAP could cost around $250,000 to produce and require an average of 6 months (with consultant help) to draft.

4.6.2 County Actions and Recommendations

While energy security is a major issue, other planning documents (e.g., Hazard Mitigation Plan and CAPs) may be better positioned to begin to outline key assets and ways to increase energy supply resiliency rather than an EAP. SDG&E is also already pursuing methods to address energy disruption, so collaboration on information and tactics is important. Because financing options are not clearly laid out to fund an EAP, the same issues could be addressed in future planning or updates to pertinent documents.

4.7 BMP #7: INCREASE THE COUNTY'S PERCENTAGE OF ENERGY DERIVED FROM VARIOUS RENEWABLE ENERGY TECHNOLOGIES

As described in Section 2.2 the County is currently capturing 2.3 percent of its annual electricity needs through a number of small PV systems as well as through a PPA completed in 2011. The County could increase its percentage of energy derived from various renewable energy technologies through policies and administrative actions.

4.7.1 Costs and Benefits

Table 4-7 BMP #7: Increase the County's Percentage of Energy Derived from Various Renewable Energy Technologies

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Administrative	- Planning & Development - DGS	- $4,000 - $30,000 (Residential Wind Turbines) - $24,000 – 34,000 (PV Systems) - $4,000-$8,000 (Solar Water Heaters)	- Incentives - Federal Income Tax Credits (Residents)	- Analyze Long-Term Costs and Benefits of Increasing the Percentage of Renewable Energy Used - Review Permitting Process for Solar Water Heaters	- Reduces GHGs - Controls Utility Costs - Achieves Emissions Targets - Could Align with CAP Targets	- Staff Time and Resources - Start-Up and Implementation Costs	High

Notes: DGS = Department of General Services, PV = Photovoltaic, GHG = Greenhouse Gas, CAP = Climate Action Plan

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-7 summarizes the main components of BMP #7. Costs associated with installing specific renewable energy technologies vary, but can be made more affordable to residents and building owners through incentives and tax credits. However, it would be important to streamline permitting processes for renewable technologies and a significant amount of staff time and resources would be needed.

4.7.2 County Actions and Recommendations

Increasing the renewable energy mix in the County would provide environmental co-benefits and would also help towards achieving legislative targets. Because the County is currently using a very small amount of renewable energy, there is an opportunity to increase this percentage mix by implementing small changes. The exact percentage reduction should be aligned with RPS requirements and should also help achieve GHG reduction targets identified in the CAP.

4.8 BMP #8: ESTABLISH A RENEWABLE ENERGY GROUP PROCUREMENT INITIATIVE

4.8.1 Costs and Benefits

A Renewable Energy Group Procurement Initiative (GPI) is a regional, multi-agency collaborative purchase of renewable energy equipment (e.g., rooftop solar PV panels) for public agency facilities (e.g., city halls, fire stations, libraries, and community centers).

Table 4-8 BMP #8: Establish a Renewable Energy Group Procurement Initiative (GPI)

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Administrative	- DGS - Third Party (Owner of Property)	- Varies - ½ FTE for 3 Months, then 10 Hours per Month for 1-3 Years - Technical, Financial, and Legal Costs.	PPA	- Research lessons learned from SV-REP - Research GPI Implementation Along with CCA - REN & Microgrid Projects - Encourage SANDAG to pursue a GPI - Consider Tribal Members in a County-Led GPI	- Economies of Scale - Reduces Redundancies - Increases Purchasing Power - Economic Activity - Creates Jobs	- Staff Time and Resources - Start-Up and Implementation Costs - Staffing Budget	Low

Notes: DGS = Department of General Services, FTE = Full-Time Equivalents, PPA = Power Purchase Agreement, CCA = Community Choice Aggregation, SV-REP = Silicon Valley Renewable Energy Project, REN = Regional Energy Network, SANDAG = San Diego Association of Governments

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-8 summarizes the main attributes of BMP #8. A major benefit of a GPI is the ability to obtain significant discounts when purchasing products and services in bulk. Group purchasing can also lower transaction costs, staff time, organizational burden, and risk for each participant. The major disadvantage of a GPI is that the amount of collaboration needed amongst stakeholders, staff, and participants in order to implement a successful program is significant.

4.8.2 County Actions and Recommendations

A significant amount of research is still needed to determine whether a GPI would be feasible for the County, including how GPI implementation would work alongside a CCA or Microgrid (see BMP #15). While there is potential for cost savings, this may not be the best use of current staff time and resources due to high level of coordination needed to implement a GPI. There are also a number of technical, financial, and legal costs to consider. For more information on costs see Section 5.9.1.4 of the Empower Report.

4.9 BMP #9: PARTICIPATE IN THE CREATION OF A NEW REGIONAL ENERGY NETWORK

First introduced in California in 2012, RENs were designed to give local governments more flexibility and independence in managing rate-payer funded energy efficiency programs. A REN is a formal collaboration between local governments in which they act as energy efficiency program administrators. A REN can design and implement energy efficiency programs and can submit proposals directly to the CPUC. REN programs are designed to supplement, not supplant existing IOU efforts in energy efficiency programs.

4.9.1 Costs and Benefits

Table 4-9 BMP #9: Participate in the Creation of a New Regional Energy Network (REN)

BMP Type	Responsibility	Cost	Duration	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Programmatic	- DGS - Partners	$18.6 M - $22.4 M (Yearly Budget)	2 Years (Start Up)	SDG&E Funding via rate-payers as required by CPUC	- Approach CPUC as a Third Pilot REN with SANDAG - Participate in REN Development Opportunities in the Region	- Funding Resource Outside IOU - Formalizes County Commitment to Renewable Energy - Reduces Redundancies	- Staff Time and Resources - Long Start-Up	Low

Notes: DGS = Department of General Services, M = Million, SDG&E = San Diego Gas & Electric, REN = Regional Energy Network, SANDAG = San Diego Association of Governments, IOU = Investor-Owned Utility

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-9 summarizes the key components of BMP #9. Through a REN, there is the potential to raise energy funds outside of traditional IOU channels with greater ease. It also formalizes the County's commitment to renewable energy, and creates less duplication among jurisdictions. However, full development of a REN could take years and costs associated with implementation are high, with budgets ranging from $18 to 22 million for other RENs. Existing RENs in California (i.e., SoCalREN and BayREN) currently only target energy efficiency and do not address opportunities to advance renewable energy.

4.9.2 County Actions and Recommendations

The County should continue to monitor CPUC regulations for any changes related to the formation of a REN and the role of Local Government Partnerships. Because other RENs do not specifically address opportunities to advance renewable energy, additional efforts would be needed to identify if a REN could advance renewable energy in the County. Staff time and resources needed to coordinate the start-up of a REN should be considered. The County could continue to collaborate with regional partners, such as SANDAG and other cities, to identify future opportunities to create a REN.

4.10 BMP #10: CREATE A RENEWABLE ENERGY OVERLAY / COMBINING ZONE

Overlay zoning is a regulatory tool used to streamline the planning process so that renewable energy project construction can occur more expediently. Implemented by amending the County's existing zoning code, an overlay zoning ordinance would provide a supplemental layer of regulations for purposes of renewable energy development. A renewable energy overlay would be placed over existing base zone(s) and would identify requirements and allowable uses for renewable energy development. The process for adopting an overlay zone are the same for adopting a zoning or rezoning provision. The overlay provisions, as well as any changes to the County's zoning map, must be approved by the Board of Supervisors for adoption. The overlay zone must also be in line with objectives of the County's General Plan.

4.10.1 Costs and Benefits

Table 4-10 BMP #10: Create a Renewable Energy Overlay / Combining Zone

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Planning	Planning & Development	\$100,000 - \$250,000	General Fund	- Define the Purpose, Identify Areas, and Rules of the Overlay Zone District.	- Reduces Processing Time for Renewable Energy Projects - Saves Developers Time and Money - Allows for Better Siting of Renewable Energy Development	- Staff Time and Resources - High Start-Up Costs	High

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-10 above summarizes the main features of BMP #10. An overlay zone is an alternative to the existing segmented approach of re-writing the zoning code to approve a specific use in a particular area. Creating an overlay zone can help speed-up the permitting process by saving time and certainty for both developers and County staff. It can also help ensure renewable energy projects are sited thoughtfully considering both near- and long-term uses and also environmentally sensitive areas.

4.10.2 County Actions and Recommendations

A renewable energy overlay zone can save the developer and the government money by reducing planning process time and providing more certainty to investors. It also indicates to investors that the County wants to develop renewable energy resources in specific locations in the County. While it may be difficult to secure funding for an overlay zone, the potential benefits for creating an overlay zone are worth considering. The County could better direct renewable energy development and identify opportunity areas that consider current and proposed land uses and environmental conditions.

4.11 BMP #11: DEVELOP A BUILDING ENERGY DISCLOSURE PROGRAM

Building energy disclosure involves the analysis and documentation of a building's energy performance as a way to drive improvements in energy efficiency and reduce energy use. Establishing a program would help to incorporate a home or commercial building's energy performance into its overall value, thus further incentivizing energy efficiency improvements.

4.11.1 Costs and Benefits

Table 4-11 BMP #11: Establish Building Energy Disclosure Policies

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Policy	- DGS - Building Services	- Monitoring and Verification Costs - Consultant Fees - Incentive Payments to Building Owners - 1 FTE - Residential: $200-500 (Energy Ratings) and $200-$400 (Energy Audit)	General Fund	- Inventory Commercial Buildings - Research Role of Incentives in Disclosure Policies - Create Database of Building Performance	- Buyers Access Property Data - Sellers Can Distinguish Themselves	- Staff Time and Resources - Start-Up and Implementation Costs - Staffing Requirements - Potentially Significant Costs to Homeowners - Costs Vary Depending on Building Type	Low

Notes: DGS = Department of General Services, FTE = Full-Time Equivalents

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-11 summarizes the key components of BMP #11. By providing information on energy-related costs, building owners can make more informed decisions on cost-effective improvements. Home sellers also benefit by being able to distinguish themselves from similar homes in the market. Building energy disclosure is especially beneficial in the commercial sector as energy costs can affect their bottom line. A disadvantage to this program is that the monitoring and verification needed for implementation would be quite expensive for the County. Collecting data to support the program would also be costly and hiring an outside consultant may be needed for proper project oversight and implementation.

4.11.2 County Actions and Recommendations

To begin to develop a Building Energy Disclosure Program, the County could start by creating an inventory of commercial buildings and a database of building performance. The County could also research the role of incentives in disclosure policies. While a Building Energy Disclosure Program could provide the County with a lot of relevant data, the actual coordination and manpower needed to create, implement and oversee the program is quite high for the overall end gain. It would take time and money to develop an appropriate rating system and the County would likely need to incentivize customers joining the program (e.g., subsidizing meters for building owners).

4.12 BMP #12: PROMOTE MORE AGGRESSIVE BUILDING STANDARDS INCLUDING THE SIGNIFICANT RETROFIT OF EXISTING BUILDINGS

Building energy efficiency standards in California are designed to generally ensure new and existing buildings achieve energy efficiency and preserve outdoor and indoor environmental quality. Building energy codes set minimum standards to which buildings can be constructed. These measures are listed in Title 24 Part 6 of the California Code of Regulations. The County could establish a stronger array of programs and policies for new construction and for significant retrofits of existing buildings.

4.12.1 Costs and Benefits

Table 4-12 BMP #12: Promote More Aggressive Building Standards Including the Significant Retrofit of Existing Buildings

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Policy	- DGS - Building Services	Additional $2,300 to New Residential Construction[1]	General Fund	- Create ZNE definition and policy for County - Work to Include Prewiring for EVs for Residential and Commercial Buildings	- Creates Market Solutions - Building Professional Training - Implementation Costs Can Be Recovered Through Energy Savings - Reduces GHGs	- Staff Time and Resources - Start-Up and Implementation Costs - Additional New Construction Costs	Low

Notes: DGS = Department of General Services, ZNE = Zero Net Energy, EV = Electric Vehicle, GHG = Greenhouse Gas

1 Costs to Implement 2013 Title 24 added $2,300 to New Residential Construction Projects

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-12 above summarizes the main details of BMP #12. By establishing more aggressive building standards including significant retrofits of existing buildings, the County can cost-effectively meet its own renewable energy goals. By continuing to adopt advanced energy standards the County can continue to lead by example by promoting stricter construction practices. Costs to implement 2013 Title 24 standards added $2,300 to new residential construction projects, which homeowners saved in energy costs within the first 18 months of occupancy. Energy efficient construction provides multiple long-term benefits to building owners and occupants.

4.12.2 County Actions and Recommendations

While there is an opportunity to achieve cost-savings and energy efficiency through stricter building standards, as outlined in Section 2.1.2 of this summary, the State has already approved more aggressive building standards and this BMP is already being addressed. The 2016 Title 24 standards (effective January 1, 2017) will result in about 28 percent less energy use for lighting, heating, cooling, ventilation and water heating than the 2013 Title 24 standards for single-family residences. For non-residential land uses, the 2016 standards would result in 5 percent less energy use than those built to 2013 standards. Additionally, the 2016 CALGreen Building Standards (effective January 1, 2017) will require pre-wiring for electric vehicles. The State has also established ZNE building goals to have all new residential construction be ZNE by 2020 and all new commercial construction be ZNE by 2030. In regards to retrofits of existing buildings, there is opportunity to reduce energy use, but defining what constitutes a "significant" retrofit could prove to be controversial. Implementation of such standards would also increase staff time and resources who would have to deal with implementation.

4.13 BMP #13: INCREASE RENEWABLE ENERGY EDUCATION AND OUTREACH

Education and outreach programs support and often enable technology-heavy renewable energy programs and policies by educating public policy makers and citizens about potential options, thus resulting in more exposure (and sometimes more funding) for these practices. Education and outreach efforts are often considered a separate and distinct program under government operations area since they tend to cut across multiple sectors. Education and outreach programs can be grouped into five categories; meetings and special events; general renewable energy campaigns and outreach products; internet-based outreach; publications; and technology and issue-specific campaigns, including financing information.

4.13.1 Costs and Benefits

Table 4-13 BMP #13: Increase Renewable Energy Education and Outreach

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Programmatic	- Planning & Development - DGS - Other County Departments	Varies. $10,000 - $1M[1]	- General Funds - Pursue Grant Funding - Partnerships	- Update County's Website for RE Efforts - Consider Mobile Apps with Resources - Partner to Leverage Marketing and Outreach	- Educates Residents and Policy Makers - Increases Funding Opportunities - Encourages Innovation	- Staff Time and Resources - Start-Up and Varied Implementation Costs	Medium

Notes: DGS = Department of General Services, RE = Renewable Energy, M = Million

1 Outreach Can Account for 10 Percent of Program Budgets

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-13 summarizes the key components of BMP #13. Greater awareness of renewable energy leads to enhanced customer knowledge and increased renewable energy use. This can lead to more renewable energy projects, particularly rooftop solar applications. Varying substantially in costs, education and outreach programs can range from a $10,000 renewable energy information kiosk in a public library to a $1 million energy awareness project for local governments managed by IOUs. Other energy outreach programs in California can range anywhere from $50,000 to $250,000. Education and outreach programs can account for 10 percent of total program costs on large multi-year renewable energy projects.

4.13.2 County Actions and Recommendations

There are a number of resources in the County that are already providing education and outreach programs in clean energy (e.g., SDG&E). There is an opportunity to promote solar PV and EVs in the County through education and outreach. The County could also utilize its own website to promote these programs. Sonoma County, Los Angeles County, San Francisco, and Santa Monica all have websites that invite participation in renewable energy programs, while also educating the public about energy issues. Given that education and outreach costs can vary by so much, it is important that the County identify what types of programs would be most successful and cost effective. The County could also look to partner with other local agencies and organizations that are already focused on renewable energy education and outreach. If the County chose to pursue a REN, a number of outreach programs could also be implemented through the REN framework.

4.14 BMP #14: START A COMMUNITY SOLAR INITIATIVE

Community Solar is an innovative approach to reducing GHG emissions and lowering the cost of solar PV electricity through economies of scale. Community Solar helps avoid the traditionally high upfront costs of solar by spreading the investment among several customers. Community Solar programs range in size from those small enough to be installed on a building's rooftop to larger ground-mounted systems that can be located on acres of land.

4.14.1 Costs and Benefits

Table 4-14 BMP #14: Start a Community Solar Initiative

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Programmatic	- Utility - Privately-Owned - Non-Profit	N/A	- Private Investment - Community Investment - Pursue Grant Opportunities	- Encourage County Subscription to Community Solar - Reserve Portion of Projects to Low-Income Customers - Get Involved with Discussion Surrounding SB 43	- Limits Upfront Solar Costs - Supports Solar Industry - Reduces Utility Transmission and Distribution Costs - Compatible with CCA - Keeps Revenue with County - Reduces GHGs	- Staff Time and Resources - Start-Up and Implementation Costs	High

Notes: CCA = Community Choice Aggregation, GHG = Greenhouse Gas, N/A = Not Available

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-14 above summarizes the main attributes of BMP #14. Because many people are not able to install solar PV systems on their rooftops for a number of reasons (i.e., limited or no space, financial restrictions, living in a rental or multi-family unit, or poor rooftop solar orientation). Community Solar can help consumers gain access to solar opportunities. It also minimizes the usual high upfront solar costs and supports the local solar industry. In 2015, through SB 43, the CPUC began implementation of the Green Tariff Shared Renewables program to expand access of renewable energy resources for consumers through the use of community renewable programs. Because regulations following passage of SB 43 have yet to be finalized, specific costs for the program are unknown.

4.14.2 County Actions and Recommendations

Community Solar offers consumers better access to solar opportunities and could also promote the more solar development in the County. The County should be involved in tracking the regulatory decisions established by SB 43 and consider how it could implement a Community Solar initiative in the future. The County should also look to other cities that have implemented Community Solar (e.g., City of Carlsbad).

4.15 BMP #15: ESTABLISH A MICROGRID AND DEVELOP POLICIES RELATED TO MICROGRIDS

A microgrid is a self-contained power system set up for a small geographic region. It usually has one or more power sources (often renewable), advanced energy storage, and an intelligent energy management system. Microgrids tend to be cleaner and more efficient than traditional power sources because they often utilize solar, wind, and/or combined heat and power to generate power. A microgrid can operate while connected to the main grid, but can automatically disconnect itself if the main grid goes down. When disconnected, the microgrid can continue to operate, providing electricity, heat, and cooling. There are several microgrid projects in the San Diego region set up by the U.S. Department of Defense and universities in Southern California. The University of California San Diego (UCSD) microgrid is one of the larger, premier, state-of-the-art microgrid projects in the world ensuring reliable power to 45,000 people and 450 buildings.

4.15.1 Costs and Benefits

Table 4-15 BMP #15: Establish a Microgrid and Develop Policies Related to Microgrids

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Programmatic/ Policy	- Utility - Partners	$15.1M[1]	- US DOE - SDG&E - CEC - Other Partners	- Partner with SDG&E and UCSD on Microgrid Policy Development - Identify Sites in the County that Could be Tied Into a Microgrid - Identify Potential Locations for Microgrid Siting	- Continued Operation if Main Grid Fails - Increases Efficiency - Increases Security and Safety - Reduces GHGs	- Staff Time and Resources - Start-Up and Implementation Costs - Staffing Requirements	High

Notes: M = Million, DOE = Department of Energy, SDG&E = San Diego Gas & Electric, CEC = California Energy Commission, UCSD = University of California San Diego, GHG = Greenhouse Gas

[1] Cost to Build a 4MW Demonstration Microgrid in Borrego Springs, Which Was Not 100 Percent RE.

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-15 summarizes the key components of BMP #15. Microgrids offer economic, environmental, power quality, and security benefits. The primary benefit of a microgrid is reliability and its ability to keep critical infrastructure, such as transportation systems, hospitals, data centers, water treatments facilities, police and fire departments, operating, particularly during times of crisis. Microgrids work well for large institutions like universities, hospitals, and multiple-unit government facilities because of the significant amount of electricity demand concentrated in one area. Microgrids can be expensive; a 4 MW demonstration microgrid project in Borrego Springs cost $15.1 million to build.

4.15.2 County Actions and Recommendations

Increasing the number of microgrids in the County could have a number of benefits to the County. Borrego Springs was funded through a variety of agencies and partners (i.e. DOE, SDG&E, CEC, IBM, Motorola), suggesting that microgrids are an important asset and worth investing in. Microgrids need to be connected and part of a larger renewable energy plan and direction to be effective. The County could begin by partnering with SDG&E and UCSD on microgrid policies and identifying potential sites in the County where microgrids would be ideally suited.

4.16 BMP #16: ESTABLISH ELECTRIC VEHICLE AND CHARGING PROGRAMS

As the first step toward integrating a more complete review of transportation services, the County could establish EV and charging programs. California plug-in vehicles sales represent more than 40 percent of the national market and is continuing to grow. This growth necessitates development of additional infrastructure (i.e., charging stations) to support this new type of market. Because EVs both consume and produce electricity, they are also potential sources of intermittent power and a place to store electric power.

4.16.1 Costs and Benefits

Table 4-16 BMP #16: Establish Electric Vehicle (EV) and Charging Programs

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Programmatic	- DGS - Planning & Development	$4,000 per EV Parking Space	- Rebates for EVs - CEC - CSE	- Consider Public EV Charging Stations as Future Revenue Generation - Promote a Solar- and EV-Ready Ordinance - Work with SDG&E on Siting EV Charging Stations - Encourage Prewiring for Level 2 EVSE as a Percentage of Total Spaces in Multi-Family Buildings - Standardize Permitting and Inspection Processes	- Improves AQ and Health - Reduces GHGs in line with the CAP - Reduces Dependence on Petroleum - Reduced Fuel Costs - Increases Availability of Charging Station Infrastructure - State and Local Rebates	- Staff Time and Resources - Start-Up and Implementation Costs	High

Notes: DGS = Department of General Services, EV = Electric Vehicle, CEC = California Energy Commission, CSE = Center for Sustainable Energy, AQ = Air Quality, GHG = Greenhouse Gas

Source: Empower Devices (2015) and Ascent Environmental (2016)

Table 4-16 above summarizes the main attributes of BMP #16. EV initiatives and programs can help the County meet CAP-related and other GHG emission reduction goals. The San Diego region already has an extensive EV network in place, so further investment in programs will continue to build market share and could help expand EVs into the County. While costs of specific programs are not available, the cost for an EV parking space is about $4,000. There are also a number of rebates and incentive programs to encourage EV development and use.

4.16.2 County Actions and Recommendations

In 2012, the San Diego Association of Governments (SANDAG) established the Regional Electric Vehicle Infrastructure (REVI) Working Group which assessed planning and siting issues and typical barriers to EV development. The County could collaborate with the REVI Working Group, who has already done a lot of research on creating and adopting a formal plug-in vehicles program. The County could also work with SANDAG to identify optimum future locations for public EV charging stations that are in line with long-term development and growth areas. From a planning process perspective, the County could also work with the County's Air Pollution Control District (APCD) and other County Departments to coordinate a larger regional program with incorporated towns and cities to develop standardized permitting and inspection processes, include EVs in parking standards, and streamline zoning codes. Given that the EV market is only expected to grow and more money will likely be provided to support EVs, the County should consider ways to further promote EVs.

4.17 BMP #17: DEVELOP A LEGISLATIVE STRATEGY TO SUPPORT RENEWABLE ENERGY PROGRAMS

Legislative outreach that supports renewable energy programs was recommended by the CREP TAC on August 17, 2016. The recommendation aims to enact legislative proposals and respond to Federal and State legislation that supports renewable energy programs.

4.17.1 Costs and Benefits

Table 4-17 BMP #17: Develop a Legislative Strategy to Support Renewable Energy Programs

BMP Type	Responsibility	Cost	Financing Options	CREP Actions	Advantages	Disadvantages	Return on Investment
Policy	- OSIA	$250,000	- General Funds	- Sponsor Renewable Energy Policy - Prioritize Renewable Energy Advocacy Efforts - Develop Legislative policy and guidelines	- Educates Residents and Policy Makers - Increases Renewable Energy Opportunities	- Staff Time and Resources - Start-Up and Implementation Costs	Medium

Notes: OSIA = Office of Strategy and Intergovernmental Affairs

Source: Ascent Environmental (2016)

Table 4-17 summarizes the key components of BMP #17. A legislative strategy could help educate residents and policymakers on pertinent legislation that supports renewable energy development that the County can take advantage of. The County of San Diego has an Office of Strategy and Intergovernmental Affairs (OSIA) that manages a Legislative Program for the Board of Supervisors. Development and implementation of legislative strategy to support renewable energy is estimated to cost $250,000.

4.17.2 County Actions and Recommendations

A legislative strategy can help the County take advantage of legislation that supports renewable energy programs. The County could work with OSIA to develop a legislative strategy that builds upon their existing legislative review process. The County could develop a strategy to address legislation that supports: Consumer Choice Alternative Energy Models such as CCAs, DA and SEU; financing and funding opportunities such as PACE, P2P, Lending, Crowdfunding and Greenhouse Gas Reduction Fund monies; Community Solar Initiatives; Net Energy Metering; Microgrids; and Regional Energy Networks, among others.

5 ECONOMIC ANALYSIS

5.1 ENERGY EXPENDITURES IN THE COUNTY

The economic analysis, summarized here and provided in full in Section 3 and Appendix A1 of the Empower Report, examines the possible economic benefits within the unincorporated areas of the County if households and businesses were to shift away from current investment patterns to pursue a more productive and cleaner energy future. More specifically, the benefits of renewable energy and energy efficiency resources are assessed, while also looking at the scale of investment necessary to drive those improvements.

With an estimated 505,000 residents, the unincorporated areas account for about 16 percent of the County's total population. Table 5-1 looks at the summary of energy expenditures in 2012 for the County as a whole, as well as the unincorporated areas. The County spends an estimated $9 billion for energy, while the unincorporated County spend around $1.6 billion. Transportation expenditures are the highest for the entire County, accounting for 60 percent of total energy costs. Natural gas and electricity account for 15 and 39 percent, respectively, of total energy costs. Given the large amount of energy expenditures with the County's current energy mix, there is opportunity for reduction by investing in renewable energy and overall energy efficiency.

Table 5-1 Summary of Energy Expenditures in 2012[1]

	Natural Gas	Electricity	Transportation	Total Energy[2]
San Diego County[3]	$389 M	$3,141 M	$5,485 M	$9,014 M
Unincorporated Areas	$40 M	$504 M	$1,025 M	$1,569 M
Total Expenditures from Unincorporated Areas	10.3%	16.0%	18.7%	17.4%

Notes: For more detailed analysis, see Empower Report. M = Millions
[1] Numbers are presented in 2012 dollars
[2] Total energy does not include use of coal, propane, compressed natural gas, and marine fuels, among other sources
[3] Includes both the incorporated and unincorporated areas of the County
Source: Empower Devices (2015)

5.2 METHODOLOGY

Using different economic scenarios with different patterns of energy use, known as "Innovation Scenarios," the analysis compares how different investments and technologies might benefit jobs, income, and net gains in overall economic activity in the County. In addition to the four Innovation Scenarios, a future "Reference Case" is used as a baseline for what the economy might look like assuming no further changes in the region's energy makeup (i.e., business-as-usual). These four Innovation Scenarios provide different insights into future energy production and consumption patterns. Analysis of the four scenarios uses the DEEPER Modeling System to determine the net economic benefits of the different investment patterns.

While there are many new emerging technologies that will undoubtedly shape future energy markets, the following innovation scenarios only explore the known and more established set of renewable energy and energy efficiency technologies:

- **Reference Case.** The Reference Case assumes that from 2015-2050 the unincorporated areas of the County will continue to follow current trends in 2012. It assumes the regional population, employment, and overall economy are projected to grow annually at about 1.1 percent, 1.5 percent, and 2.6 percent, respectively. Electricity use is projected to grow 1.4 percent annually. Natural gas consumption is projected to grow at a slower pace, about 0.5 percent per year. Real costs of energy are anticipated to escalate 1.3 percent and 3.2 percent for electricity and natural gas, respectively. The combined energy expenditure will expand at an average 2.8 percent per year, or about 0.2 percent faster than the economy as a whole. It also assumes that the State's RPS will continue to require that 33 percent of all electricity sales be provided with renewable technologies through 2050.

- **Innovation Scenario I.** Innovation Scenario I assumes that the RPS requirement of having a 33 percent renewable energy mix by 2050 will be met. It also assumes that efficiency of electricity will increase to 20 percent above the normal rate of improvement, and natural gas will increase to 15 percent by 2050.

- **Innovation Scenario II.** Innovation Scenario II assumes that the RPS requirement will be increased to 50 percent by 2030, as proposed by Governor Jerry Brown in his inaugural address on January 5, 2015 and in compliance SB 350, The Clean Energy and Pollution Reduction Act of 2015. It assumes that energy efficiency will reach 25 percent of total electricity consumption above the normal rate of improvement and natural gas will increase to 15 percent by 2050.

- **Innovation Scenario III.** Innovation Scenario III assumes that the RPS requirement will reach 50 percent in 2030, and then 80 percent in 2050. Again, electric energy efficiency is assumed to increase to 25 percent and natural gas to 15 percent by 2050.

- **Innovation Scenario IV.** Innovation Scenario IV explores the prospect of an RPS that climbs to 50 percent in 2030, and then to a full 100 percent in 2050. Electric efficiency is assumed to increase to 25 percent and natural gas to 15 percent by 2050.

5.3 RESULTS

5.3.1 Economic Benefits

Table 5-2 below shows the comparison of energy expenditures for the Reference Case and four Innovation Scenarios from 2015-2050 (in 2012 dollars). Assuming energy bill expenditures would be the same in 2015, all four Innovation Scenarios show decreasing expenditures as time passes, with ultimate reductions ranging from 16 percent in Scenario I to as much as 49 percent in Scenario IV by 2050 as compared to the Reference Case. The findings are consistent with the notion that each Scenario would provide increasing mixes of renewable energy options and efficiency, which would in turn translate to lower energy bill expenditures in the County as soon as 2025.

Table 5-2 Energy Bill Expenditures in the Unincorporated County (2015-2050)[1]

Energy Expenditure	2015	2025	2040	2050	% Change Reduction in 2050 to Reference Case
Reference Case	622	821	1,200	1,547	0%
Scenario I	622	801	1,106	1,294	16%
Scenario II	622	797	1,031	1,132	27%
Scenario III	622	796	967	922	40%
Scenario IV	622	796	934	797	49%

Notes: Numbers may not add up due to rounding. For more detailed analysis, see Empower Report. M = Millions

[1] Numbers are presented in 2012 dollars

Source: Empower Devices (2015)

Table 5-3 below summarizes the key economic impacts for each Innovation Scenario, in terms of annual average and cumulative costs and savings. The analysis weighs the costs of each Innovation Scenario, with the economic benefits that each scenario provides. Costs include policies or programs needed to implement each scenario, along with technological investments needed to increase energy efficiency and create more renewable energy options. Economic benefits include net energy savings and net job creation. Scenario I offers the highest benefit-cost ratio of 5.3, with minimal investment and program costs, for potential average energy savings of $53 million a year. Compared to the Reference Case, this activity supports an average annual gain of 600 jobs for the County. As the mix of renewable energy increases in the scenarios, so do costs associate with program development and technological investments. This does, however, translate to larger net energy savings (e.g., Scenario IV net energy savings is three times that of Scenario I) and more jobs created.

For more detailed analysis, including specific breakdown of economic impacts by 5-year increments, refer to Section 3.3.2.2 of the Empower Report.

Table 5-3 Annual Average and Cumulative Economic Impacts of Innovation Scenarios

	Benefit-Cost Ratio	ANNUAL AVERAGE[1]					CUMULATIVE[1]	
		Program/Policy Costs	Technological Investments[2]	Energy Bill Savings[3]	Net Energy Savings[4]	Net Job Creation	Investments	Energy Bill Savings
Scenario I	5.3	$2 M	$17 M	$71 M	$53 M	600	$500 M	$2,600 M
Scenario II	2.3	$5 M	$45 M	$120 M	$99 M	1,000	$1,900 M	$4,300 M
Scenario III	1.9	$9 M	$84 M	$167 M	$137 M	1,500	$3,100 M	$6,000 M
Scenario IV	1.9	$11 M	$103 M	$192 M	$161 M	1,800	$3,700 M	$6,900 M

Notes: Numbers may not add up due to rounding. For more detailed analysis, see Empower Report. M = Millions
[1] Annual and cumulative numbers are presented as 2012 dollars
[2] Technological investments include investments that promote energy efficiency and renewable energy
[3] Energy bill savings include savings from the industrial, residential, and commercial sectors
[4] Net Energy savings subtract policy/program costs (1st column) with technological investments (2nd column).
Source: Empower Devices (2015)

5.3.2 Environmental Benefits

In addition to economic benefits, reducing energy waste and converting to a larger mix of renewable energy sources, would have environmental benefits to consider as well. As shown in Table 5-4, implementation of each Innovation Scenario would result in reduced carbon dioxide (CO_2) emissions.

Table 5-4 Environmental Benefits of Innovation Scenarios

	CO_2 Emissions as Percent of 2050 Reference Case (%)
Scenario I	75
Scenario II	61
Scenario III	35
Scenario IV	19

Notes: Source: Empower Devices (2015)

The combination of renewable energy and energy efficiency technologies would equate to emissions reduction of 0.45 million metric tons of CO_2 by 2050, which is 75 percent of the Reference Case. Scenario IV, would reduce emissions by 1.34 million metric tons of CO_2 by 2050, which is 19 percent of the Reference Case. For additional environmental benefits for Scenario IV, see Table 3-5 of the Empower Report.

6 CONCLUSION

The CREP was initiated as a major first step towards promoting renewable energy in the County. The County has a number of options to consider for later adoption and implementation as part of the CREP. Table 6-1 below summarizes the BMPs proposed, sorted first by "top priority" BMPs, or ones that offer the most benefit and opportunities for renewable energy development and growth. The list is then summarized by return on investment potential. For more analysis regarding recommendations, see the Executive Summary of this report.

Table 6-1 Summary of CREP BMPs

BMP #	Title	Conclusion	Return on Investment
3	Establish Institutional Capacity	**Top Priority:** Develop a CCA Feasibility Study	High[1]
14	Start a Community Solar Initiative	**Top Priority:** Track Community Solar Legislation	High
15	Establish a Microgrid and Develop Policies Related to Microgrids	**Top Priority:** Develop Policies & Identify Sites for Future Microgrids	High
10	Create a Renewable Energy Overlay / Combining Zone	**Top Priority:** Reduces Planning Process Time & Increases Certainty	High
7	Increase the County's Percentage of Energy Derived from Various Renewable Energy Technologies	Better Addressed in the County's CAP	High
16	Establish Electric Vehicle Programs	Better Addressed in the County's CAP	High
4	Establish Financing Capacity	Establish Appropriate PACE Partnership/Collaboration	Medium[2]
5	Develop a Solar Energy Workforce Development Initiative	Establish Appropriate Partnership/Collaboration	Medium
13	Increase Renewable Energy Education and Outreach	Establish Appropriate Partnership/Collaboration	Medium
17	Develop a Legislative Strategy to Support Renewable Energy Programs	Establish Collaboration with OSIA	Medium
1	Amend the General Plan and add an Energy Element	Better Addressed in the County's CAP	Low
2	Establish a New Office of Sustainability	High Admin/Operating Costs	Low
6	Build an Energy Assurance Plan	Better Addressed in the County's CAP	Low
8	Establish a Renewable Energy Group Procurement Initiative	High Level of Coordination Needed	Low
9	Participate in the Creation of a New Regional Energy Network	High Administration Burden	Low
11	Develop a Building Energy Disclosure Program	High Admin/Operating Costs	Low
12	Promote More Aggressive Building Standards Including the Significant Retrofit of Existing Buildings	Current Legislation Already Addresses Issue	Low

Notes: CCA = Community Choice Aggregation, CAP = Climate Action Plan, OSIA = Office of Strategy and Intergovernmental Affairs

[1] CCA was determined to have a "high" return on investment ranking, DA, and SEU were both determined to have a "medium" return on investment ranking

[2] PACE and Bonds were determined to have a "medium" return on investment ranking. P2P/Crowdfunding was determined to have a "low" return on investment ranking.

Source: Empower Devices (2015)

7 REFERENCES

ARB. *See* California Air Resources Board.

California Air Resources Board. 2011b. *Facts About the Advanced Clean Cars Program.* Available at http://www.arb.ca.gov/msprog/zevprog/factsheets/advanced_clean_cars_eng.pdf. Accessed August 16, 2016.

California Energy Commission. 2012a. *Integrated Energy Policy Report Update*. Available: http://www.energy.ca.gov/2012publications/CEC-100-2012-001/CEC-100-2012-001-CMF.pdf. Accessed: August 16, 2016.

______. 2012b (May). *Building Energy Efficiency Standards: Frequently Asked Questions.* Available: http://www.energy.ca.gov/title24/2013standards/rulemaking/documents/2013_Building_Energy_Efficiency_Standards_FAQ.pdf. Accessed August 18, 2016.

______. 2013 (July). *Impact Analysis - California's 2013 Building Energy Efficiency Standards.* Available: http://www.energy.ca.gov/2013publications/CEC-400-2013-008/CEC-400-2013-008.pdf. Accessed August 18, 2016.

______. 2015a. *2016 Building Energy Efficiency Standards: Frequently Asked Questions*. Available: http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/2016_Building_Energy_Efficiency_Standards_FAQ.pdf. Accessed August 18, 2016.

______. 2015b. (June). *2016 Building Energy Efficiency Standards: Adoption Hearing*. Presentation on June 10, 2015. Available: http://www.energy.ca.gov/title24/2016standards/rulemaking/documents/ 2015-06-10_hearing/2015-06-10_Adoption_Hearing_Presentation.pdf. Accessed August 18, 2016.

______. 2015c. (December). *Renewable Energy Projects in Development with Existing and Approved Transmission Lines.* Available: http://www.energy.ca.gov/maps/renewable/ renewable_development.pdf. Accessed August 18, 2016.

______. 2016. *Renewable Energy and Conservation Planning Grants*. Available: http://www.energy.ca.gov/ maps/renewable/renewable_development.pdf. Accessed August 22, 2016.

CEC. *See* California Energy Commission.

California Public Utilities Commission. 2016a (August). *Resolution E-4874*. Available: http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M166/K269/166269927.PDF. Accessed September 27, 2016.

______. 2016b (August). *Decision Providing Guidance for Initial Energy Efficiency Rolling Portfolio Business Plan Filings.* Available: http://docs.cpuc.ca.gov/PublishedDocs/Published/G000/M166/K232/166232537.PDF. Accessed: September 27, 2016.

CPUC. *See* California Public Utilities Commission.

Del Mar, City of. 2016 (May) *Del Mar Climate Action Plan.* Available: http://www.delmar.ca.us/DocumentCenter/Home/View/2388. Accessed August 22, 2016.

Energy Policy Initiatives Center for Center for Sustainable Energy. 2015 (June). *Community Solar in California.* Available: http://www.sandiego.edu/law/documents/centers/epic/Community% 20Solar%20Final_2.2.16.pdf. Accessed August 20, 2016.

Governor's Office of Planning and Research. 2003. *State of California General Plan Guidelines.* Available: https://www.opr.ca.gov/docs/General_Plan_Guidelines_2003.pdf. Accessed August 23, 2016.

Kats, Greg. 2011 (October). *Energy Efficiency Financing – Models and Strategies.* Prepared by Capital E for the Energy Foundation. http://newbuildings.org/sites/default/files/EnergyEfficiencyFinancing_ModelsStrategies201110.pdf. Accessed September 2, 2016.

KPBS. 2016 (June). *SDG&E Gets OK to Market on Alternative Energy Program.* Available: http://www.kpbs.org/news/2016/jun/16/sdge-gets-ok-market-alternative-energy-program/. Accessed September 23, 2016.

Lancaster, City of. 2016. *Community Choice Aggregation.* Available; http://www.cityoflancasterca.org/residents/lancaster-choice-energy. Accessed August 23, 2016.

Mosaic. 2012 (December). *Solar Crowdfunding in California: Part 2, Everybody Solar.* Available: https://joinmosaic.com/blog/solar-crowdfunding-california-part-2-everybody-solar/. Accessed September 23, 2016.

San Diego, City of. 2014 (September). *City of San Diego Climate Action Plan.* Available: https://www.sandiego.gov/sites/default/files/legacy/mayor/pdf/2014/climateactionplan2014.pdf. Accessed August 20, 2016.

San Diego, County of. 2009. *County of San Diego Strategic Energy Plan.* Available: http://www.sandiegocounty.gov/reusable_components/images/dgs/Documents/Energy_StrategicEnergyPlan.pdf. Accessed August 20, 2016

San Diego Gas and Electric. 2016 (September). *Direct Access FAQ.* Available: http://www.sdge.com/customer-choice/electricity/direct-access-faq. Accessed September 22, 2016.

Solana Beach, City of. 2016 (April). *City of Solana Beach: Community Choice Aggregation Technical Analysis.* Available: http://solana-beach.hdso.net/docs/CAC/CAC-SB-CCA.pdf. Accessed September 20, 2016.

Attachment E – Technical Advisory Committee Approved Meeting Minutes for August 17, 2016, January 9, 2015, and October 2, 2014 and Draft Meeting Minutes for September 21, 2016

COMPREHENSIVE RENEWABLE ENERGY PLAN
TECHNICAL ADVISORY COMMITTEE
APPROVED MEETING MINUTES

August 17, 2016, 8:00 AM
5520 Overland Avenue, Campus Center Chambers
San Diego, California

A. Call Meeting to Order at 8:10 AM

TAC members:

Jason Anderson
Craig Benedetto
Peder Norby
John Reaves
Corinne Lytle Bonine

County of San Diego:

Stephanie Smith
Darren Gretler
Mary Kopaskie
Joseph Farace
Noah Alvey
Laurel Lees
Bulmaro Canseco
Emma Schoppe
Kelsie Holman

Members of the public:

Poonam Boparai
Jeff Hoyos
Anna Lowe
Erika Morgan
Donna Tisdale
Jim Whalen

(TAC member Corinne Lytle Bonine attended via conference call. TAC members Richard Caputo, Ken Parks and Douglas Kot did not attend.)

B. Business

1. The January 9, 2015 Technical Advisory Committee (TAC) Meeting Minutes were approved, with no members opposed.

C. Comprehensive Renewable Energy Plan Development

1. County staff provided an overview of the County's sustainability initiatives, CREP background including the direction from the Board of Supervisors direction from September 2013, TAC history, CREP Draft Phase I Report, and next steps.

2. County staff presented the sixteen recommendations included in the CREP Draft Phase I Report. TAC members asked questions on each measure and provided additional considerations (Agenda Item 4). ~~TAC members provided the following input~~The following comments were provided by TAC members, but do not indicate consensus:
   (1) Amend the General Plan by Adding an Energy Element
      - As a regional leader, the County should incorporate an Energy Element into the General Plan.
      - The County should consider the unintended consequences of adding a potentially duplicative or redundant Energy Element.
      - An Energy Element may be a low priority tool because it may provide little benefit.
      - An alternative to an Energy Element is to incorporate and consolidate the energy policies into the County's Climate Action Plan (CAP) to ensure implementation.
   (2) Establish a New Office of Sustainability
      - A sustainability office can be a community resource or a "one stop shop" for the public to learn about sustainability information and programs; the County should provide a consolidated group of individuals with one point of contact for the public.
      - The County should consider the financial implications of creating a new, separate office outside the County's existing organizational framework.
      - The sustainability office should be able to work across different County departments while allowing specialists to be efficient and effective in their fields.
      - PDS staff would be best suited for implementing a sustainability group instead of an additional, separate bureaucratic process.
      - The County should consider the City of San Diego's new office of sustainability as a model.
   (3) Establish Institutional Capacity (Community Choice Aggregation [CCA], Direct Access [DA], and Sustainability Energy Utility [SEU])
      - The County should consider waiting for the City of San Diego's CCA feasibility study before pursuing a separate County-funded study.
      - The County should research existing CCAs and the success rates.
      - Support CCA but the County needs to proceed cautiously while the uncertainty around local and regional CCAs grows.
      - CCAs may provide consumer confusion.
      - The structure and layout of a CCA is not well understood.
      - The County should consider the risks to the General Fund from administering a CCA, and ways to mitigate the risk.
      - The County should partner with other jurisdictions on CCA feasibility studies to minimize costs.
      - DA is a good tool to promote renewable energy; the County currently participates in Direct Access for County facilities and operations, but it is not available for residential consumers.
      - SEUs do not provide a significant return on investment.
   (4) Establish Financial Capacity (PACE, Bonds, Lending/Crowdfunding)

- Supporting financial mechanisms is a high priority measure, which should be implemented right away.
- The Board of Supervisors has authorized PACE in the County, but the programs are run by private companies.
- The County does not have a PACE program that is run and funded by County departments.
- The County should research examples of crowdfunding efforts related to renewable energy.
- Information about existing financial mechanisms can be distributed by the new sustainability office/group.

(5) Develop a Solar Energy Workforce Development Initiative
- Several other groups are already providing these resources; as such, the County should not duplicate those efforts.
- The County should focus on regional collaboration and leveraging existing efforts instead of leading a renewable energy workforce training program.
- The new sustainability office/group could support existing non-governmental organizations that provide job trainings for local workers to construct renewable energy projects.
- Information about existing training opportunities can be distributed by the new sustainability office/group.
- The County should consider permit streamlining for projects that use local construction workers.

(6) Build an Energy Assurance Plan
- This initiative recommends an “Energy Security Plan”, which is something that SDG&E is responsible for, not the County.
- Energy assurance is a security issue, and not a tool that promotes renewable energy directly.
- The County should avoid duplication of existing efforts.

(7) Increase the County’s Percentage of Energy Derived from Various Renewable Energy Technologies
- This measure is related to the County’s Strategic Energy Plan, and can be used to inform the CAP analysis.
- The County should be a regional leader by using renewable energy such as solar and wind at County facilities.
- The County should increase the percentage from 2.3% considering other agencies that may use a much higher percentage such as 33%.
- The energy efficiency in County facilities should meet the State’s net zero building requirements.
- The County should avoid duplicating efforts with the Center for Sustainable Energy.

(8) Establish a Renewable Energy Group Procurement Initiative
- This measure is a good tool to promote renewable energy if implemented in conjunction with other measures such as a CCA feasibility study, Regional Energy Network, County-led microgrid projects, and existing regional collaboration efforts.
- This stand-alone tool is not a high priority measure; implementation of CAP measures is a high priority.

(9) Participate in the Creation of a New Regional Energy Network (REN)

- This measure is a long-term collaborative effort that merits continued attention.
- The County should continue working with regional partners to identify opportunities for a REN and funding for renewable energy projects and programs.

(10) Develop a Renewable Energy Overlay Zone

- This measure may include a “pipelining provision” for existing projects.
- This is a high priority measure with a high return on investment, which the County should pursue and incorporate into the CAP analysis as a high yield greenhouse gas reduction measure.
- Overlay zones help the County identify priority areas and streamline the permitting process of renewable energy projects, which will reduce costs.
- An overlay zone will help provide guidelines and framework for developers, which provides the community with predictable development scenarios.
- An overlay zone will help SDG&E locate equipment.
- The County should identify environmental impacts during the planning phase.
- This measure will be highly controversial with some communities, and will require extensive outreach and public input during the planning phase.

(11) Develop a Building Energy Disclosure Program

- This information is not readily available for residents in apartment complexes who do not control their energy sources; there is an unequal playing field.
- This measure should be implemented at the State level and not locally; the County should consider lobbying for the state to take a leadership role.
- This is a low priority measure, but may be more informed through the development of the CAP analysis.

(12) Promote More Aggressive Building Standards Including the Significant Retrofit of Existing Buildings

- Consider the City of San Diego’s CAP as a model.
- Take into consideration the added cost to new development when implementing building restrictions that are more stringent than Title 24, particularly with the housing shortage in San Diego.
- Concentrate on cost savings efforts for existing buildings.
- Renewable energy should be used to electrify the transportation system and not as much for buildings; transportation-related measures yield higher return on investment than measures that address energy in buildings.
- Don’t pre-wire, but do require that conduits be installed to allow for EV charging and solar panels.
- This measure may disproportionately affect retail and commercial property owners.

- The County should work with the PACE finance program to achieve the desired outcome.

(13) Increase Renewable Energy Education and Outreach
- Several organizations are already providing education and outreach.
- The County should not duplicate education and outreach efforts; instead the County should coordinate and partner with those organizations.
- The new sustainability office/group could "tell the story better" by doing better with what we have, and by being a point of contact for the public.
- It is difficult to quantify the return on investment for outreach activities – have similar efforts in Sonoma or Alameda been effective in promoting renewable energy?

(14) Starting a Community Solar Initiative
- This measure should not be limited to solar; expand the initiative to include wind power.
- The County should consider the rate structure compared to the investor-owned utility.
- The County should research and be aware of the legislation, which dictates what utilities and agencies can or cannot do.

(15) Establish a Microgrid and Develop Policies Related to Microgrids
- Microgrids are an expensive frontier.
- The County should partner with UCSD to explore successes and lessons learned.
- The County should consider limiting their role to removing obstacles, and not being directly involved with the development of microgrids.
- Not all microgrids are solar/renewable; there are also natural gas microgrids.
- The County should research if the microgrids would be connected to an overall system, or if they can be a tool for onsite generation.
- This measure may supplement the County's hazard mitigation plan or other regional energy assurance plans.
- The County should consider this measure for County facilities.

(16) Establish Electric Vehicle Programs
- This measure should be refined to include EV Charging Infrastructure Programs that include charging stations that are powered by renewable energy.
- This is a high priority recommendation, as it offsets greenhouse gas emissions significantly; this measure should inform the CAP analysis.
- The County is a car-centric region without mass transit to help reduce vehicle miles traveled and greenhouse gas emissions.
- The County should consider the higher yield of electrifying the transportation system versus energy efficiency in buildings.
- The County should consider prioritizing car share parking, and provide flexibility in meeting the parking standards (i.e., instead of requiring parking, replace some spaces with EV charging stations.)

- The County should consider requiring homes to be pre-wired to accommodate EV charging stations.
- The County should identify which actions are duplicative with other efforts, and collaborate with regional partners to leverage existing resources.
- This measure is an opportunity to position the County to obtain additional grant funding, which will provide a greater yield for the economy.
- The County should consider the unintended consequences associated with property owner concerns.

3. The TAC members were asked to consider the sixteen measures provided in the CREP Draft Phase I Report, including a seventeeth measure added during Agenda Item C2 (see Agenda Item C4). The TAC was asked to identify those measures that are most effective in promoting renewable energy in the county. The TAC members were provided with five sticky dots they could use to identify the priority measures. Each member was restricted to providing up to two dots per measure.
   - The TAC members identified the following seven measures as high priority for consideration (2 dots or more):

     (10) Renewable Energy Overlay Zone
     (17) Added Item: Legislative Outreach (see Agenda Item C4)
     (7) Increase County's Renewable Energy Use
     (4) Financial Capacity - PACE, Bonds, Lending, Crowdfunding
     (2) Establish a New Office of Sustainability
     (9) Regional Energy Network
     (16) EV and Charging Programs
   - The TAC members identified the following three measures as a medium priority for consideration (1 dot):

     (3) Institutional Capacity - CCA, DA, SEU
     (12) Aggressive Building Standards and Retrofits
     (14) Community Solar Initiative
   - No dots were provided on the other seven measures.

4. During Agenda Item C2, TAC members provided the following additional considerations:
   - Add "Legislative Outreach" as a seventeenth measure, primarily focused on Renewable Energy and EV education, funding, net metering and priority programs related to these initiatives.
   - The "Legislative Outreach" measure should include a strategy of informing the OSIA to encourage legislation that promotes renewable energy programs, projects and funding.
   - Prioritization of renewable energy should focus on residential and non-residential rooftops, parking lots, and disturbed lands.

D. Public Comment

The public provided the following comments:

- Some communities will oppose overlay zones
- There is concern with water use of large scale wind and solar projects
- There is concern with environmental justice and the disproportional impact on low income communities
- The County needs to understand the financial risks associated with CCA as it relates to the County's General Fund
- The County can work with independent non-profits to administer a CCA, which would mitigate for potential financial impacts to the General Fund
- The County should prepare a CCA Feasibility Study
- The San Diego Energy District supports a CCA
- The County should pursue a CCA with caution
- EVs are more important in the County than the City of San Diego as the County is car-centric with no mass transit
- The County should be a regional leader and consider the electricity systems of the future such as CCAs and Microgrids
- Keep CREP as a separate plan from the CAP, but renewable energy measures should inform the CAP
- Renewable energy measures are also resiliency tools
- Consider microgrids as not only a tool to promote renewable energy, but as a hazard mitigation measure within the Hazard Mitigation Plan and a climate change resiliency measure in CAP
- A sustainability office can be effective; the City of San Diego has benefitted from this initiative and it has opened the door for additional funding
- The sustainability office should be a consolidated team, group or person to coordinate sustainability-related activities that are implemented in various County departments, and can be a point of contact for the public

During Agenda Item C3, the public attendees participated in the same dot exercise as the TAC, but used different boards.

- The public attendees identified the following seven measures as high priority for consideration (2 dots or more):
  - (2) Establish a New Office of Sustainability
  - (3) Institutional Capacity - CCA, DA, SEU
  - (7) Increase County's Renewable Energy Use
  - (6) Build an Energy Assurance Plan
  - (10) Renewable Energy Overlay Zone
  - (13) Renewable Energy Education and Outreach
  - (15) Establish a Microgrid and Microgrid Policies
- The public attendees identified the following three measures as a medium priority for consideration (1 dot):
  - *(17) Added Item: Legislative Outreach (see Agenda Item C4)*
  - (4) Financial Capacity - PACE, Bonds, Lending, Crowdfunding
  - (9) Regional Energy Network
- No dots were provided on the other seven measures.

E. Meeting Adjourned at 10:25 AM

COMPREHENSIVE RENEWABLE ENERGY PLAN
TECHNICAL ADVISORY COMMITTEE
MEETING MINUTES
January 9, 2015, 1:00 PM
5510 Overland Avenue, Third Floor, Drake Conference Room
San Diego, California

A. Call Meeting to Order

TAC members:
Jason Anderson
Craig Benedetto
Corinne Lytle Bonine
Douglas Kot
Peder Norby
Ken Parks
John Reaves

County of San Diego (CSD):
Noah Alvey
Joseph Farace
Darren Gretler
Andy Hamilton
Stephanie Smith
Andrew Spurgin
Melanie Tylke
Mark Wardlaw

Empower Devices (ED):
Erin Malcolm Brandt
George Burmeister
Kat A. Donnelly
Skip Laitner

Members of the public:
Susan Freedman
Anna Lowe
Cesar Rios
Ian Stewart
Donna Tisdale
Jim Whalen

(TAC member Richard Caputo attended via conference call.)

B. Business

1. October 2, 2014 Technical Advisory Committee Meeting Minutes were approved, with no members opposed.
2. Technical Advisory Committee By-laws were approved, with no members opposed.
3. Rosenberg's Rules of Order were approved, with no members opposed.

C. Comprehensive Renewable Energy Plan Development

County staff provided an overview of direction from the Board of Supervisors

1. ED staff provided a summary of the October 2, 2014 TAC Meeting
2. ED staff presented the Economic Methodology. TAC members provided the following input:
    - Provide realistic but ambitious goals/targets
    - Show the triple-bottom-line benefits on key, strategic topics
    - Present technical information in layman's terms
    - Provide land use impacts of the CREP, including encumbering by generation and transmission
    - Describe how the pace of investment impacts cost/benefit (for example on PV and fueling costs)
    - Provide a business model approach to loading order of the scenarios
    - Address demand response (cost of consumption aspect)
    - Include information on the Governor's goals appears that Scenarios 2 and 3 reflect Governor's renewable energy goals - Scenario 1 may not be innovative
    - Consider increase in electricity as future fuel source
    - Summarize the CREP goal as an investment in energy efficiency and renewable energy to reduce operating costs and greenhouse gas emissions

3. ED staff presented on Opportunities for Increasing Renewable Energy and Energy Efficiency in San Diego County. TAC members provided the following input:
    - Address Community Choice Aggregation (CCA) and the percent of customers leaving investor owned utilities
    - Discuss the reliability of CCA
    - Provide the advantages and disadvantages of CCAs (Start-up costs, Financial risk to partners, Duplication of services, Rate stability/unequal benefits, Success rate, Funding source, Legislative barriers)
    - Provide consistency in data sets for public presentation
    - Consider Mark Jacobson study on California Energy Use and Renewables
4. ED staff presented on Best Practices Evaluation. TAC members provided the following input:
    - Consider Regional Energy Networks as a possible funding opportunity
    - Consider best practices from Center of Sustainable Energy, SANDAG, City of Chula Vista, and the City of San Diego
    - Consider increasing costs of renewables
    - Account for yearly increase in rate of return by San Diego Gas & Electric (SDG&E)
    - Suggest a menu of options, illustrating a weighting/ranking of options to help reach the overall targets (i.e. initiatives)
    - Consider technical and economic feasibility
    - Consider start-up costs, capital intensities, longevity of resources
    - Consider end-user costs if available
    - Consider indirect benefits
    - Give Board all the options to consider (with cost benefit presented to the customer).
    - Concern about cost implications and reliability of renewables, consider price predictability for budget purposes
    - Concern over using BAU (Business as usual) as a public facing term, consider using ‘current situation’, ‘current targets’, ‘status quo’ as alternatives.
5. County staff presented Summary and Next Steps

D. Public Comment

The public provide comment on the following Items:

C.3 Economic Development
- A reduction of large scale renewables in the backcountry may not be the consensus of those residing in the County.
- The benefits of greenhouse gas reductions are not direct benefits of the CREP. The CREP should provide air modeling benefits and potential health impacts of implementing the CREP.
- The CREP should show the year 2030 as a mid-point to align with the Governor’s renewable energy goals.
- CREP should consider the greenhouse gas impacts from truck trips to renewable energy sites in the County
- Include the borrowing payback periods

C.4 Opportunities for Increasing Renewable Energy and Energy Efficiency in San Diego County
- Is 100% renewable energy attainable?
- What are the options besides CCAs and Direct Access?

C.5 Best Practices Evaluation
- Large scale renewable projects do not benefit communities where they are located
- Address the big picture to provide reason to support this county administered system
- Consider quality of life

COMPREHENSIVE RENEWABLE ENERGY PLAN
TECHNICAL ADVISORY COMMITTEE
ADOPTED MEETING MINUTES

Thursday October 2, 2014, 1:00 PM
5510 Overland Avenue, Third Floor, Drake Conference Room
San Diego, California

A. Introductions

Wardlaw began the meeting with an overview of the agenda and goals for the day. Wardlaw indicated that Alvey would moderate the remainder of the meeting.

Meeting attendees provided brief introductions and described their interest in the development of the Comprehensive Renewable Energy Plan (CREP) and the Technical Advisory Committee (TAC). Meeting attendees were as follow:

TAC members:
Jason Anderson
Craig Benedetto
Corinne Lytle Bonine
Douglas Kot
Peder Norby
Ken Parks
John Reaves

County of San Diego:
Noah Alvey
Joseph Farace
Darren Gretler
Andy Hamilton
Stephanie Smith
Melanie Tylke
Mark Wardlaw

Empower Devices:
Erin Malcolm Brandt
George Burmeister
Kat A. Donnelly

Members of the public:
Nick Doenges
Cesar Rios
Ian Stewart
Donna Tisdale
Drake Welsh
Jim Whalen

(TAC member Richard Caputo was not able to attend the meeting.)

B. Responsibilities

Smith provided an overview of the Brown Act, procedural rules for meeting and TAC member responsibilities.

C. Comprehensive Renewable Energy Plan

Alvey provided an overview of actions by the Board of Supervisors resulting in the creation of the TAC.

Brandt introduced the Empower team members, qualifications, and experience. Brandt then summarized the tasks associated with plan development including economics, best management practices, financial and regulatory analysis.

Burmeister summarized the approach to research by discussing the methodology, multidisciplinary framing, and "Open Architecture" approach to plan development. Burmeister then reviewed the economic trends and potential scenarios, best practices evaluation criteria, and best practices sources.

Brandt requested that the TAC provide written input regarding the approach to research and distributed a survey. Alvey allocated time to complete the written survey.

After the written surveys were gathered, Alvey requested verbal input from the TAC and other meeting attendees.

Present TAC members provided the following input:

- *Establish an appropriate baseline*
- *Include geothermal energy production options*
- *Address energy production reliability*
- *Evaluate stored energy alternatives*
- *Consider SDG&E pre-existing contracts*
- *Assess the impact of power purchase agreements*
- *Evaluate utility scale energy and rooftop solar and identify an appropriate balance, if feasible*
- *Encourage implementing energy efficiencies rather than new infrastructure*
- *Facilitate the streamlining of development of renewable energies in minimally impacted areas*
- *Create guiding documents for implementation*
- *Address impacts to all of Southern California, not just San Diego*
- *Pipeline renewable energy projects in process, so that they are not impacted by the CREP*
- *Create a plan that can be implemented and is legally feasible*
- *Identify best practices from other Counties*
- *Coordinate with adjacent Counties*
- *Identify locations where renewable energy will work the best*
- *Recognize the California Public Utility Commission's regulatory authority*
- *Consider opportunities for Natural Gas*
- *Property Assessed Clean Energy (PACE) should be analyzed*
- *Identify opportunities for renewable energy sources/generation within the public right-of-way*
- *Address grid isolation and production*

- *Reliability and resiliency will be essential for success*
- *Evaluate cultural and natural impacts*
- *Consider all stakeholders from the small scale residential consumers to larger commercial and industrial consumers*
- *Address financial impacts to the business community*
- *Promote sustainability from a green economy standpoint*
- *Evaluate and address Community Choice Aggregation*
- *Promote strategic guidelines and policy initiatives*

Additional input from meeting attendees:

- *Consider wildlife and wildlife monitoring tools in relation to implementing renewable energy projects*
- *Work with wildlife agencies to streamline the review process*
- *Evaluate the impacts of renewable energy sources over time*
- *Consider strategies to facilitate low cost energy upgrades in low income areas*
- *Concerns regarding energy billing/usage disclosure on a commercial owner and residential owner basis*
- *Consider the recent Desert Renewable Energy Conservation Plan (DRECP)*
- *Consider the costs of transmission (i.e. lines and other infrastructure aspects) Evaluate water use for transmission lines and project impacts in groundwater dependent areas*
- *Understand where jobs are created and recognize local job creation*
- *Address the life cycle costs of projects*

D. Appoint Chair and Vice Chair

Alvey indicated that Norby had expressed interest in being the Chair for the committee.

TAC members discussed Norby acting as the Chair for the committee. Benedetto volunteered to act as the Vice Chair.

Norby was elected to the position of Chair and Benedetto was elected as Vice Chair by a unanimous vote of present TAC members.

E. Schedule Next Meeting

Alvey indicated that the next TAC meeting was tentatively scheduled for the beginning of December and indicated that a Doodle poll would be sent out in order to identify an acceptable date.

F. Public Comment

No public comment was received. Alvey thanked everyone for attending and the meeting was adjourned.

COMPREHENSIVE RENEWABLE ENERGY PLAN
TECHNICAL ADVISORY COMMITTEE
DRAFT MEETING MINUTES

September 21, 2016 10:00 AM – 11:15 PM
5560 Overland Avenue, Meeting Room: 171
San Diego, California

A. Call Meeting to Order at 10:10 AM

TAC members:
Jason Anderson
Craig Benedetto
Peder Norby
Corinne Lytle Bonine
Ken Parks
John Reaves

County of San Diego:
Stephanie Smith
Alex Bell
Mark Wardlaw
Mary Kopaskie
Noah Alvey
Laurel Lees
Bulmaro Canseco
Emma Schoppe

Members of the public:
Poonam Boparai
Erika Morgan
Donna Tisdale
Jim Whalen
Josan Feathers
Nicole Capretz
Adaline Woodard
Ben Boyce

(TAC members Richard Caputo and Douglas Kot did not attend.)

B. Business

1. The August 17, 2016 Technical Advisory Committee (TAC) Meeting Minutes were approved with revisions.

C. Comprehensive Renewable Energy Plan

1. County staff provided an overview of stakeholder engagement efforts and shared staff's proposed recommendations for the Comprehensive Renewable Energy Plan (CREP) Phase II.

2. TAC members provided feedback on the following eleven best management practices that staff recommended as priority for further consideration:

   - Prepare a Community Choice Aggregation Feasibility Study and Continue to Assess Other Alternative Energy Models (BMP #3)
   - Create a Renewable Energy Overlay Zone (BMP #10)
   - Establish a Sustainability Taskforce within the County's Existing Organizational Framework (BMP #2)
   - Develop a Legislative Outreach Strategy to Support Renewable Energy Programs (BMP #17)
   - Track Community Solar and Wind Initiatives and Legislation (BMP #14).
   - Increase the County's Renewable Energy Generation, Transmission, Use and Storage (BMP #7)
   - Prepare a Microgrid Feasibility Study and Establish Policies Related to Microgrids (BMP #15)
   - Participate in the Creation of a New Regional Energy Network (BMP #9)
   - Increase Renewable Energy Education and Outreach (BMP #13)
   - Promote Vetted Renewable Energy Finance Mechanisms such as Property Assessed Clean Energy Programs, Bonds, Peer-to-Peer Lending or Crowdfunding, Among Others (BMP #4)
   - Promote Alternative Fuel Programs (BMP #16)

   There was consensus that the following six best management practices are lower priority:

   - Amend the General Plan to Add an Energy Element (BMP #1)
   - Develop a Solar Workforce Development Initiative (BMP #5)
   - Build an Energy Assurance Plan (BMP #6)
   - Establish a Renewable Energy Group Procurement Initiative (BMP #8)
   - Develop a Building Energy Disclosure Program (BMP #11)
   - Promote More Aggressive Building Standards Including the Significant Retrofit of Existing Buildings (BMP #12)

D. Public Comment

Public attendees voiced general support for:

- investigating alternative energy models, such as community choice aggregation;
- collaborating with other jurisdictions such as Los Angeles County regarding community choice aggregation;
- increasing the County's regional leadership through renewable energy generation, storage, transmission or use;
- promoting alternative fuel and infrastructure programs such as electric vehicle charging stations and rideshare opportunities;
- exploring renewable energy finance programs;
- exploring community solar initiatives and microgrid projects and policies;
- enhancing renewable energy education and outreach;

- providing a sustainability taskforce to be one point of contact for outreach; and
- being more proactive through legislative outreach on topics such as alternative energy models, net metering and renewable energy portfolio standards.

E. Meeting Adjourned at 11:15 AM

Attachment F – Valley Center Community Planning Group Preliminary Meeting Minutes for September 12, 2016

Valley Center Community Planning Group

Preliminary Minutes of the 12 September 2016 Meeting

Chair: Oliver Smith; Vice Chair: Ann Quinley; Secretary: Steve Hutchison

7:00 pm at the Valley Center Community Hall; 28246 Lilac Road, Valley Center CA 92082

A=Absent/Abstain BOS=Board of Supervisors PDS=Department of Planning & Development Services DPW=Department of Public Works DRB=Valley Center Design Review Board GP= County General Plan N=Nay P=Present PC=County Planning Commission R=Recused SC=Subcommittee TBD=To Be Determined VCCPG=Valley Center Community Planning Group VC= Valley Center VCPRD=Valley Center Parks & Recreation District Y=Yea

Forwarded to Members: 29 September 2016

Approved:

A	Call to Order and Roll Call by Seat #:	7:02 PM

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
MILLER	O'CONNOR	JANISCH	HUTCHISON	BRITSCH	PLOTNER	QUINLEY	FAJARDO	BOULOS	NORWOOD	SMITH	VICK	STIEDEMANN	GARRITSON	VACANT
P	A	P	P	A	P	P	P	P	P	A	P	P	P	

Notes: O'Connor arrives 7.15 pm; Quinley presides in absence of Smith

Quorum Established: 11 present

B	Pledge of Allegiance

C	Approval of Minutes:

Motion: Move to approve the minutes of 8 August 2016 as corrected

Maker/Second: Hutchison/Vick	**Carries: 11-0-0** (Y-N-A); **Voice**

D	Public Communication/Open Forum:

Hutchison asks for consideration of allowing him to approach the County Library regarding storage of VCCPG records which are accumulating at his house.

Dave Ross, audience, reporting for the Valley Roadrunner, inquires if there are any candidates running in the November election who would like to participate in a series of planned VC candidate interviews to be published in the paper. Those interested can contact him at the paper's offices.

E	Action Items [VCCPG advisory vote may be taken on the following items]:
E1	Presentation on county Renewable Energy Plan by Emma Shoppe *http://www.sandiegocounty.gov/content/dam/sdc/pds/advance/CREP/2016-08-17-crep-tac-presentation.pdf* (Quinley)

Discussion: Quinley introduces Emma Shoppe, PDS, who presents the County's comprehensive renewable energy plan with a handout. Her presentation is an update of the plan and an opportunity for feedback from local communities. The plan originated as a result of BOS direction with linkage to the countywide sustainability project. The BOS approved the work plan that aims at energy efficiencies, best management practices [BMPs], recommendations, etc. The work plan to date is a draft phase I report [April 2016]. Shoppe and her colleagues are working in conjunction with the Climate Action Plan [CAP] for 2017. Additional opportunities to participate in developing the renewable energy plan will occur through October. The BOS will consider BMP recommendations in December 2016. The handout presented is a BMP workbook. Shoppe offers a superficial overview of the workbook contents. More information on the renewable energy plan can be found at the website **www.sandiegocounty.gov/pds/advance/CREP.html**

Garritson asks about the cost of developing the plan. Shoppe says that phase I has cost about $300K. Janisch asks why only the unincorporated areas are included and she wonders if this kind of action is taken in incorporated areas as well. Shoppe affirms that the plan is being applied throughout the County. Will Rogers, audience, asks about the various kinds of renewable sources of energy. Shoppe says the different types of renewable energy are not specifically called out in the plan. Glavinic asks about power storage options. He suggests creating potential energy by the storage of water or some other medium that can be elevated during the day with solar power and then released during the nighttime. Shoppe agrees that such a scheme could be an option. Janisch inquires whether this plan will necessitate changes to the County's General Plan. Shoppe says one possible goal would be to add an energy element to the General Plan. She says the County has reached out to the public on how to revise the CAP so that it comports with the goals and requirements of the state. Rogers, audience, asks if there are centers for energy conservation that would fast track approval of projects if they comply? Yes, says Shoppe. Plotner asks if the County is considering reducing energy requirements through the use of roof gardens and landscaping techniques. Shoppe says the plan is not addressing the heat island effect of cities. However, Shoppe says that such considerations are possible above and beyond the scope of this plan. Janisch asks about small-scale wind projects and what qualifies as small scale. Shoppe says that is an aspect that will be considered in the next step of the plan. Garritson asks about additional costs of retrofitting older buildings and constructing new buildings under this plan. Quinley injects that energy cost reductions would offset increased building costs. Shoppe says an economic feasibility study is part of phase I, and it will address such costs. Hutchison asks about the impacts to the plan from large projects such as Lilac Hills Ranch [LHR], which will add considerable Vehicle Miles Traveled [VMT] that could be drastically reduced if such projects were more properly located in proximity to existing infrastructure and job centers. Shoppe says VMT is part of the calculus of the CAP and will fold into this plan. Vick challenges the purpose of the plan to provide options for energy savings and how projects like LHR will change the General Plan to avoid California Environmental Quality Act and Assembly Bill AB-32 Green House Gas requirements. Joe Farace, PDS, says other discretionary actions will be in place to address that kind of issue even if Measure B is adopted in November. Farace is not sure how the Measure B initiative will impact GHG and CAP. Janisch cites renewable energy item 8 in the workbook and a Silicon Valley project, and asks if we will emulate such projects or not? Shoppe demurs, saying it is only an example.

Motion: None, information only

E2	Valley Center Parks & Recreation District presentation on Star Valley Park made by Larry Glavinic, Vice Chair of the Board of VCPRD (Vick).

Discussion: Larry Glavinic presents. He indicates that he is here to create a great legacy. He notes that VC can still make useful progress. He wants to enlist VCCPG in creating public interest in parks and recreation. He is challenging the community to continue a great parks legacy for VC. He observes that VCPRD continues to lack funds for maintenance of existing facilities. He wants support to create new funding. VCPRD will offer Star Valley Park workshops in September and October. He notes that the Park Land Dedication Ordinance [PLDO] fund is one source of present funding, but it cannot be used for maintenance. VCPRD is able to generate income by renting facilities, such as the ball fields and community center. VCPRD has received about 500 surveys so far, but wants more [VC has a 20K population]. He observes that community-gathering space is insufficient, as are senior facilities and others. VCPRD is under-funded and has current budget shortfalls. The courts, fields, pool, buildings, and restrooms are not adequately maintained. Staffing is also inadequate. Facility supervision is inadequate. The park space for VC is below the state Quimby Act requirement. There are 42-acres today, but the present need is for 200-acres. He cites that VC is taxed less for parks than surrounding communities. VC is presently taxed $22 per year per parcel. The current facilities were largely built by volunteers, but VCPRD can't maintain them with volunteers. He also notes that the available level land in the town center is diminishing.

Glavinic says according to surveys, people are willing to pay more [$30-$120 per year] for new facilities and are not satisfied with the present facilities. The new facilities desired are: playgrounds, picnic areas, and sports fields, an emergency evacuation center, fitness center, and a new community center. Glavinic contends that the Star Valley Park [SVP] proposal responds with an amenity list that conforms to desires expressed in surveys. Star Valley Park will be a phased build out. VCPRD is looking at an early 2017 assessment vote, 2018 ground breaking, followed by purchase of the remainder of the project site. Garritson asks about the cost of the mail-in balloting proposed. $6K says Glavinic. Glavinic describes the SVP site with a 3-D animation. Glavinic says improving what is presently owned will cost each parcel owner $20 to $40 per year. The rest of the procurement of the site will raise the cost to $120 per year. With a fitness center, the cost could rise to $175 per year. O'Connor asks about the provision of parking, especially for large events. Glavinic says parking for large events can be accommodated on the playing fields, and there will be other less extensive permanent parking. Glavinic says expansion with SVP will allow for a larger VCPRD staff. Will Rogers injects that it would allow after school programs and will include a splash park as well. An audience member adds that a central location is needed for several activities. Vick asks about what parents presently do for kids' activities. An audience member says they go outside of VC for many activities presently. Vick says we are pushing people away from VC because of lack of facilities. A small payment is worth having attractive facilities.

Norwood says now is the time to do this. Vick reminds we presently pay $22 per year per parcel. He summarizes the lack of facilities and the impacts. Garritson revisits his concerns about the cost of the project. O'Connor rejoins that we are not paying enough as a community for parks. He observes that governments provide safety, water, sewer, and parks, and we are not paying enough for parks. Garritson disagrees. He suggests private funding as an alternative. However, Glavinic warns that with private/public financing, the community would loose use of the park for half the year while private groups [soccer, baseball, etc.] commanded the space. A discussion of soccer fees that could support development of parks ensues.

Motion: None

E3	Presentation and discussion by Valley Center Parks and Recreation about planning for public parks located in private projects in Valley Center. (Norwood)

Discussion: Norwood introduces Vick who passes it off to Larry Glavinic, Vice Chairman, VCPRD. Glavinic leads a discussion of the parks in private developments. Large private developments either provide dedicated land or PLDO funds to satisfy the state/county requirement for parklands. However, PLDO funds don't come to VCPRD if a developer builds a park or if the development has over 50 Equivalent Dwelling Units. Typical problems of such privately developed parks include lack of parking, restrooms etc., and pocket parks are insufficient for entire community's needs. He says the current PLDO ordinance needs to be changed to benefit VCPRD better. He adds that the community needs flexibility of uses within parks.

Vick wants VCCPG to be aware of projects that propose public parks that won't really benefit the public. He says the Park Circle public park was rejected by VCPRD for some of the reasons cited for privately developed parks. PLDO is for development not for maintenance of parks. The Park Circle park will mostly serve residents, not the public. Plotner asks about the PLDO contribution per house, how much comes back to the community. Glavinic says all that is collected is available to VCPRD. Garritson notes that PLDO is still only for capital improvement. O'Connor suggests Garritson write a letter to state Assemblywoman Marie Waldren to change state law governing PLDO funds.

Motion: None

E4	Discussion and mandatory vote on Chair's submitted VCCPG recommendations regarding the 7 alternatives presented by county staff for changing the Marijuana Collective Ordinances. (Quinley, O'Connor).

Discussion: Letter sent by Smith presented for ratification [appended below]. Motion by Vick to ratify. No comments or questions.

Motion: Move to ratify the letter sent by Smith regarding the Marijuana Collective Ordinances alternatives.

Maker/Second: Vick/miller	**Carries: 12-0-0** [Y-N-A]; Voice

E5	Discussion and possible vote on PDS 2016-STP-16-006-- Nelson Way, Phase II, located at 8530 Nelson Way and old HWY 395.Project is a cultivation facility serving an adjacent medical marijuana dispensary.

	The Proposed structure is a 1 story made-of-wood framing and stucco. The project is ground up and has no grading required. Owner is T and M holdings at 609-802-23011. Applicant and contact person is Darren Machulsky at 609-462- 4234 or *dmachulsky@yahoo.com*. PDS project manager is Michelle Conners at 858-2636. (O'Connor).

Discussion: O'Connor presents. He observes that the applicant is not present. He advises that the applicant still desires a cultivation facility along with the dispensary, but the plans are on hold at the County offices. The County is attempting to clarify the requirements for such facilities, but likely won't have definition until after a particular initiative is voted in November. There has been no contact with the DRB regarding the boundary fence for the neighbor. O'Connor says the neighbor is elderly and won't feel safe with such a facility next door. He suggests that a chainlink fence would likely suffice. Quinley asks about recreational marijuana sales at this facility. O'Connor says that is uncertain but possible. Garritson says likely.

Motion: None

F	**Group Business**
F1	Resignation of Mark Jackson from seat number 15 of the Planning Group effective August 9, 2016; Thanks to him for his service

Discussion: Quinley notes the resignation of Mark Jackson from the VCCPG 9 August 2016, creating a vacancy in seat 15. She observes that the community owes Jackson a debt of gratitude for his years of effort on behalf of the community. Jackson was chair of the Mobility SC and an engaged member of the VCCPG. He will be missed.

Miller comments on the South Village SC meetings. He announces he return of Tractor Supply and Park Circle at end of the year, possibly after the road 19 issues have been addressed.

Quinley announces the resubmittal of Lilac Plaza.

Motion: None

F2	Discussion and Vote on the Appointment of Jon Vick as Chair of the Mobility Subcommittee.

Discussion: Quinley nominates Vick to replace Jackson as chair of the Mobility SC.

Motion: Move to appoint Jon Vick to the vacant chair of the Mobility SC.

Maker/Second: Quinley/O'Connor	**Carries: 11-0-1** [Y-N-A]; **Voice;** Vick abstains out of modesty

F3	Next regular meeting scheduled for 10 October 2016	
G	**Motion to Adjourn**	**8.37 pm**
	Maker/Second: Miller/ O'Connor	**Carries12-0-0** [Y-N-A]; **Voice**

Subcommittees of the Valley Center Community Planning Group

a)	Mobility – Mark Jackson, Chair
b)	Community Plan Update – Mark Jackson, Chair
c)	Nominations – Hans Britsch, Chair
d)	Northern Village – Ann Quinley, Chair
e)	Parks & Recreation –LaVonne Norwood, Chair
f)	Southern Village –Bill Miller, Chair
g)	Tribal Liaison – Claire Plotner, Chair
h)	Website – Jeana Boulos, Chair
i)	Lilac Hills Ranch – Steve Hutchison, Chair
j)	Solar – Oliver Smith, Chair

k)	Ad Hoc Committee on Handbook Update and Member Training – Ann Quinley, Chair
l)	Lilac Plaza – Ann Quinley, Chair

Correspondence Received for the Meeting:

1) PDS2015-ERer-15-08-021; APN 1880250-19 Valley Center Rite Aid. First iteration review of Technical Studies which indicates changes that are required to the Plot Plan, compliance with Design Guidelines, Landscaping, Sewer, Access to the project, Traffic Impact Study, Preliminary Grading Plan, Stormwater Quality Management Plan, Among other issues. Chris Peto is project manager. (Quinley)
2) Discretionary permit for Rezone PDS2015-REZ-15-004. Lilac Plaza Development located at corner of Valley Center Road and Lilac Road. The project requests a general plan amendment to review for commercial buildings including parking area and appurtenant uses. The site is 7.0 acres. The Owner Applicant is Lilac Plaza LLC, P.O. Box 420130, San Diego, CA 92172. Telephone is 619-279-2472 PL. The PDS Planner is Benjamin Mills at 858-495-5234 or Benjamin.Mills@sdcounty.ca.gov. (Quinley)
3) Gorial ABC Permit; PDS2015-ABC-16-007 renewal of an alcohol sales license (#533733) at an existing market located at 27455 Valley Center Road; Owner and applicant is Thaier Gorial, at 619-795-6632. The project manager is Don Kraft at 858-694-3856. (Miller)

4) Park Circle Major Use Permit. PDS 2015-TM-5603 located at Mirar de Valle and Valley Center Road. Owner is Konyn Reality Investment Company; developer is Touchstone Communities at 858-586-0414. Submittal contains Plot Plan, Trails and Recreation Plan, Landscape, Walls and Fence plan. The project area is 73.93 acres with 368 lots and 318 dwelling units. Minimum size of residential lots is 2,200 SF. (Miller)

Appended material for item E4: [next page]

TO: Joseph Farace September 1, 2016
Group Program Manager, Advance Planning
County of San Diego Planning & Development Services

SUBJECT: **Comments on amending the Zoning Ordinance section pertaining to Medical Marijuana Collective Facilities (MMCF).**

Joseph,

Thank you for the opportunity for the Valley Center Community Planning Group to review the proposed amendments the Zoning Ordinance section pertaining to Medical Marijuana Collective Facilities (MMCF). As the county input needs to be received by September 5, 2016 and the next VCCPG meeting is scheduled for September 12, 2016, this response was written by the Chair and will be validated at our next meeting.

1) Some of the options presented appear to be non-viable. For instance, it is our understanding that changing the separation requirement from residential zoned to residential occupied reduced to number of available locations to near zero.
2) Is it common for a cultivation facility to be co-located with a dispensary/co-op like the one proposed at the VCCPG? Dispensaries had a very noticeable impact on the amount of loitering and traffic in an area like Santa Cruz/San Francisco. This was usually caused by dispensary rules about the number of people allowed in at one time, how far away someone had to wait (typically a few blocks), and the presence of a "bouncer" at the door. Before deciding on the exact buffer around a school/park/residence, it would be helpful to see how restrictive that would be on the number of parcels available for cultivation facilities.
3) Does the county offer any data regarding safety and crime around cultivation facilities without nearby dispensaries?
4) Limiting the number of facilities to the point where hot spots are created is also not desirable. Limiting the number per district and perhaps having a mile radius around each park/church/school/etc. creates hot spots upon which the entire county would descend. It may be preferable to see several spaced out small ones than a handful of large facilities, with more restrictive spacing between facilities.
5) What would requiring a MUP allow in the review process? Would it let the county and community groups take more site specific considerations into account before allowing the cultivation facility?
6) A city boundary offset does not appear to makes sense, especially if it's just 1000 ft, unless the goal is to eliminate cultivation facilities. If the ordinance is adopted, presumably there would be benefits (tax?) to the city housing the facility and few areas where they could be built. Placing a facility on the boundary would not make much difference over placing one 1000 ft away. However, the ordinance options to call out that the schools/parks/churches exclusion zone applies to schools/parks/churches in adjacent cities as well, so that seems restrictive enough.

Regards,

Oliver Smith
Chair, VCCPG

cc: christopher.livoni@sdcounty.ca.gov
adam.wilson@sdcounty.ca.gov
michael.delarosa@sdcounty.ca.gov
keith.corry@sdcounty.ca.gov
tim.mcclain@sdcounty.ca.gov

Attachment G – Sample of Boulevard and Jacumba Community Comment Letters Received in September through October 2016

Dear Ms. Lees,

I am strongly opposed to the potential for San Diego County to prioritize utility scale wind, solar, and transmission infrastructure projects in their current **Climate Action Plan and Comprehensive Renewable Energy Plan**, as a way to meet mandated green house gas emission reductions. It is not necessary to d

Renewable Energy Overlay Zones should be rejected from consideration for placement over the Boulevard / Jacumba community planning areas. Any such Zones should only be allowed in areas already zoned commercial/industrial in the already built environment.

It would be better to prioritize and incentivize the current proliferation of self-generation point-of-use renewable energy projects, like the 625 megawatts already installed on rooftops, parking lots and other existing facilities in SDG&E's service territory that do not require expensive and destructive new long-distance transmission lines like the Sunrise Powerlink. I may also be interested in Direct Access or Community Choice options to purchase energy from vendors other than SDG&E.

________________________________ name

________________________________ address

Return Address:

SAN DIEGO CA 920

19 SEP 2016 PM 2 L

Place Stamp Here

Laurel Lees, PDS

Land Use/Environmental Planning Manager

5510 Overland Ave, Suite 310

San Diego, CA 92123

RECEIVED

SEP 23 2016

Planning and Development Services

-123985

Attachment H - Campo Lake Morena Community Planning Group Meeting Agenda and Comment Letter for September 26, 2016

County of San Diego
Campo Lake Morena Planning Group
Mountain Empire Community Center, 976 Sheridan Road
Campo, CA 91906
7 p.m., Monday, September 26, 2016
Final Agenda

The public is encouraged to attend and participate in the meetings of the Campo Lake Morena Planning Group, which is the county-sponsored link between the community and San Diego County dealing with planning and land use. Members of the public will be given the opportunity to speak regarding any item on the agenda. In addition, during public discussion, members of the community will be given the opportunity to address other matters pertaining to land use issues in our area. No action or vote may be taken on items not on the agenda. The final agenda will be posted 72 hours prior to the meeting and may be found at the Campo branch of the U.S. Post Office, the Campo branch of the San Diego County Library and the Lake Morena Market bulletin board. Preliminary agendas are published around mid-month in *The Alpine Sun*.

1. CALL TO ORDER

2. PLEDGE OF ALLEGIANCE

3. ROLL CALL: 1-Joe Carmody, 2- Lynn Correa, 3-Billie Jo Jannen, 4-Linda McCoy, 5-John Clarke, 6-Steve Biddle, 7- Christine Sperrazzo Lepley

4. APPROVAL OF MINUTES: July 6, 2016, July 25, 2016

5. PUBLIC DISCUSSION: At this time, the public is invited to speak on any item that does not appear on the agenda. Public speakers will be limited to 2 minutes.

Action Items
6. NEW BUSINESS:

a. **Review proposed letter for Comprehensive Renewable Energy Program report.** The report proposes the creation of an energy development overlay, which would drastically change the general plan and community plans in Mountain Empire It also does not mention doing an full appraisal of the effects of the overlay on greenhouse gas emissions. Discussion and vote.

b. **Review proposed letter of support for the Mountain Health and Community Services Senior and Disabled transportation program. This is for the company's annual grant application to SANDAG.** Esther Matos will present. Discussion and vote

c. **Captain Hank Turner of the SDC Sheriff's Office will discuss the community's requests and comments about local deputies' handling of resident calls, including, but not limited to, the Border Fire**. Discussion and vote.

7. OLD BUSINESS:

a. **Jenn Maldonado of Congressman Juan Vargas' office will report on efforts to work with the military to keep low-flying helicopters from presenting risk and noise to residents and public facilities**. In addition, Vargas's office is taking an interest in the community's efforts to get San Diego City to allow Lake Morena water levels to rise before before further draining is done. Discussion and vote.

b. **Brooke V. Emery of the California Department of Transportation has requested time to provide the community with a brief update on the bridge repairs at Forrest Gate on Highway 94.** Information only

c. **Standing Subcommittee reports:**
   1. Groundwater, John Clarke.
   2. Sewer and Septic, Joe Carmody
   3. Community Economic Impacts, Steven Biddle
   4. Traffic and Public Safety, Steven Biddle

8. CORRESPONDENCE AND ANNOUNCEMENTS

a. **The Star Ranch vesting and landscape architecture maps have been updated** and are available, both at meetings and by appointment with the CLMPG chairman. Staff has delayed release of the EIR until it can figure out what type of greenhouse gas analysis large projects should include. Guidance for developers was posted sometime in August. When asked, assigned planner Mark Slovick has been vague and uninformative about the status of the project, but says it is still in process.

b. **Notice of September 9 meeting of the county Traffic Advisory Committee**. No items of interest to our area. Sent to group.

c. **The Registrar of Voters says there will be no election for the planning group** because the number of candidates is equal to the number of seats available. **Rob Romero** will be joining us in Seat 5 in January 2017.

d. **From the August 20 chairman's meeting/CAP visioning session:** Several follow-up emails containing information gathered during the session. One speaks directly to questions about including soil sequestration calculations in plan documents. They say they don't know how to calculate this, meaning that the CAP and energy overlay will be done with no information about real impacts on greenhouse gases. Forwarded to group.

e. **Notice of public workshops on California Environmental Screening.** This state project identifies communities that are impacted by poverty and other factors to determine where Cap and Trade economic benefits should be directed. Forwarded to group.

f. **Notice of Transportation Grant Cycle for FYI: 2018**: From the notice: "Caltrans will offer approximately $2.8 million for the FTA 5304 portion of the grant that only MPOs and RTPAs can apply for. The remaining $5 million in State Highway Account funds will be set aside for Cities, Counties, Transit Agencies, and Tribal Governments to apply for directly. The goals of the Sustainable Communities grant are to identify and address mobility deficiencies in the multimodal transportation system including the mobility needs of environmental justice and disadvantaged communities, encourage stakeholder collaboration, involve active public engagement, integrate Smart Mobility 2010 concepts, and ultimately result in programmed system improvements." Forwarded to group.

g. **Letter from Remnant Electric to the planning group** enquiring about the status of the Lake Morena cell tower application we heard in January. I called him back and reported that the project was approved, but the status is uncertain, according to the county planner. Hard copy only. Available on request.

h. **Another chairman meeting is planned for Saturday, October 8, from 9 a.m. to 12 p.m.** Topics covered will include the County's **Park Lands Dedication Ordinance**, **Strategic Plan on Waste Reduction**, and **Comprehensive Renewable Energy Plan**, among others. We look forward to sharing information and hearing your input on the first three items at the next meeting. Forwarded to group.

i. **San Diego County Housing and Community Development Services is seeking grant proposals for the County's share of federal Community Development Block Grant funds.** The CDBG program funds improvements to local youth and senior centers, parks, streets and sidewalks, drainage systems, and fire facilities in the unincorporated areas of the county. Residents and non-profits in the unincorporated area may propose projects that benefit low- and moderate-income persons and align with the County's Consolidated Plan. The deadline to submit applications for CDBG funding is 5 p.m. Friday, October 28. Forwarded to group.

j. **Jacumba Hot Springs is holding it's annual Fall Festival and Swapmeet on Saturday, October 1 at the Jacumba Hot Springs Park, 44635 Old Highway 80**. Events include food service all day, live music by Bill Moffett and the Ghost Riders, multiple raffle drawings and sales booth spots for only $10. Forwarded to group.

9. EXPENSES

a. Please report any valid expenses for group approval.

10. UPDATES AND POTENTIAL ACTION ITEMS

11. REQUEST FOR AGENDA ITEMS FOR UPCOMING AGENDAS: All requests for placement of agenda items must be to the planning group chairman by the third Tuesday of each month.

Next regular meeting, October 24, 2016 at Mountain Empire Community Center. If you wish to appear on the agenda, please contact CLMPG Chairman Billie Jo Jannen, 28736 Highway 94, Unit 1, Campo, CA 91906, jannen@inbox.com or call 619-415-6298. Agendas are posted 72 hours prior to meeting.

From: Billie Jo Jannen, Chairman, Campo Lake Morena Community Planning Group

To: Emma Schoppe, Land Use/Environmental Planner, San Diego County Planning & Development Services

September 26, 2016

Re: Missing elements, initial draft of proposed San Diego County Comprehensive Renewable Energy Plan Report

Dear: Ms. Schoppe:

The Campo Lake Morena Community Planning Group has reviewed the initial draft of the proposed Comprehensive Renewable Energy Plan Report**. The report has serious shortcomings in its treatment of greenhouse gas releases and fails to even acknowledge the disproportionate share of energy cost to the backcountry communities that would be sacrificed under the proposed overlay.**

No project, especially high-impact industrial-scale renewable projects, should be approved without a complete cradle-to-grave review of greenhouse gas release. County staff assigned to both CREP and the proposed Climate Action Plan have eschewed any mention of the gases released from soil when vegetation is removed and soil is disturbed during construction.

Also ignored are the releases in manufacturing, transporting and building the facilities. The concrete and metal fabrication for a single project releases thousands of tons of GHGs. The Newhall Ranch decision states the expectation that development should consider the broader picture when assessing projects -- and the worldwide impact of renewable energy projects is very large. The fact that GHG is generated in China or Malaysia doesn't make it non-germane to California if California is mandating the use of those materials.

The overlay proposed in the report will most assuredly result in massive releases of greenhouse gas – whether in California or elsewhere -- yet it is suggested with no acknowledgement whatsoever of these releases.

According to research on sequestration in arid biomes, soil sequestration – and not surface vegetation -- is the greater part of greenhouse gas-holding capacity (*please see attached references*). Therefore, the permanent greenhouse gas release resulting from construction and continuing use on large project footprints needs to be accurately counted in order to honestly assess whether the public and private expense, as well as the local loss of scenic and property values, should be undertaken at all.

Both the CREP and the CAP ignore soil releases altogether and fail to provide would-be builders of large projects with any methodology for even estimating, let alone calculating, the magnitude of GHG release for either the proposed energy overlay or project building standards.

You cannot mitigate what you have not quantified, so you cannot demonstrate that you have achieved the greenhouse gas savings required by state law.

Staff assigned to the CAP project has informed us that soil sequestration is too new a concept to allow it to be included in GHG calculations, so only surface vegetation is counted in the assessment tool provided by the state. **We reject this reasoning.** The fact that the ponderous state process has failed to provide a complete tool, is no reason for County staff to neglect consulting with the scientists who have been working for years on soil sequestration accounting (*see references*). Some of these researchers are located right here in San Diego County.

If retention of GHGs is substantial enough, natural sequestration may actually be a more economical route to achieve a solid reduction in atmospheric GHGs than sacrificing that capacity for the sake of hundreds or thousands of acres of expensive industrial-scale renewables. This information is well worth having and should be covered in detail in the CREP report, the CAP and in project EIRs.

Economic issues

The economic analysis of impacts on the unincorporated area (section 3.3) ignores the cost of propane, the only gas energy available to rural communities, and doesn't even mention indirect costs to local residents and ratepayers under the proposed overlay.

Contrary to the report writers' assertion, the amount of propane used, as well as the cost to businesses and residents, would be very simple to glean from our two or three local propane suppliers. **There is no reason not to include this substantial rural expense.**

Furthermore, the indirect costs of energy from industrial-scale wind and solar is borne almost exclusively by the communities in which these facilities are built. Unlike the more compact installations for natural gas and nuclear generators, wind and solar generators require vast tracts of land. They are visible for great distances, and in the case of wind turbines, are also audible over great distances. This affects home values, quality of life, and as demonstrated by the Manzanita health study, can cause increased health care costs for local families and their insurance providers.

None of these factors are considered in the economic analysis, but certainly should be, given the potential for high financial penalties to local residents. In fact, we would recommend that no overlay be approved without a thorough review of the economic impacts to the communities located under it.

These impacts force a disproportionate share of the region's skyrocketing energy costs on a population that is already known for housing generally lower-income residents than the communities that would be "benefiting" from the energy output. Under no circumstances should these costs be ignored in the County's energy math.

The report never even mentions transmission losses, which can be substantial – as much as 40 percent – and could render pointless the vast amounts of money, greenhouse gas releases, and relentless rate increases associated with industrial-scale renewables. When generation is located miles from the majority of end users, it adds millions to the cost of providing electricity. **Placing an energy overlay on distant sites guarantees that this waste will continue and increase, when we *should* be *decreasing* energy waste.**

The report should offer better analysis on local generation in areas where it will minimize both transmission losses and destruction of sequestration in currently undisturbed areas. The capacity for small-scale solar and wind generation in cities and suburban sites hasn't even begun to be tapped. This has been largely ignored in favor of preserving a business model of energy generation and distribution that hasn't changed since it was established in the late 1800s.

These protectionist practices do the taxpayer and ratepayer a terrible disservice. Very few businesses receive this kind of protection and promotion from government at all levels. Most businesses that cling to outdated business practices eventually go out of business in the natural course of events. It is time for power companies to adapt to modern needs and for municipalities to stop enabling their obsolete business model.

Placement of this overlay does little beyond helping private companies to maintain a monopoly. Worse, it forces electricity users to support an outdated, expensive and illogical approach to electricity distribution.

San Diego County should be taking the lead in using modern approaches to funding and distributing electricity instead of perpetuating a wasteful model that is, more clearly every day, directly harming the millions of people the County is supposed to represent.

Sincerely,

Billie Jo Jannen
(619) 415-6298

cc:
Supervisor Dianne Jacob, San Diego County Board of Supervisors
Chairman Michael Beck, San Diego County Planning Commission
Project Manager Bulmaro Canseco, San Diego County Climate Action Plan

Supporting Information

Every industrial renewable project we have seen sports vast tracts of desertified soils that have lost their ability to hold carbon and nitrogen. Researchers have been reporting for over a decade on the long-misunderstood capacity of arid and semi-arid systems to hold on to nitrogen- and carbon-based gases. In fact, semi-arid soils can hold substantial carbon and nitrogen – often more than the surface vegetation.
www.californiachaparral.com/images/Luo_et_al_Chaparral_as_carbon_sink_2007.pdf
http://ag.arizona.edu/oals/ALN/aln49/lal.html#desertification

Soil microbes and vegetation substantially increase the amount of carbon that arid soil holds onto in response to increased amounts of carbon.
http://phys.org/news/2014-04-arid-areas-absorb-unexpected-amounts.html

Unimpaired natural systems will not only hold the carbon they have, but will hold even more in future, making them an irreplaceable GHG-buffering resource.
www.currentscience.ac.in/Volumes/106/10/1357.pdf

Once degraded, soil is unlikely to regain its ability to sequester GHGs.
(http://onlinelibrary.wiley.com/doi/10.1111/gcb.12957/abstract)

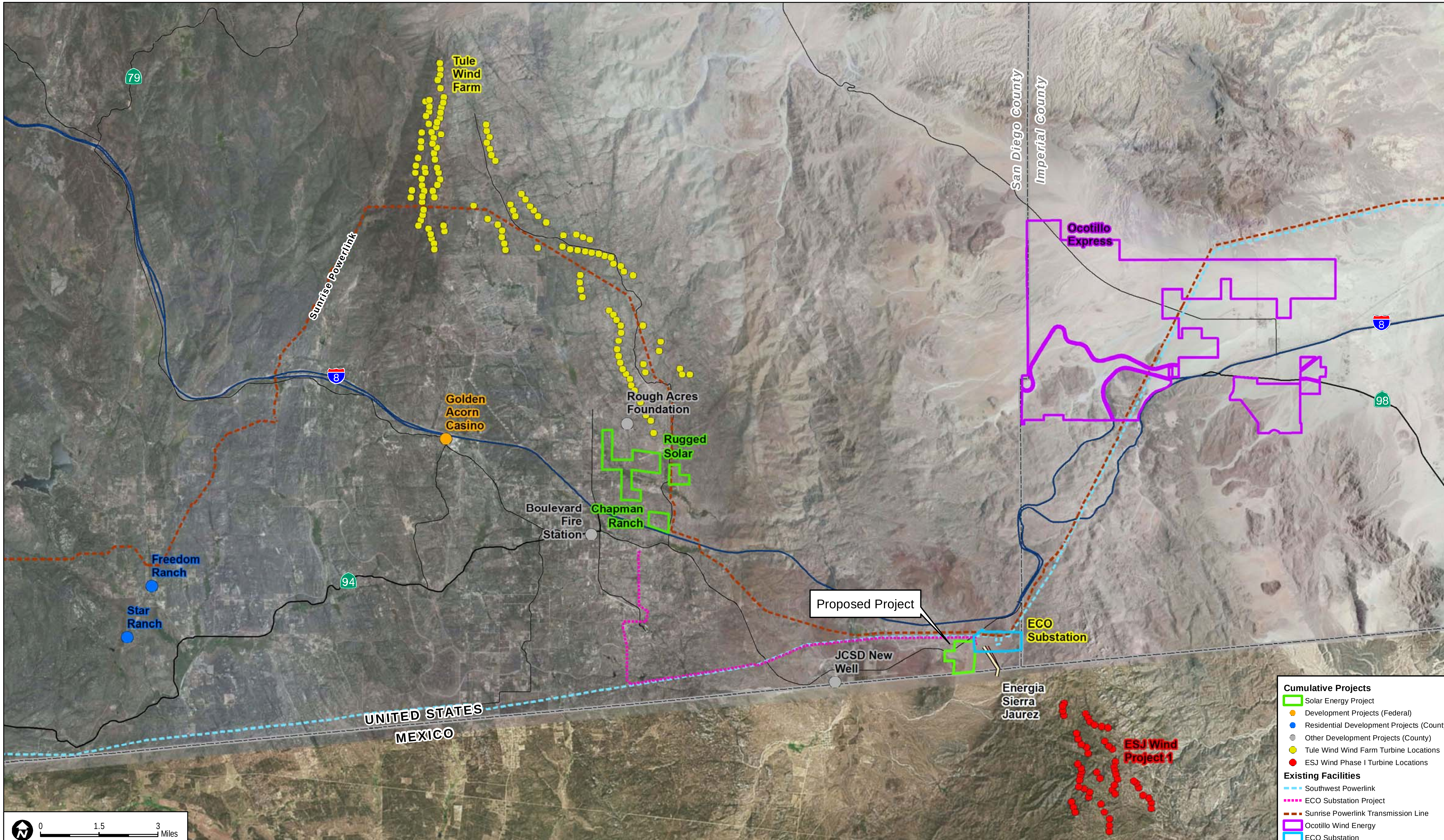
Wind and water erosion on compacted and stripped off lands removes the finer particles needed for effective sequestration.
http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=D4A41F4B3C9A972A5610DACD64AECA27?doi=10.1.1.493.3931&rep=rep1&type=pdf

Developments usually use rated (nameplate) capacity, rather than efficiency capacity, to describe their projects. However, projects will never produce to nameplate capacity. The public is given the impression that it's receiving (for example) 10 megawatts, when in reality, it's getting 3, and the other 7 are coming from a fossil fuel peaker plant:
https://www.eia.gov/tools/faqs/faq.cfm?id=101&t=3
www.eia.gov/totalenergy/data/annual/pdf/sec17.pdf

Explanation and calculations for transmission and distribution losses can be found on several websites. For example:
http://electrical-engineering-portal.com/total-losses-in-power-distribution-and-transmission-lines-1
https://www.eia.gov/tools/faqs/faq.cfm?id=105&t=3

The greenhouse gases and dirty pollutants released in mining, smelting, transport and casting the materials for turbines and solar panels measures in thousands of tons, while rare earths mining and processing is outright catastrophic:
http://web.mit.edu/12.000/www/m2016/finalwebsite/problems/environment.html
http://e360.yale.edu/feature/boom_in_mining_rare_earths_poses_mounting_toxic_risks/2614/

EXHIBIT
3



DUDEK

8477

SOURCE: Bing 2014; Soitec 2012

FIGURE 1-9

Cumulative Projects Map

Jacumba Solar Energy Project

EXHIBIT
4

COUNTY OF SAN DIEGO

LAND USE AGENDA ITEM

FINAL

DATE: May 8, 2013

XX

TO: Board of Supervisors

SUBJECT: WIND ENERGY ZONING ORDINANCE AMENDMENT AND GENERAL PLAN AMENDMENT TO THE MOUNTAIN EMPIRE SUBREGIONAL PLAN (BOULEVARD SUBREGIONAL PLANNING AREA) AND BORREGO SPRINGS COMMUNITY PLAN TO ALLOW WIND ENERGY DEVELOPMENT, POD 10-007 (DISTRICTS: ALL)

SUMMARY

Overview

On February 25, 2009 (2), the Board of Supervisors directed staff to develop a new regulatory framework for wind turbines that would simplify processing and bring regulations in line with current wind turbine technologies. The Board's direction included the establishment a 50 kilowatt rated capacity as the threshold between the two tiers. Wind turbine systems that generate 50 kilowatts or less would be defined as "small wind turbine," and systems with a cumulative capacity of more than 50 kilowatts would be defined as "large wind turbine." The project being considered is composed of a series of amendments to the County's Zoning Ordinance related to wind turbines and meteorological testing (MET) facilities that implement the Board's direction.

The project also includes a General Plan Amendment to modify the Boulevard Subregional Planning Area of the Mountain Empire Subregional Plan (Boulevard Community Plan) to increase opportunities for large wind turbine projects through the Major Use Permit process. Changes are also proposed to the Borrego Springs Community Plan to allow opportunities for small wind turbine development.

Recommendation(s)

CHIEF ADMINISTRATIVE OFFICER

1. Certify that the Final Environmental Impact Report (EIR) dated January 2013 on file with the Department of Planning and Development Services as Environmental Review Number 2009-00-003 prepared for the Wind Energy Ordinance Amendment POD 10-007 has been completed in compliance with the California Environmental Quality Act (CEQA) and State CEQA Guidelines, that the EIR was presented to the Board of Supervisors and that the Board of Supervisors reviewed and considered the information contained therein before approving the project, and that the EIR reflects the Board of Supervisors' independent judgment and

analysis (Attachment H).

2. Adopt the CEQA Findings Regarding Significant Effects of the project prepared pursuant to CEQA Guidelines Section 15091 (Attachment G).

3. Adopt the Mitigation Monitoring and Reporting Program prepared pursuant to CEQA Guidelines Section 15097 (Attachment G).

4. Adopt the Statement of Overriding Considerations prepared pursuant to CEQA Guidelines Section 15093 (Attachment G).

5. Adopt the Decision and Explanation Regarding Recirculation of the EIR prepared pursuant to CEQA Guidelines Section 15088.5 (Attachment G).

6. Adopt the Statement of Location and Custodian of Documents prepared pursuant to CEQA Guidelines Section 15091(e) (Attachment G).

7. Direct the Director of Planning and Development Services and Director of Public Works to implement the mitigation measures within their respective jurisdictions that are adopted in the CEQA Findings Regarding Significant Effects for the County of San Diego Wind Energy Ordinance Amendment POD 10-007.

8. Adopt the attached Ordinance entitled:

   AN ORDINANCE AMENDING THE SAN DIEGO COUNTY ZONING ORDINANCE RELATED TO WIND ENERGY TURBINES (Attachment A)

9. Adopt the attached resolution entitled: Resolution of the San Diego County Board of Supervisors Adopting General Plan Amendment (GPA) 12-003, which adopts amendments to the Regional Land Use Element, Mountain Empire Subregional Plan (Boulevard Chapter) and Borrego Springs Community Plan. (Attachment B)

10. Provide direction to staff regarding the five policy issues summarizedat the end of this report.

Fiscal Impact
N/A

Business Impact Statement
The proposed project will further County, state and federal goals of utilizing alternative renewable energy resources. The proposed ordinance streamlines and clarifies existing wind energy regulations and will increase development opportunities for both small and large wind turbines, while ensuring that such improvements do not adversely impact the environment, public health/safety, or the livability of the community.

SUBJECT: WIND ENERGY ZONING ORDINANCE AMENDMENT AND GENERAL PLAN AMENDMENT TO THE MOUNTAIN EMPIRE SUBREGIONAL PLAN (BOULEVARD CHAPTER) AND BORREGO SPRINGS COMMUNITY PLAN TO ALLOW WIND ENERGY DEVELOPMENT, POD 10-007 (DISTRICT: All)

Advisory Board Statement
N/A

Background
With the cost of oil, gas and electricity increasing, more and more people are turning to renewable energy as a viable source of electricity. There are many types of renewable energy sources, one of which is wind energy. Because this is an emerging and developing technology, it is important that County codes and regulations be made relevant to today's technology in order to provide an effective and efficient, rather than frustrating, permitting process. It is also important that the codes address the new environmental and community challenges that are often associated with this emerging technology. As such, any amendments to County regulations should strike a balance between the needs of business, environment and community.

On February 25, 2009 (2), the Board of Supervisors (Board) took two actions related to renewable energy. The first action directed staff to develop a new two tiered framework for wind turbine regulations to simplify processing and bring regulations in line with current wind turbine technologies. The second action amended Meteorological Testing Facility (MET) regulations to allow MET facilities through the Administrative Permit process. Staff worked on the project and prepared a draft EIR in the summer of 2010 after fair arguments were raised during the project's initial public review. Minor amendments to the ordinance to address inconsistencies with State law and allow multiple small turbines and MET facilities through the Administrative Permit process were approved by the Board on September 15, 2010. The draft Wind Energy Ordinance Amendment, General Plan Amendment and EIR were made public November 8, 2011. The Planning Commission held three hearings, and a full day workshop, to review and consider the project between April and July 2012. On July 20, 2012, the Planning Commission recommended approval of the project to the Board.

At approximately the same time the Wind Energy Ordinance was under development, Iberdrola Renewables submitted an application for a Major Use Permit, Zoning Ordinance Amendment, and General Plan Amendment for the Tule Wind project. This project was considered by both the Planning Commission and Board and received final project approval from the Board on August 8, 2012. Subsequent to the Tule Wind project's approval, staff returned to the Planning Commission in order to incorporate the Tule Wind project zoning ordinance changes into the proposed Wind Energy Ordinance Amendment. On October 19, 2012, the Planning Commission recommended approval of the Wind Energy Ordinance Amendment with the Tule Wind project zoning ordinance changes to the Board of Supervisors.

On April 10, 2013, the Board directed staff to prepare a draft comprehensive Renewable Energy Plan. Staff will return in 120 days with a draft Plan that includes cost and time estimates, as well as options for Board consideration. As part of this action, it was determined by the Board that the Wind Energy Ordinance would be considered separately from the Renewable Energy Plan.

Analysis
The Board's direction included the establishment of a 50 kilowatt rated capacity as the threshold between the two tiers. Wind turbines that generate 50 kilowatts or less would be defined as "small wind turbine," and wind turbines with a cumulative capacity of more than 50 kilowatts would be defined as "large wind turbine." Further direction was given to continue with a ministerial permit process for small wind turbines and a Major Use Permit process for large turbine systems.

Given the complexity of this proposed legislative change, coupled with the amount of public input and the number of hearings that have occurred, there is a significant amount of information to convey. This staff report has been organized as follows.

A. Current Regulations - This section summarizes the framework of the County's existing wind energy regulations.

B. Project Description - This section summarizes proposed changes to wind energy regulations.

C. Project Issues - This section summarizes the main issues associated with the project.

D. Environmental Impact Report - This section summarizes the type of analysis, determinations, and alternatives that were included in the EIR.

E. Planning Commission Hearings and Actions - This section summarizes the issues covered and actions taken during the Planning Commission hearing process.

F. Policy Decisions - This section summarizes the major policy items for Board of Supervisor consideration.

<u>A. Current Regulations</u>
The Zoning Ordinance now identifies three categories of use types relating to wind turbines. Each category is regulated on a tiered scale, based primarily on the blade swept area of the wind turbine. Other factors include height, noise, and setback requirements. The three existing categories are described below and summarized in Table 1.

1. <u>Wind Turbine System, Small</u>
   Turbines that qualify as small have a blade swept area of up to 220 square feet (an approximate diameter of 16.5 feet for a conventional horizontal axis turbine) and are allowed by right on lots greater than one acre. The height limit is 65 feet on lots less than five acres and up to 80 feet on lots greater than five acres.

2. <u>Wind Turbine System, Medium</u>
   Turbines in this category have a blade swept area of up to 850 square feet (an approximate diameter of 33 feet for a conventional horizontal axis turbine) and are allowed on lots greater than one acre with an Administrative Permit. The height limit is

65 feet on lots less than five acres and up to 80 feet on lots greater than five acres.

3. Wind Turbine System, Large

   Large turbines consist of a single turbine or an array of turbines sometimes referred to as wind farms or utility scale wind projects. Large turbines have a blade swept area greater than 850 square feet, but less than 6,400 square feet for all turbines cumulatively and are allowed on lots greater than five acres with approval of a Major Use Permit. The height of a large turbine system may not exceed 80 feet.

Table 1. Current Regulations

Turbine Tier	Number of turbines permitted	Permit Required	Max. Permitted Blade Area	Maximum Height
Small	One	Ministerial	220 s.f. (approx. 16.5 ft diameter)	65 ft ≤ 5 acre lot 80 ft > 5 acre lot
Medium	Multiple	Administrative Permit	850 s.f. (approx. 33 ft diameter)	65 ft ≤ 5 acre lot 80 ft > 5 acre lot
Large	Multiple	Major Use Permit	6,400 s.f (approx. 7 turbines w/ 33ft blade diameter)	80 ft

B. Project Description

The amendments to the Zoning Ordinance would eliminate the current Wind Turbine System Medium category, as well as the reliance on blade swept areas to classify turbine sizes. The proposed amendment utilizes a two-tier (category) framework based on the criteria described below and summarized in Table 2.

1. Small Wind Turbine

   The proposed amendment would allow up to three tower mounted turbines no greater than 80 feet in height or five roof mounted turbines meeting the height limit of the zone (typically 35 feet) through a ministerial Zoning Verification Permit process.

   In order to qualify as a small wind turbine, the cumulative rated capacity of all turbines on the lot cannot exceed 50 kilowatts. A 10 kilowatt wind turbine is commonly recommended for an average size home. Therefore, the proposed 50 kilowatt rated capacity threshold can accommodate power needs for homes and other accessory structures, such as wells and agricultural structures common in the backcountry.

   Design and siting criteria have been incorporated into the ordinance to minimize impacts. Design provisions include prohibiting trellis style towers, eliminating the use of guy-wires and requiring manual and automatic speed controls. Siting provisions include prohibiting turbines on ridgelines, maintaining buffers from sensitive biological areas, and limiting the ground disturbance area for turbines.

2. Large Wind Turbine
   The proposed amendment would allow the development of multiple large wind turbines. The number, height, location and setbacks would be evaluated through the discretionary Major Use Permit process. The primary changes related to large turbines are described as follows.

   a) Turbine Classification – Eliminates blade swept area restrictions and establishes a threshold of more than 50 kilowatts to define a large wind turbine.

   b) Wind Resource Map – Establishes permitted location for large wind turbines based on available wind resources.

   c) Noise – Requires an acoustical analysis to establish property-line setbacks.

   d) Height – Removes current 80-foot height limitation and allows height to be established through discretionary review of the Major Use Permit.

   e) Decommissioning Plan – Incorporates a decommissioning plan requirement into existing removal surety requirements.

   f) Findings – Adds separate Major Use Permit findings specific to large wind turbine projects.

The proposed ordinance amendment eliminates blade swept area restrictions and uses a 50 kilowatt or above threshold as the criteria to define the large turbine tier. Eliminating the blade swept area restriction will allow for the development of a greater number of turbines. The project also introduces a Wind Resources Map, which defines the areas within the county where large turbines would be permitted. The Wind Resources Map boundaries were established from National Renewable Energy Laboratory data, which define the wind resource areas capable of supporting large turbine development in the unincorporated area.

With regard to noise, the proposed ordinance requires large turbine applicants to prepare and submit an acoustical study to demonstrate compliance with all applicable noise level limits, including a new low frequency noise limit, during the Major Use Permit review process. Setbacks required to meet the proposed noise provision will vary as a result of the type and size of turbines, number and location of turbines, topography and prevailing weather conditions. In cases where utility-scale wind turbine projects are proposed, noise setbacks are estimated to range from 1 to 1 ½ miles from property lines**.** Ordinance provisions have also been included to allow Major Use Permit applicants to obtain noise setback waivers from neighboring property owners. Additionally, an applicant may seek a noise waiver from the decision making body if the project's benefits are found to outweigh its impacts.

The project also deletes the current 80 foot height limit and allows turbine height to be established through the discretionary review process. Turbines will be required to comply with Federal Aviation Administration height and marking requirements and shall not create an airport hazard or interfere with military or emergency service aviation operations. Other updated provisions include requiring biannual compliance review, decommissioning plan, and Major Use Permit findings that are specific to large wind turbines.

Table 2. Proposed Regulations

Turbine Tier	Number of Turbines permitted	Permit Required	Energy Capacity	Maximum Height
Small	3 towers	Ministerial	< 50kW	80 feet
Large	Multiple	MUP	≥ 50 kW	Set through MUP process

3. Meteorological Testing Facilities

The project also includes amendments to the Zoning Ordinance regarding the regulation of metrological (MET) testing facilities. MET facilities are temporary testing equipment placed in areas to determine whether there is adequate wind to support commercial sized wind turbine projects. In addition to the more traditional tower mounted MET facilities, smaller trailer-size MET facilities are becoming more common. The proposed changes will allow these smaller temporary MET facilities that meet the height limits of the zone be allowed upon approval of a ministerial Zoning Verification Permit. The Zoning Verification Permit process would ensure that the proposed MET facility complies with all applicable regulations.

The proposed amendments to each section of the Zoning Ordinance are included as Attachment B in strikeout/underline format.

4. General Plan Amendment

This General Plan Amendment (GPA) (Attachment C) proposes to amend two community plans. It includes changes to the Boulevard Subregional Planning Area of the Mountain Empire Subregional Plan (Boulevard Community Plan) to allow opportunities for large wind turbine projects through the Major Use Permit process; and it includes changes to the Borrego Springs Community Plan to allow opportunities for small wind turbine projects through the ministerial permit process.

a) Boulevard Community Plan – Policies within the existing Boulevard Community Plan limit development opportunities for large wind turbines. The GPA included with this project would remove or revise prohibitive policy language to allow increased opportunities for large turbine development subject to the approval of a Major Use Permit.

b) Borrego Springs Community Plan – A current policy within the Borrego Springs Community Plan related to viewshed protection would prohibit ministerial permitting of small wind turbines due to the fact that it calls for discretionary review and analysis. The GPA would revise this policy and allow small turbine development subject to the approval of a ministerial Zoning Verification Permit.

C. Project Issues

In working with stakeholders throughout the processing of this project, several major issues have emerged, which are summarized below.

1. Wind Energy Regulations and Standards Researched

Some public comments suggested that County staff look at wind energy regulations in other jurisdictions and duplicate those standards here in San Diego County. County staff did, review and consider a number of wind ordinances while researching and drafting the proposed Ordinance and continued its outreach after hearing from the public. Jurisdictions researched are listed in Table 3 below.

Table 3. Researched Wind Regulations from other Jurisdictions

California	Nationwide	International
Alameda	Maine	Australia
Imperial	Texas	Denmark
Kern	Wisconsin	Germany
Los Angeles		New Zealand
Marin		United Kingdom
Riverside		
San Bernardino		
Solano		

What became clear from this research is that there is no universally accepted method for regulating wind turbines, and regulations are often based on local conditions. For example, parcelization, density and neighboring land use patterns all may influence the degree and type of regulations required. While some have pointed to other jurisdictions as examples of successful regulations, it is important to understand the local context of where turbine projects in these other counties are being sited. For example, in Solano County, large turbines are located in areas that feature low densities and large lot sizes In contrast, San Diego County's prime wind resources are located in highly parcelized areas and, in many cases, are close to residential properties. As a result, the regulations in Solano County cannot be relied upon as the basis for wind regulations in San Diego County.

2. Low Frequency Noise
   The current code requires turbines to meet noise limits that are audible to the human ear, which is referred to as the "a-weighted" measurement. One of the key provisions of the proposed ordinance amendment as it relates to large wind turbines is the new limitation on low frequency "c-weighted" noise. A common example of low frequency noise is the bass from amplified music; although the music source may be some distance away and may not be loud, the low frequency component (the low bass sound) can be felt or may cause vibrations which generate other noises.

   Wind turbines are known to create very low frequency noise as a result of the turbine blades moving through the air, particularly when the blade passes the tower. The "a-weighted" sound can be mitigated through use of walls, berms and construction methods. Low-frequency "c-weighted" sound can only be mitigated by distance from the source. Therefore, establishing proper setbacks for siting large wind turbines is essential to addressing wind turbine noise impacts.

   During the development of the ordinance, some people raised concerns that the County's proposed low frequency noise limit is too restrictive, while others argued the opposite. County staff reviewed research suggesting noise setbacks from as small as 0.2 mile to as much as 6.2 miles. Based on research papers on the subject, there is a growing consensus that distances between 1 to 1½ miles from residential uses are adequate to address low frequency wind turbine noise. The County's proposed low frequency noise provision is in line with this setback range. It should be noted that mechanical and other audible noise associated with wind turbines will continue to require compliance with existing noise ordinance "a-weighted" requirements.

3. Pure-Tone Noise
   Concerns have been raised related to large turbines creating pure-tone noise. Pure-tone noise is the distracting noise typically heard when the turbine blades are out of alignment or the system is out of balance, and is sometimes described as a whine or humming sound. Pure-tone testing is conducted when the turbines are in operation. In response to these concerns, an operational requirement has been incorporated into the proposed ordinance to limit the impacts of pure-tone noise on neighboring properties. This new provision was developed with technical noise experts, and several noise consultants. Pure-tone noise provisions are utilized in other jurisdictions' wind regulations and Kern County's pure-tone ordinance provisions served as the model for the County's proposed standards.

4. Fire Hazards
   Concerns have been raised that large wind turbine development may increase the risks of wild fire. Modern turbines can often exceed 400 feet in height and are typically located in remote areas which can create challenges for firefighting efforts.

Under the proposed ordinance, all large turbines will be required to obtain a Major Use Permit. Fire risks will be closely analyzed as part of this discretionary and environmental review process. Some examples of project specific fire mitigation measures that were required for a recently approved project included: 1) Providing funding for the training and acquisition of necessary firefighting equipment and services to improve the response time and firefighting effectiveness; 2) Providing funding for the local Fire Safe Council for coordinating a Community Wildfire Protection Plan (CWPP) and Evacuation Plan. Funding for the Council will enable the organization to apply for grant funding, and ultimately, to implement fuel reduction and evacuation plans; and, 3) Requiring turbines to be equipped with fire suppression/detection systems.

Therefore, all projects have been, and will continue to be required to comply with County Fire regulations, to complete a Fire Protection Plan and, if necessary, to provide project specific mitigation that will be reviewed by the Local Fire Authority Having Jurisdiction, the County Fire Authority, and ultimately, the County decision making body. At this time, however, it cannot be assured that all future large wind turbine projects will have less than significant impacts related to fire hazards. Refer also to the additional discussion on significant impacts below under Environmental Impact Report (Section D).

5. Health
   Public concerns have been raised regarding potential health effects from large turbines. In response, the County's Health and Human Services Agency (HHSA) conducted a review of research on the human health effect of wind turbines and issued a Public Health Position Statement (Attachment F). HHSA's analysis included an examination of the available research on potential health impacts from noise, electromagnetic radiation, shadow flicker, blade glint and land surface temperature relationship. The Public Health Position Statement concluded that the health effects of many forms of renewable energy generation, such as wind turbines, have not been assessed to the same extent as those from traditional energy sources (e.g., fossil fuel, radiation, etc.). The pathological effects on humans due to wind farms have only recently begun to be studied. However, based on the review of the available evidence, including journal articles, surveys, literature review and government reports, HHSA concluded that while anecdotal reports support adverse health effects, there are no epidemiological evidence-based studies to support direct pathological effects from wind turbines and that any potential impact on humans can be mitigated by following existing planning guidelines related to turbine placement.

6. Biology
   Throughout the processing of the Wind Energy Ordinance Amendment, concerns have been raised related to the potential biological effects of permitting small wind turbines under a ministerial process. While large turbines would still be subject to discretionary review and undergo project specific environmental analysis to assess and avoid biological impacts, small turbines would be permitted ministerially through a streamlined process.

This led to public concerns about potential effects to habitat and existing preserves, as well as issues related to direct impacts to birds and bats from turbine blades. As such, the proposed ordinance includes a number of provisions to minimize biological impacts. County staff worked closely with the state and federal Wildlife Agencies and environmental stakeholders to develop and incorporate design criteria that would avoid or minimize impacts to species and habitat. Examples include setback requirements from transmission towers and lines, blue line streams, known roost sites for bat species and known golden eagle nest sites. The ordinance also limits the area of ground disturbance around the base of the turbine tower and prohibits small turbines on ridgelines. Refer also to the discussion under Section E, Planning Commission Hearings and Actions, of this staff report for additional details regarding biological concerns and proposed siting criteria.

D. Environmental Impact Report

A draft EIR was prepared for the project pursuant to CEQA, and was circulated for public review from November 8th to December 23rd of 2011. For each environmental topic, the analysis of the proposed small wind turbines and MET towers regulations was provided followed by an analysis of the proposed large wind turbines regulations. In addition, project alternatives for both small and large wind turbine regulations were included and analyzed in the EIR.

The analysis of small wind turbines and MET towers concluded potentially significant environmental impacts related to aesthetics, biology, cultural resources, and fire hazards would result from the project. All feasible design criteria were included in the regulations for small turbines and MET facilities to minimize impacts. For example, small wind turbines are prohibited on ridgelines in order to minimize potential impacts to birds as well as to reduce potential adverse effects to scenic resources. While all feasible design criteria have been included, the project's adverse environmental effects would still be significant and unavoidable.

The analysis of large wind turbines concluded potentially significant environmental impacts related to aesthetics, air quality, agriculture and forestry resources, biological resources, cultural resources, fire hazards, noise, land use, and traffic/transportation would result from the project. Mitigation measures are proposed that will help to reduce these types of impacts. For example, a shadow flicker study requirement will be incorporated into the County CEQA Significance Guidelines for Aesthetics and will be required during the discretionary review process for large wind turbine Major Use Permits. The shadow flicker study will determine whether shadows created by the turbines will affect scenic areas or sensitive receptors and, more importantly, to determine whether changes can be included to reduce adverse aesthetic effects from shadow flicker. While all feasible mitigation measures have been included in the project, the environmental effects related to large wind turbines would still be potentially significant and unavoidable.

CEQA requires the EIR to describe a range of reasonable alternatives to the proposed project that would feasibly attain most of the project objectives but would avoid or lessen any significant environmental impacts. There are two project alternatives analyzed in the EIR, but they were not recommended by the Planning Commission: a Limited Small Wind Turbine Alternative, and a Limited Large Wind Turbine Alternative. The Limited Small Wind Turbine Alternative involves three components, as follows.

1. Reduced Project Area – Small wind turbines permitted without discretionary review would only be allowed in previously disturbed/developed areas.
2. Reduced Height – The maximum wind turbine tower would be 65 feet.
3. Fewer turbines – A maximum of two small wind turbines would be allowed on a legal lot. One additional wind turbine (three total) would be allowed when all turbines are mounted on an existing permitted structure.

The Limited Large Wind Turbine Alternative also involves three substantial changes as compared to the proposed project. The three main components of this alternative are described here.

1. Reduced Project Area-1 – This alternative would reduce the project area and shift development away from village areas by limiting turbine development to rural and semirural areas, as designated by the General Plan, and requiring a 2,000-foot setback from Interstate highways.
2. Reduced Project Area-2 – Large wind turbines would be permitted within wind resource areas classified as "fair" through "superb" and would not be permitted within "marginal" wind resource areas as shown on the Wind Resources Map.
3. Existing General Plan Policies – This alternative would retain the existing policies and language of the General Plan. As such, the policies in the Boulevard and Borrego Springs community plans that restrict wind turbine development would not be amended.

The County received 35 comment letters and emails during public review of the draft EIR. Based on these comments and Planning Commission actions, minor changes were made to the document. The proposed final EIR was made available to the public on March 26, 2013, which includes formal responses to the public comments received. County staff has also prepared CEQA Findings Regarding Significant Effects, a Mitigation Monitoring and Reporting Program and a Statement of Overriding Considerations for the proposed project (Attachment G).

E. Planning Commission Hearings and Actions

The Planning Commission held a total of five public hearings and one full day workshop related to the development of the Wind Energy Ordinance Amendment and associated environmental analysis. A summary of each hearing/workshop is available in Attachment J.

On July 20, 2012, the Planning Commission recommended that the Board adopt the proposed Wind Energy Ordinance Amendment and General Plan Amendment with certain changes that are described below. The recommended changes are included in the ordinance that is before the

Board for consideration today. This section describes the major issues and discussions that occurred during the Planning Commission hearing process.

1. Low Frequency Noise Waiver
   A setback waiver provision is proposed as part of the ordinance that allows decision makers to waive noise setback requirements if the project's benefits are found to outweigh its impacts. The waiver can be approved by the Planning Commission, and the Commission's decision is appealable to the Board.

   At the May 11, 2012 Planning Commission Workshop, staff presented a series of maps that reflected the land use and parcelization patterns of the primary wind resource areas in the unincorporated area. Due to the availability of wind resources, existing parcelization and proximity to existing transmission lines, the Boulevard community area is the most viable area within the County's land use jurisdiction for utility scale wind turbine development. Staff's analysis further found that the areas south of Interstate 8 within the Boulevard area are highly parcelized and contain a number of residences within the expected setback buffers of the wind resources.

   As a result of this analysis, the Planning Commission recommended that the Board not apply the noise waiver provision countywide, but limit it to the utility scale wind resource areas north of Interstate 8 within the Boulevard area. The intent of this recommendation is to encourage wind farm development to locate away from the most parcelized and developed region south of Interstate-8. The designated Noise Waiver Areas are shown on the Wind Resources Map (see Attachment E).

2. Health
   In recognition that wind turbines are an emerging and evolving technology and that research concerning the health effects from wind turbines lack current substantiated information, the Planning Commission directed staff to report back to the Commission in three years with a literature review of the most current research regarding the human health effects from wind turbines.

3. Biology
   In response to concerns raised by the Wildlife Agencies, the Planning Commission recommended the inclusion of additional siting criteria for small wind turbines relative to sensitive areas. The additional criteria include setback requirements from recorded open space easements, designated preserve areas and riparian vegetation. In addition, the Commission recommended that Administrative Permits (a discretionary permit) be required for small turbines proposed in Pre-Approved Mitigation Areas of the County's Multiple Species Conservation Program.

4. Miscellaneous
   The Planning Commission recommended that the provisions stated below be added to or

clarified in the proposed ordinance.

i. Update the small turbine certification provision to specify reliance on the California Energy Commission's May 23, 2012 List of Eligible Equipment.

ii. Update the pure-tone noise provision related to large turbines to incorporate language to address repeating sources of sound.

iii. Incorporate ordinance language to allow applicants to utilize an alternative turbine manufacture/model after a Major Use Permit application has been filed.

iv. Include ordinance language to ensure that large turbine sites are maintained and kept clean of debris/turbine parts.

v. Clarify the ridgeline definition and sensitive species setback provision related to small turbines.

Subsequent to the Planning Commission's action on July 20, 2012, the Board of Supervisors, on August 8, 2012, adopted amendments to some of the wind regulations in the Zoning Ordinance in connection with the approval of the privately-initiated Tule Wind project. The amendments exempt the Tule Wind project from the existing height and setback requirements for large wind turbines. Given the Board's action, staff added the same setback exemption to the proposed Wind Ordinance and referred the revised ordinance back to the Planning Commission on October 19, 2012, because the Planning Commission had not previously considered this exemption. (The elimination of the height limit in the proposed ordinance amendment made it unnecessary to include a height limit exemption for the Tule Wind project.) The Planning Commission considered and recommended adoption of the Tule Wind project zoning ordinance changes and also considered the issues related to grandfathering/exempting existing projects as described below.

5. <u>Grandfathering/Exempting Existing Projects</u>
Prior to the October 19, 2012 Planning Commission hearing, Iberdrola Renewables, the Tule Wind project applicant, submitted letters contending that the Tule Wind project is grandfathered under the existing Zoning Ordinance and further requested to be exempted from the proposed Wind Energy Ordinance or any future amendments to the code relative to wind regulations. Staff and County Counsel reviewed the applicable "grandfathering" provision in the current Zoning Ordinance (Section 1019) and determined that this provision does not apply. Section 1019 only applies if a permit application is pending when the Zoning Ordinance is amended. In such cases, the application must comply with the code that was in effect when the application was deemed complete. The section was never intended to apply to a project after the permit is issued. Once the permit has been issued, any changes to the Zoning Ordinance that do not affect the conditions in the permit would apply. In addition, any amendment to the permit or subsequent permits for

the project would be required to comply with the current code.

Staff reviewed the Tule Wind project in relation to the proposed Wind Energy Ordinance Amendment, and determined the Tule Wind project meets the provisions of the proposed ordinance amendments that would apply to the Tule Wind project.. However, one operational standard related to pure-tone noise cannot be evaluated for compliance prior to turbine operations and is not exempted or grandfathered under Section 1019 of the Zoning Ordinance. The Planning Commission considered Tule's exemption request at the October 19, 2012 hearing, and the Commission elected not to include it in the proposed ordinance amendment.

F. Policy Decisions

Given the project issues and Planning Commission actions outlined above, staff has identified five policy decisions/questions that are listed below for the Board's consideration.

1. Should small wind turbines be allowed in the Pre-Approved Mitigation Areas without discretionary environmental review?

   Under existing regulations, a single small wind turbine is allowed on a property regardless of the parcel's particular location. The Wind Energy Ordinance Amendment proposes to expand that allowance to three free-standing small turbines or five roof-mounted turbines allowed ministerially. During the Planning Commission hearing process, the Wildlife Agencies recommended a provision which would require a discretionary permit for any small turbines located on properties designated as Pre-Approved Mitigation Area in the County's Multiple Species Conservation Program to ensure that the placement and operation of the turbines conform to MSCP requirements. The permit granted to the County under the MSCP granted take authority under existing standards (a single small wind turbine). Thus, any additional turbines should be reviewed under a discretionary permit process to determine compliance with MSCP requirements. The Planning Commission agreed with this recommendation and, therefore, a section has been added to the draft ordinance requiring an Administrative Permit for small wind turbines proposed in existing Pre-Approved Mitigation Areas.

2. Should setback waivers be limited to the wind resource areas north of Interstate-8 in the Boulevard area?

   Project analysis discussed at the Planning Commission found that the areas south of Interstate 8 within the Boulevard area are highly parcelized and contain a number of residences within the expected setback buffers of the wind resources. Therefore utility scale turbine development is not viable south of Interstate-8 in the Boulevard community area. As a result, the Planning Commission has recommended that a setback waiver provision related to noise be limited to utility scale wind resource areas north of Interstate-8 within the Boulevard area. The setback waiver allows decision makers to waive noise setback requirements if the project's benefits are found to outweigh its negatives. The project's EIR evaluated the impacts of a setback waiver applied throughout large wind turbine project area identified in the proposed Wind Resource Map. Therefore, the Board has the option to not limit setback waivers.

3. Does the proposed project adequately address public health concerns?

   Public concerns have been raised regarding potential health effects from large turbines. In response, the HHSA conducted a review of research on the human health effect of wind turbines and issued a Public Health Position Statement. HHSA has concluded that, while anecdotal reports support adverse health effects, there are no epidemiological evidence-based studies to support direct pathological effects from wind turbines and that any potential impact on humans can be mitigated by following existing planning guidelines related to turbine placement. HHSA conclusions are consistent with other jurisdictions that have reviewed health concerns related to wind turbines. In addition, the Planning Commission has recommended that staff report back to the Commission in three years with a literature review of the most current research regarding the human health effects from wind turbines.

4. Does the proposed project adequately address concerns related to fire?

   Concerns have been raised that utility scale wind development may increase the risks of wild fire. Under the proposed ordinance, all large turbines will be required to obtain a Major Use Permit. Fire risks will be closely analyzed as part of the discretionary and environmental review process individual projects. Therefore, all projects have been, and will continue to be required to comply with County fire regulations, to complete a Fire Protection Plan and, as appropriate, to provide project specific mitigation that will be reviewed by the Local Fire Authority Having Jurisdiction, the County Fire Authority and ultimately, the County decision making body.

5. Should the Tule Wind Project be exempt from the proposed Wind Energy Ordinance Amendment?
   During the Planning Commission hearing process Iberdrola Renewables requested that the Tule Wind project be exempted from the proposed wind ordinance amendment. Staff reviewed the Tule Wind project in relation to the proposed Wind Ordinance, and determined that while the Tule Wind project was approved prior to the consideration of the ordinance before you today, the project still meets the provisions of the proposed ordinance amendments that would apply to the project. However, one operational standard related to pure-tone noise cannot be evaluated for compliance prior to turbine operations and is not exempted or grandfathered under Section 1019 of the Zoning Ordinance. Iberdrola Renewables has stated a concern that this pure-tone standard would require them to perform an additional study which they feel would delay or possibly make their project infeasible. Based on the proposed ordinance, the County would only

require evidence of compliance with the pure-tone standard if a complaint is received in the future. While no study is required by the County, Iberdrola Renewables has expressed the need to complete their own study as a matter of due diligence. The Planning Commission elected not to include an exemption for Tule in their recommendation because they felt the pure-tone provision was an appropriate protection to neighboring properties.

The Board may elect to exempt the Tule Wind project from the proposed pure-tone noise provision by incorporating an exemption specific to the Tule Wind project into the pure-tone provision (Section 6952 f.3).

Environmental Statement

An Environmental Impact Report (EIR) has been prepared for this project and is on file at the Department of Planning & Development Services as Environmental Review Number 09-00-003. A Notice of Preparation (NOP) soliciting input on the scope of the EIR was issued in September of 2010. The Draft EIR was made available for public review in November of 2011. Staff has prepared responses to comments received during public review. The NOP, EIR, comments and responses can be viewed on the project website and are attachments to this report (Attachment H).

Linkage to the County of San Diego Strategic Plan

Today's proposed actions supports the Sustainable Environments Initiative in the County of San Diego's 2013-2018 Strategic Plan by streamlining wind energy regulations and bringing them up to date with current technologies. In this way, the proposed action ensures that planning, development and infrastructure support the economy and a strong region.

Respectfully submitted,

USE "INSERT PICTURE" FUNCTION TO INSERT SIGNATURE

SARAH E. AGHASSI
Deputy Chief Administrative Officer

ATTACHMENT(S)

SUBJECT: WIND ENERGY ZONING ORDINANCE AMENDMENT AND GENERAL PLAN AMENDMENT TO THE MOUNTAIN EMPIRE SUBREGIONAL PLAN (BOULEVARD CHAPTER) AND BORREGO SPRINGS COMMUNITY PLAN TO ALLOW WIND ENERGY DEVELOPMENT, POD 10-007 (DISTRICT: All)

SUBJECT: WIND ENERGY ZONING ORDINANCE AMENDMENT AND GENERAL PLAN AMENDMENT TO THE MOUNTAIN EMPIRE SUBREGIONAL PLAN (BOULEVARD CHAPTER) AND BORREGO SPRINGS COMMUNITY PLAN TO ALLOW WIND ENERGY DEVELOPMENT, POD 10-007 (DISTRICT: All)

AGENDA ITEM INFORMATION SHEET

REQUIRES FOUR VOTES: [ ] Yes [X] No

WRITTEN DISCLOSURE PER COUNTY CHARTER SECTION 1000.1 REQUIRED
[ ] Yes [X] No

PREVIOUS RELEVANT BOARD ACTIONS:
February 25, 2009 (2) and September 15, 2010 (5) (Attachment I)

BOARD POLICIES APPLICABLE:
N/A

BOARD POLICY STATEMENTS:
N/A

MANDATORY COMPLIANCE:
N/A

ORACLE AWARD NUMBER(S) AND CONTRACT AND/OR REQUISITION NUMBER(S):
N/A

ORIGINATING DEPARTMENT: Planning and Development Services

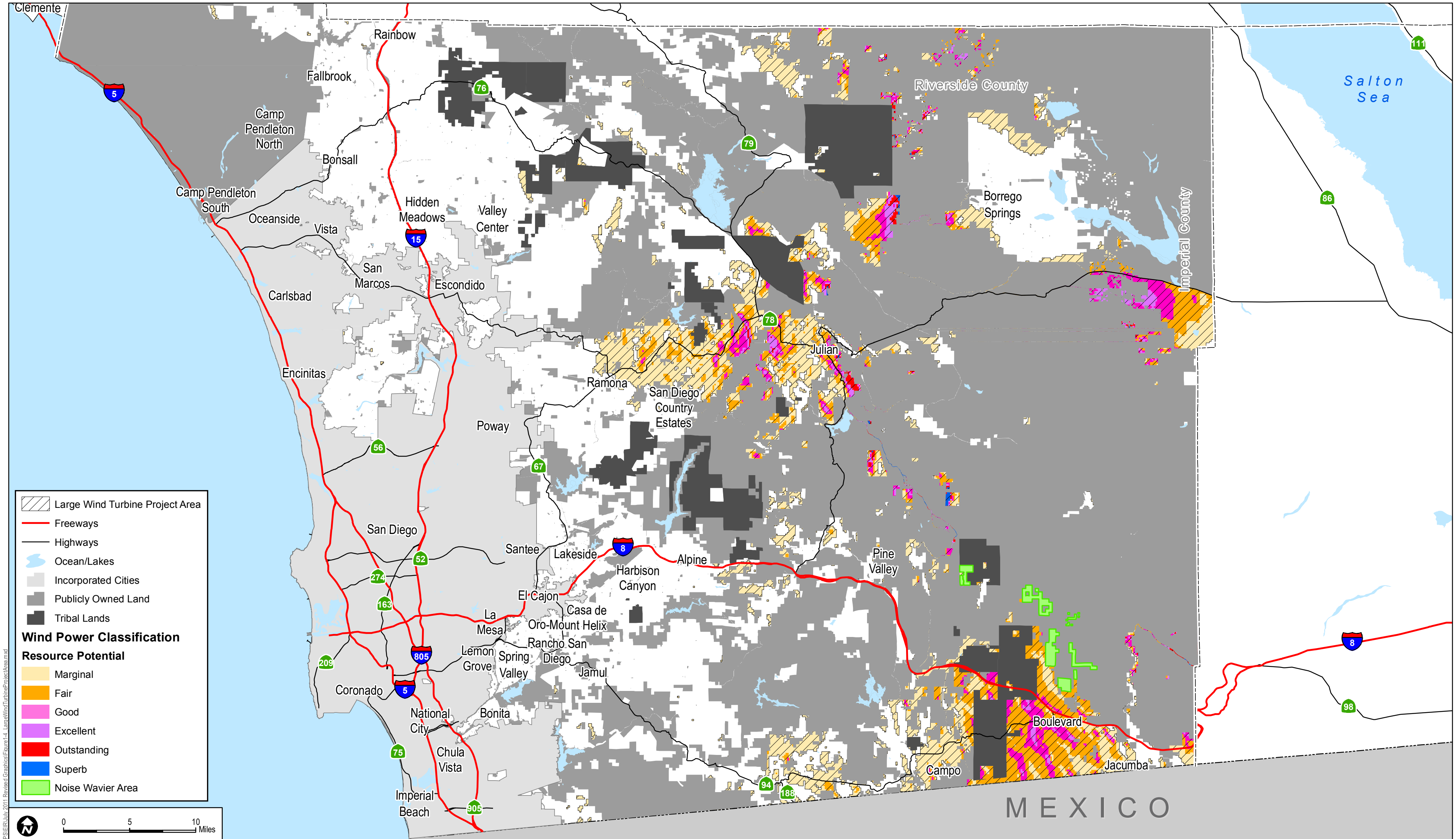
OTHER CONCURRENCE(S): Health and Human Services Agency
County Fire Authority

CONTACT PERSON(S):

Mark Wardlaw, Director	Matt Schneider, Planner/Project Manager
Name	Name
858-694-2962	858-694-3714
Phone	Phone
Mark.Wardlaw@sdcounty.ca.gov	Matthew.Schneider@sdcounty.ca.gov
E-mail	E-mail

EXHIBIT
5

Attachment E
Wind Resource Map



DUDEK

6281-01

SOURCE: Wind Data: NREL 2009; SanGIS, SANDAG; USGS

FIGURE 1-4

Proposed Wind Resource Map

Wind Energy Ordinance Draft EIR

Per Section 6952 Large Wind Turbine, b.

EXHIBIT
6

Attachment D
Resolution Approving GPA 12-003
Exhibit A & B Strikeout/Underline

County of San Diego General Plan Update

Boulevard Subregional Planning Area

MOUNTAIN EMPIRE SUBREGIONAL PLAN

August 2011

CERTIFICATE OF ADOPTION

I hereby certify that this Plan, consisting of text and exhibits, is the Boulevard portion of the Mountain Empire Subregional Plan and is a part of the San Diego County General Plan, and that it was considered by the San Diego County Planning Commission during nine hearings that occurred from November 6, 2009 through the 20th day of August 2010, and adopted by the San Diego County Board of Supervisors on the 3rd day of August 2011.

Attest: ________________________
ERIC GIBSON, Director
Department of Planning and Land Use

Introduction to the Community Plan

Purpose of the Community Plan

Community and subregional plans, adopted as an integral parts of the County of San Diego's General Plan, are policy plans specifically created to address the issues, characteristics, and visions of communities within the County. These distinct communities each have a distinct physical setting with a unique history, culture, character, life style, and identity. Community and subregional plans, thus provide a framework for addressing the critical issues and concerns that are unique to a community and are not reflected in the broader policies of the General Plan. As part of the General Plan, this Community Plan is consistent with all other parts of the County's General Plan.

Used in conjunction with the General Plan, a community or subregional plan (Plan) is a key tool for the public, Community Planning/Sponsor Groups, County staff, and decision makers to identify the existing conditions and development that positively contribute to its character and should be conserved, as well as the location, scale, and design of desired new land uses, and community facilities. The Plan's policies require that development be comparable to, or transition with, existing development to ensure that new development "fits" with the community and enhances the community's vision.

Scope of the Community Plan

This portion of the Mountain Empire Subregional Plan covers the Subregional planning area of Boulevard, which is illustrated in Figure 1. This planning area includes approximately 55,350 acres and contains the communities of Boulevard, Manzanita, Live Oak Springs, Tierra Del Sol, Crestwood, Jewel Valley, McCain Valley, Miller Valley, and a portion of Bankhead Springs. (See Figure 2 on page 3)

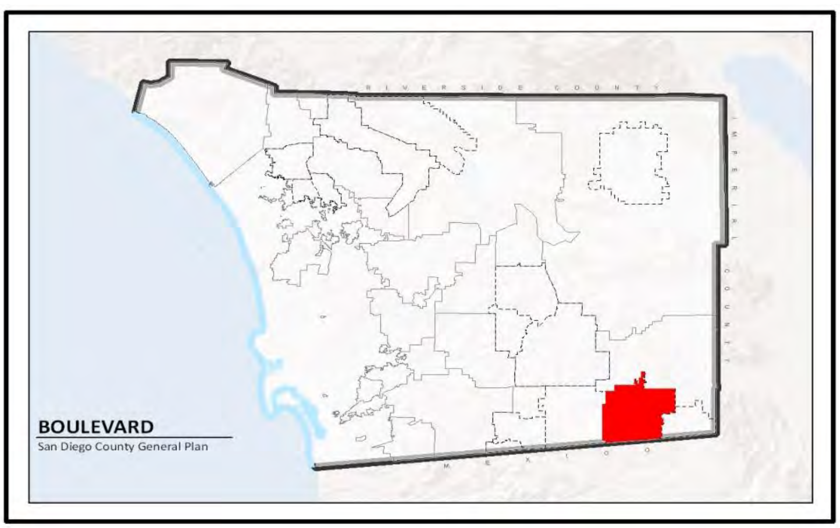


Figure 1: Boulevard Subregional Planning Area

Content and Organization of the Community Plan

The following is the content and organization of the Plan and a brief description of each of these sections of the Plan.

Vision Statement. A vision statement that expresses community values about its distinguishing character, quality of life, mix of uses, development form and scale, public realm and places, mobility, economy, environment, safety, and relationships to adjoining communities, open spaces, and the region.

Community Profile/Community Character. A description of the Community's existing character, uses, environment, conditions, factors influencing future changes, and key planning issues.

Elements. Due to the breadth and detail of the Countywide elements, communities may find it unnecessary to identify unique goals and policies for all of the following subjects. Therefore, not all communities may use all of the following elements:

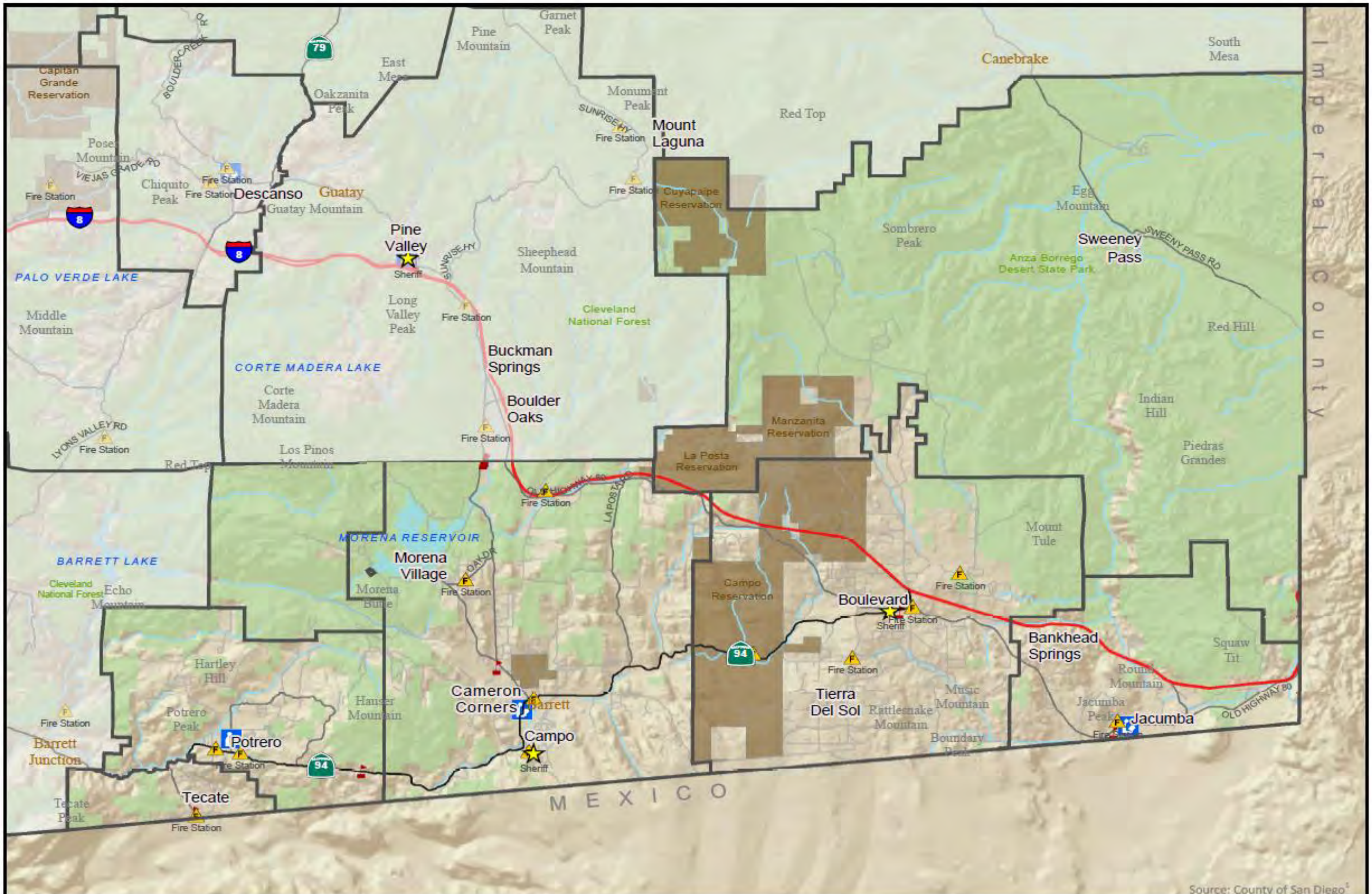
Land Use. Application of countywide land use designations and goals and policies to reflect the distinguishing characteristics and objectives for the Community. These may address objectives, such as a specific mix of uses; priority development locations and projects; needed community facilities; development form and scale; architectural, landscape, and public realm design characteristics; land use compatibility; and similar topics.

Mobility. Delineates the roadways, transit corridors, bicycle paths, equestrian paths, and pedestrian trails that supplement and complete the road networks defined by the countywide Mobility Element. Policies may also address unique Community issues, such as neighborhood traffic intrusion, commercial district parking, local public transit, and infrastructure improvements.

Conservation and Open Space. Application of countywide Conservation and Open Space Element policies to address issues associated with designated plant and animal habitats, agriculture, water bodies, open space, and other specific resources within the Community Plan area. This may encompass actions to protect resources that may uniquely apply to specific sites or resources.

Safety. Application of countywide Safety Element policies to address specific safety issues in the Community Plan area. This may encompass actions to protect residents and development from defined risks.

Noise. Application of countywide Noise Element policies to address specific source issues and impacts in the Community Plan area. This may consider differentiation of land use compatibility standards to reflect community character and location—for example, villages located in rural setting and hillsides in contrast to those located adjoining urban and suburban development.



MOUNTAIN EMPIRE CONTEXT MAP

San Diego County General Plan

Figure 2

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Public Involvement in Preparing the Community Plan

Since 2005, there have been 36 meetings on the Boulevard Community Planning Group that has discussed the General Plan Update, including many in 2008 and 2009 where the community plan was drafted.

How to Use the Community Plan

To use this Plan, the General Plan elements should first be reviewed for applicable goals and policies and the General Plan Land Use Maps (General Plan Appendix LU-A-11.1) should be referred to when applicable to determine the type, location, and density of land use allowed. This plan supplements these Countywide policies and diagrams and further directs the land uses and development desired to achieve the community's vision.

Implementing, Monitoring, and Amending the Community Plan

It shall be the responsibility of the County to implement the Plan, to monitor progress towards its implementation, and to amend the Plan when necessary. Each Plan includes the community's key issues, as well as the goals and policies to address the issues identified. For each policy or set of policies, there is one or more implementation action identified to carry it out. The implementation program also identifies the County department or agency responsible for its implementation, where appropriate. Many of the policies will be implemented by County Ordinances and other discretionary actions, such as zoning, design guidelines, and development standards in the County Zoning Code.

Implementation of the Plan should be monitored on a periodic basis by the County and the Community Planning/Sponsor Group for progress towards its implementation. For compliance with State law, the Plan shall be reviewed no less than once annually so that its implementation status may be included in the County's Annual General Plan Report to the State. The annual review provides the opportunity for the Plan to be updated and amended, as appropriate, to reflect changes in the community vision, conditions, or attitudes.

Community Background

Following the arrival of the Spanish, the establishment of their coastal mission system, the Civil War, and the Mexican-American War, local history includes a mid-1800's influx of settlers and prospectors from varied ethnic backgrounds and countries, sprawling 40,000 acre ranches, cattle and cowboys, sheep and shepherds, and trailblazers, like John Spreckles' and the San Diego and Arizona Railroad, which he blasted through the rugged Tecate Divide/HiPass area and the Carrizo Gorge. The railroad, with the famous Goat Canyon Trestle, nicknamed the Impossible Railroad, was completed in 1919, with the help of Chinese, other immigrant laborers, young high school students, and just about anyone else willing to work hard under difficult circumstances for very little pay. Primitive camps were set up along the route.

b. Relationship to Adjoining Communities

Boulevard maintains a rural relationship to its mountain neighbors who share common goals, issues, and realities. Our neighbors to the west include the Campo Kumeyaay Nation, Campo, Canyon City, and Potrero. The community of Jacumba is to our east.

c. Environmental Setting

Straddling the Tecate Divide, Boulevard is known for its vast scenic vistas, open landscapes, uncluttered ridgelines, boulder strewn outcroppings, and oak filled valleys. The area is totally dependent on groundwater resources and importation of water is not a viable option. Groundwater is key to survival for both human and natural communities. To ensure long-term availability of groundwater, future development will generally require minimum lots sizes of 20, 40 or 80 acres. In the event of further decline in annual rainfall and groundwater recharge and resources, even larger lots sizes, or some form of building moratorium may prove necessary to prevent overdraft conditions that can threaten public health and safety.

Due to the transitional nature of the Eastern San Diego County, it is one of the most biologically diverse regions in the world. The Multiple Species Conservation Program process for East County originally identified approximately 250 species that needed protection, including endangered, rare, threatened, and sensitive species. The Boulevard area is well-known amongst bird-watchers for its wide variety of birds, including Golden eagles, Coopers hawks, red tailed hawks, prairie falcons, turkey vultures, great horned owls, barn owls, blue herons, turkeys, quail, doves, numerous songbirds a plethora of hummingbirds, a variety of bats, and more, especially during the spring and fall migrations. Even Canadian geese, ducks, pelicans, and other seabirds pass through on their way east and south. In August of 2007, a California Condor, from a release site in Sierra San Pedro de Matir National Park in Baja California, was documented flying north along the Sierra Juarez Mountain ridge and into the San Diego County, in the In-Ko-Pah Mountain McCain Valley area of Boulevard.

The Boulevard area is also home to big horn sheep, bobcats, mountain lions, mule deer, desert woodrats, horned lizards, legless lizards, a wide variety of rattle and other snakes, and more.

Due to massive firestorms in 2003 and 2007, and the destruction of significant amounts of acreage and habitat and potential type conversion, Boulevard and other areas that did not burn experienced an added influx of wildlife seeking food and shelter. The McCain Valley Resource Management area and large ranch lands in the Jewel Valley, Miller Valley, and Crestwood / Thing Valley areas are key to protecting and maintaining critical grasslands, riparian areas, wetlands, and viable wildlife corridors and linkages.

Climate change is expected to further increase the biodiversity of our mountainous region with lower elevation flora and fauna migrating to the Boulevard area. These rich habitats and wildlife resources are highly valued and will be protected and defended with vigor. Projects or development that will have adverse effects on the integrity and viability of existing habitat, riparian and wetland areas, wildlife corridors, and biodiversity will be rejected.

d. Existing Land Uses and Community Character

Outside the rural village area, and the small enclaves of Tierra Del Sol, Live Oak Springs, Witcher's Grove, and Calexico Lodge, the Boulevard area is characterized by large lot single-family residences; large and small ranches historically used for cattle grazing, livestock production and horses; and small scale truck gardens, fruit trees, and dry land farming. Undeveloped meadows, extensive open spaces, and ridgelines provide for a sense of breathing room, as well as a quiet and slow-paced respite from the often hurried and noisy urban environment. Easy access to McCain Valley Resource Conservation Area and National Land Cooperative, other parks, protected and public lands, trails, scenic Historic Route 80, historic landmarks, Lark Canyon Off-Highway Vehicle (OHV) Park and campgrounds, along with Boulevard's gorgeously dark skies, and generally quiet country roads, attract visitors and tourists, including outdoor, motorcycle, bicycle, equestrian, and photography enthusiasts, and scientists from afar. These unique and highly valued resources provide for a tourism/recreation based economy that helps to support local businesses. They deserve protection and fostering.

The tribal lands and families belonging to the Campo, La Posta, and Manzanita Bands of Kumeyaay represent an ancient and ongoing occupation and knowledge of the land, which is rich with archeological and cultural resources. Remnants of Boulevard's western heritage are also represented by the old McCain Ranch house, the Miller Ranch adobe house, and modern day cowboys and livestock operations. Rock and rammed earth buildings built by Mr. Derwood Johnson in the early 1900's and the tale, tale thump, thump of driving on the concrete slabs of Historic Route 80, are also physical and nostalgic reminders of another era that add to Boulevard's rural and rustic character and charm.

e. Existing Circulation and Mobility

The existing road network serving the Boulevard / Live Oak Springs area is described below:

- Interstate-8 (I-8) — This four-lane freeway provides for the majority of east-west Southern California traffic flow through the Boulevard area, bypassing the rural towns in a rush. Crestwood Road and Ribbonwood Road (Boulevard exit) are two on-off ramps that serve the Boulevard / Live Oak Springs area, and the Campo, La Posta, and Manzanita tribal communities.

- Historic Route 80 — This two-lane predecessor to I-8 provides for a slower paced step-back-in-time travel route that runs through the hearts of the little communities of Descanso, Guatay, Pine Valley, La Posta, Live Oak Springs, Boulevard, Bankhead Springs, and Jacumba, and through scenic areas, which include pleasing views of boulder studded hills and oak studded valleys, small and large ranches, livestock, riparian and wetland areas, and stunning views.
- SR 94 — This two-lane State Highway connects I-8 and Boulevard to rural communities to the west, including Cameron Corners, Campo, Canyon City, Potrero, Tecate, Dulzura, and Jamul. SR-94 travels along much of Campo/Cottonwood Creek riparian corridor, which is full of lush valleys, wetlands, steep rocky mountain sides, and winding canyons.
- Campo, La Posta, and Manzanita tribal community roadways — These roads also link into Historic Route 80 and SR-4 via Crestwood Road, Church Road, Canebrake Road, and La Posta Truck Trail, BIA 10 (also known as East Indian Road), and BIA 15. Only the paved roads are open to the public. There are four paved north-south public collector roads in Boulevard, including Tierra Del Sol, Ribbonwood Road, Jewel Valley Road, and McCain Valley Road.
- Tierra Del Sol Road runs along the spine of the Tecate Divide and connects Historic Route 80 and SR-94 with the old community of Tierra Del Sol, previously known as HiPass and Tecate Divide, where the passenger train used to stop and drop off the mail and supplies. The views from Tierra Del Sol Road are breathtaking in the sheer amount of territory that can be seen in virtually all directions with virtually no obstructions. Tierra Del Sol Road continues on south and west, and connects the neighborhoods along the US/Mexico border. It turns into Shockey Truck Trail (also called the East West Road), which loops back along the southern boundary of the Campo Reservation, through Bureau of Land Management (BLM) land, and on into Campo via SR-94. Extensive views of Northern Baja are enjoyed from this route.
- Ribbonwood Road (SR-94) runs north of Historic Route 80 and has access ramps for I-8 east and west. It also runs further to the north, beyond I-8, and provides access to expansive ranch lands, residential neighborhoods, and a parcel belonging to the Campo Band.
- Jewel Valley Road runs south from Historic Route 80 towards the US/Mexico border. It interconnects with various private unpaved side roads that snake around in general east-west and north-south directions. Jewel Valley Road meanders along a pretty valley filled with towering oaks, numerous springs, and incredible boulder arrays. The scattered residences and large ranch properties, share gorgeous and far-reaching views into Northern Baja. Lake Domingo and the Lakeside Sportsman Club are also accessible via Jewel Valley Road.

- McCain Valley Road runs north from Historic Route 80, under I-8, and provides access to the McCain Valley Conservation Campo, several large ranches, the historic McCain family ranch house, McCain Valley Resource Conservation Area and Land Cooperative, and the Lark Canyon OHV Park and Cottonwood Campground. McCain Valley Conservation Area provides ample room for a wide variety of recreation and hobbies, and is the most visited area in the BLM's Eastern San Diego County Resource Management Area.
- Private roads serve as ingress and egress access for the majority of residences and properties in the Boulevard area. They are generally deeded easements that cross multiple private properties. These are not public access roads and they do not receive public funding for maintenance or repair. Those who have deeded rights to use the roads are responsible for maintaining them at their own expense. Private Road/No trespassing signs should be respected. The same is true for roads on tribal lands. In general, public access roads are those built, surfaced, and maintained with public money.
- An unnamed dirt access road runs intermittently along sections of the US/Mexico border fence.

f. Public Safety

<u>Law Enforcement</u>

Noise complaints in the Boulevard area are difficult to deal with due to a lack of adequate law enforcement.

Community Vision

Who Are We:

The Boulevard / Live Oak Springs area is a small remnant of the previously extensive territory of the indigenous people most commonly known as the Tipai or Kumeyaay. It is still home to several Kumeyaay Bands, including the Campo, the La Posta, and the Manzanita, who have survived despite many natural and manmade hardships and struggles. Along with the ongoing Native American influence, culture, and their incredibly rich historic, and archeological resources, a strong Spanish / Mexican / and American influence and western heritage has also played very interesting roles, both good and bad, in who we are today.

Despite the construction of Hwy 80 and I-8, and the boom and bust cyclical influx of new residents, Boulevard has still managed to retain its rugged rural character and quality of life along with wide open spaces, expansive uncluttered views, and a sense of stepping back into a bygone era.

Most non-native locals are drawn to Boulevard's backcountry by a love of open space and a slower paced rural life style, free from smog, traffic congestion, noise, and crowds. We envision that Boulevard will remain a rustic, quiet, slow-paced, low-density rural community. Our goal is to achieve a thriving yet charming Boulevard town center for shops and businesses along Historic Route 80, along with a quaint resort and shops available at Live Oak Springs. All shops, service providers, and restaurants will be small, locally owned, well patronized, and will provide good service to residents and tourists alike. Storefronts will share a rustic, step-back-in-time theme. There will be no franchise logos or bright flashing neon lights.

Many residents will telecommute for work, work for local educational facilities, for law enforcement and border security agencies, at the local tribal gaming, entertainment, and other enterprises, and/or operate small home-based cottage, art related, and/or small scale livestock, equestrian, and produce related businesses. The larger surrounding community, which includes our Kumeyaay neighbors, will interact in a positive way working towards common goals of mutual benefit.

Community Character:

Boulevard's unique transitional location, which straddles the Tecate Divide between the Laguna Mountains above and the Yuha and Anza Borrego Deserts below, provides generous portions of open, vast, and soul-soothing views of the surrounding Laguna, In-Ko-Pah, Jacumba Mountains, and Sierra Juarez Mountain ridgelines. These geographically extensive and expansive viewsheds are highly valued assets. Protecting these significant visual resources,~~ and keeping them free of industrial, energy, communication, and other infrastructure and clutter, is key~~helps to retain~~ing~~ Boulevard's slow-paced ~~non-industrial~~ rural community character, and to preserv~~ing~~e a sense of untouched time and place.

Open spaces, parks, and accessible recreation areas, such as the McCain Valley Resource Conservation Area and Land Cooperative, the Cleveland National Forest, Table Mountain, the Carrizo and Jacumba Wilderness Areas, In- Ko-Pah, and more, help to preserve our highly valued visual resources as well as a sense of time, place, and breathing room. Our night skies remain dark and beautiful helping Boulevard to achieve a Dark Sky Community designation. The San Diego Astronomy Association's expanded Tierra Del Sol Observatory will continue to draw tourists, scientists, and researchers, from around the world.

The preservation of agriculture, small livestock, equestrian, and produce operations, along with large lots for single family residences, is also key to retaining a rural community character and quality of life. The preservation of historic buildings and structures in the surrounding areas, such as the adobe Miller Ranch House in Miller Valley, the Wisteria Candy Cottage, the Hill family rock house (now known as Fossil Ranch), and the McCain Ranch House in McCain Valley, and especially along and near Historic Route 80, such as the rock and stone houses and structures near the junction of Jewel Valley Road, is also key to protecting and preserving rural character and a sense of time and place. It is our goal that these historic assets and resources will be documented, preserved, and restored. Some may be held in private hands and others may be used as local specialized museums and/or research libraries.

Growth is managed at a slower rural pace, with new single family residences built on existing lots, on minor lot splits, or as second-dwelling units. No master-planned, clustered, or cookie-cutter subdivisions impair the rural landscape or over crowd the quiet country roads. The majority of homes will rely on individual wells and septic tanks. There are small individually-owned businesses and an absence of franchise logos and bright/flashing neon lighting. Government and public facilities are compact, built to be energy efficient and self-reliant, and blend in with the natural landscape, while not straining or degrading the area's natural resources or generating water or light pollution.

Circulation and Mobility:

The routes people and vehicles move around and through the area continues to remain the same, other than the addition of a good trails system which now interconnect region-wide trails with extensive state-wide and nationwide trail systems and networks. This extensive trails system encourages multi-modal travel around the area.

Community Services and Infrastructure:

Our well funded award-winning Boulevard and Jacumba Compact Elementary School and Mountain Empire Junior-Senior High School (including home school programs), our Boulevard Fire & Rescue Department, library, medical clinic, and community center are all small scale, safe, conveniently located, energy efficient, self-reliant, and sustainable. Together, they function in an efficient and kind manner to provide for the community's needs, including child and senior care, arts, activities, and social gatherings.

Environmental Resources and Sustainability:

Our area is totally reliant on fragile and finite groundwater resources. The need for long-term sustainability of our critical groundwater and other natural resources are better understood and respected, as are the need to protect them. Surveys and new technology have deepened our knowledge of the natural limitations and carrying capacity of the land and water. Ancient grizzled oaks and young oak nurseries are valued and well protected. Homes are scattered around on larger parcels with lots of breathing room. The Tecate Divide, which runs in a general north / south angle between Boulevard and Live Oak Springs, is appropriately named as it is a true geographic divide. Surface waters on the western side flow towards the Pacific Ocean, while surface waters on the eastern side flow towards the Imperial Valley desert and the Sea of Cortez in Northern Baja.

The area that extends west from the spine of the Tecate Divide, roughly along Tierra Del Sol Road and the Tierra Heights area, is located within the boundaries of the federally designated Campo/Cottonwood Creek Sole Source Aquifer.

The air and water are clear, sweet, and free of contaminants. The night skies are dark and free from light pollution. The stars stand out like sparkling diamonds on black velvet sky, attracting star gazers from around the world. The Boulevard community has become largely energy self sufficient, gradually adopting various renewable, non invasive and unobtrusive energy sources, as well as energy efficiency and conservation methods. On-site and/or close to point of use residential scale renewable energy projects are properly located, managed, and maintained. Community recycling facilities are welcomed and widely used contributing to a sustainable and energy efficient future. There is no need for new landfills as the region continues to comply with re-use and zero waste standards and requirements.

Our native plants are judiciously used in our water conserving landscaping. Our native flora and fauna have been catalogued and are thriving in balance, because we have learned their traditional values and uses and we know more about their needs and purposes within the circle of life. Our many archaeological sites, including the ancient rock paintings and carvings, ground alignments, solstice markers, old camps, and burial sites, have been respectfully researched with the wise input of the appropriate local Kumeyaay elders and authorities.

Large ranch properties continue to be acquired/purchased and placed in a public trust, when made available by willing owners. These important properties are thoughtfully managed and maintained with innovative and constructive ideas by many local volunteers. To retain the rural ranching atmosphere, ambiance, and character, livestock grazing, ranching, and small-scale produce operations are encouraged to continue in a manner that respects the natural limitations and the carrying capacity of the land.

Economy:

Many residents telecommute for work, work for local educational facilities, law enforcement and border security agencies, at local tribal gaming, entertainment, and other enterprises, and/or operate small home-based cottage, art related, bed and breakfast lodgings, or livestock and produce businesses.

The reliance on limited and vulnerable groundwater resources, the lack of extensive infrastructure, and the distance to the urban areas, zoning and land use ordinances, along with community preferences, provides a natural deterrent to major industrial activities.

Boulevard generates attractive and non-invasive draws to help support local businesses and the broader community. Our beautiful backcountry is the ideal location for a community of artists, musicians, and writers, who enrich the community, and provide a draw for tourists with their creative offerings in galleries, community scale concerts, and workshops. A local farmer's market/craft fair is a welcome addition. The local Kumeyaay have achieved their goal of financial success through their gaming and entertainment operations and are expanding their economic base into several profitable, life-enhancing enterprises, providing many local jobs. Their water and wastewater systems are well-funded, well run and maintained. Their award-winning artificial wetlands have eliminated and solved any previous wastewater problems, and set an example for other small water and waste water systems. A Kumeyaay museum and information center is a welcome addition to the community and serves as a tourist attraction, source of employment, and as an outlet for handcrafted tribal arts. The Kumeyaay Educational Center offers university extension courses and classes in sustainable living from natural resources and in Kumeyaay history, culture, and language.

Safety:

Residents have come to understand and respect new advances in fire and native habitat management, which have made Boulevard and the backcountry a safer place to live. The Boulevard Fire & Rescue Department and law enforcement agencies are well funded, fully staffed with local residents, and provide prompt, efficient, and reliable service to the community and visitors. The U.S. Government fully enforces the immigration laws of the nation, including interior enforcement and employer sanctions. The local border is calm and quiet with low-key homeland security patrols and surveillance. No stadium lights or other invasive lighting are used

Human and Social Well-Being:

Local residents, visitors, land managers, law enforcement agents, and political leaders value the land, the open spaces, and the community where they live, work, and/or play. The local trails system connects with regional and national trail systems and provides healthy recreation opportunities for walkers, hikers, mountain bikes, and equestrians. Local OHV Parks are family friendly, well managed, maintained, and protected from encroachment.

Goals, Policies, & Implementation

1. Land Use (LU)

Village/Rural Village Boundaries

Boulevard's Rural Village Boundary is shown as Figure 3 on page 19.

Land Use Diagram

The Land Use Map is included as Figure LU-A-11.1 in the County General Plan Land Use Maps Appendix.

1.1. Community Character

Issue LU 1.1 The ability to experience open spaces, extensive views to local and distant horizons, abundant wildlife and unfragmented habitat, grazing livestock, and a sense of stepping back in time, is essential to preserving Boulevard's rural and rustic quality of life and community character. ~~Industrial scale structures (above two stories), facilities, and~~ <u>P</u>~~p~~rojects~~,~~ ~~that are often built to provide services to those in urban areas~~ should not degrade and detract from the stunning visual resources, clutter free horizons, and the rural quality, character, and atmosphere that attracts residents, visitors, and outdoor enthusiasts to Boulevard and the backcountry.

Goal LU 1.1 The continued maintenance of a rural~~,~~ ~~non-industrial~~, lifestyle and community character exemplified by a pattern of residential and agricultural uses on large lots outside the Rural Village, along with the protection and preservation of open landscapes, unique and geographically extensive views and vistas, dark skies, steep slopes, canyons, and floodplains, while accommodating moderate, responsible, and sustainable growth at a slower rural pace.

Policy LU 1.1.1 Prohibit higher density, clustered subdivisions, or industrial-scale projects or facilities that induce growth and detract from or degrade the limited groundwater resources, water and air water quality, visual and natural resources, abundant wildlife, and historic rural character of the Boulevard area. <u>Renewable energy projects, such as solar and wind projects, are not "industrial-scale projects or facilities" for purposes of this Community Plan.</u>

Policy LU 1.1.2 ~~Require~~ <u>Encourage</u> development to protect the quality and quantity of ground and surface water resources, air quality, dark skies, visual resources, and low ambient noise levels, as well as retain and protect the existing natural and historic features characteristic of the community's landscape and natural environment.

Policy LU 1.1.3 ~~Require~~ <u>Encourage</u> development to respectfully incorporate existing topography and landforms, watersheds, riparian areas, oaks, and other native vegetation and wildlife, ridgelines, historic and cultural resources, views, and sustainability design factors..

Policy LU 1.1.4 Require commercial and public development along scenic and historic routes to apply designs standards that will blend the development in with the terrain and rustic south western nature of the community character, while keeping outdoor lighting to an absolute and well shielded minimum.

Policy 1.1.5 Require development to utilize protected courtyards, porches, arcades, verandas and overhangs as a means to reduce energy consumption, provide shade, and add rustic character to buildings.

Policy 1.1.6 Require landscaping in new development to emphasize the use of xeriscape design with native, drought-tolerant, and fire-resistant plants to conserve water resources and help prevent the spread of fire.

Goal LU-1.2 The preservation of groundwater resources, community character, and protection of sensitive resources in the Boulevard Subregional Planning Area.

Policy LU-1.2.1 Require lot sizes, except through planned development, lot area averaging, or specific plan projects, to be no smaller then;

- 50% of the size indicated on the Land Use Map, without clustering or lot averaging, for Semi Rural 4 and higher densities, or
- Eight acres for Semi Rural 10 and lower densities.

Implementation LU-1.2.1 Revise the Zoning Ordinance to incorporate the new lot sizes

Example: Semi Rural 2, 1 du/2 acres indicates a lot size of 2 acres. 2 acres x 50% = 1 acre minimum lot size

Policy LU-1.2.2 Allow further reductions in minimum lot sizes indicated in Policy LU-1.2.1, through planned development, lot area averaging or specific plan projects, only when setbacks and building scale and design are appropriate to retain community character in the area, and when such reductions will not negatively impact groundwater resources.

The Conservation Subdivision Program (CSP) encourages residential subdivision design that improves preservation of sensitive environmental resources in a balance with planned densities and community character. The CSP allows for reductions in lot size through Lot Area Averaging and Planned Residential Developments, with specific findings and discretionary review. More information on these requirements is available in the Zoning and Subdivision Ordinances.

Policy LU-1.2.3 Require planned developments, lot area averaging or specific plan projects to have minimum lot sizes of four acres or the average lot size of adjacent parcels, whichever is smaller; provided the project does not have more significant impacts to groundwater resources then a conventional subdivision and uses a shared water system.

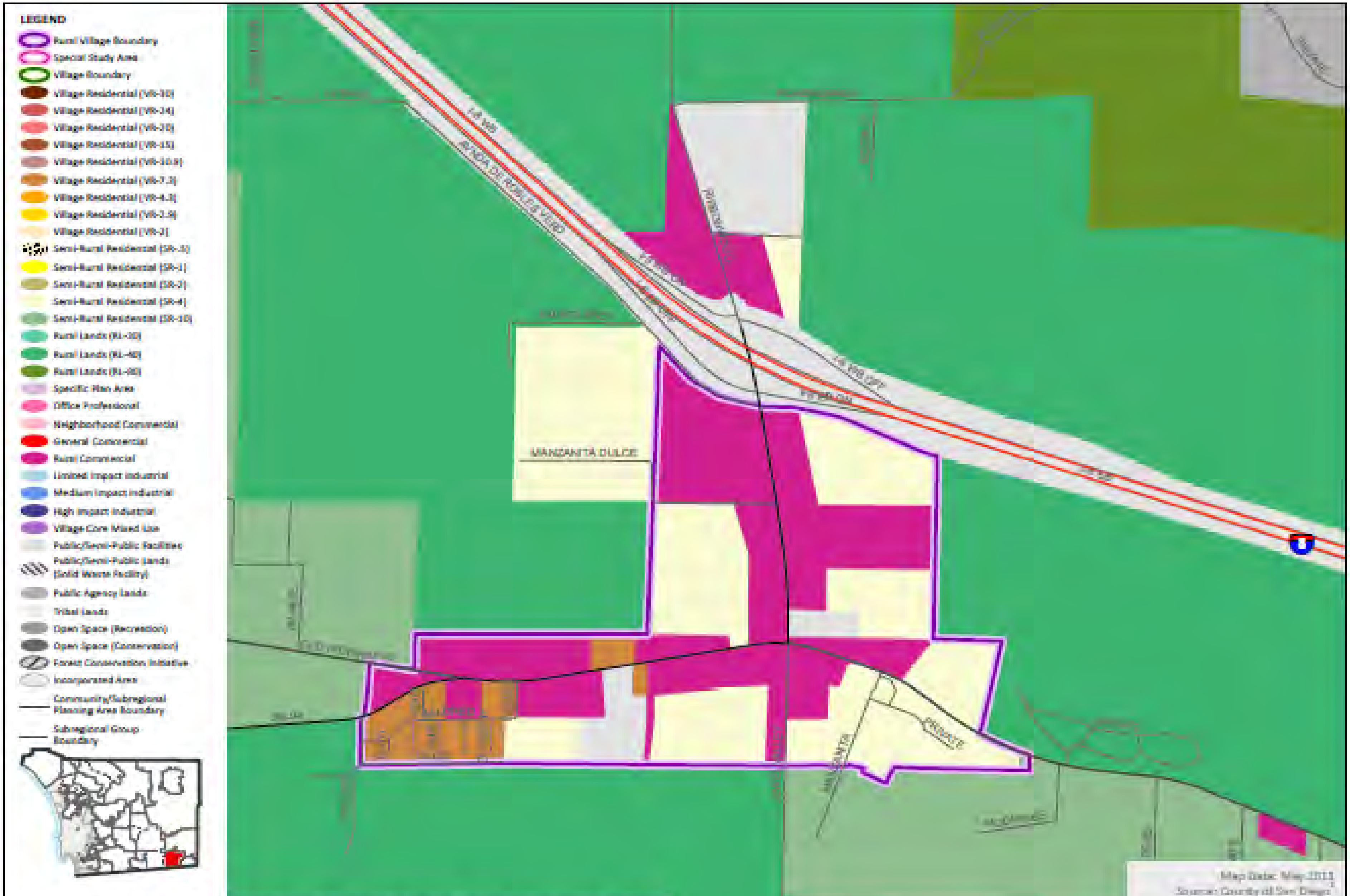
> The Groundwater Ordinance of the County of San Diego contains minimum parcel size requirements, associated with the Groundwater limitations map that can not be reduced unless through Lot Area Averaging, conservation subdivision programs, or the use of a Public or Private Water Service Agency.
>
> Projects that use Lot Area Averaging or the Conservation Subdivision program may not reduce parcel sizes below 67 Percent of the required minimum parcel size, 7.37 or 5.37 acres in the majority of Boulevard and must retain the overall average density that could be obtained per the minimum parcel sizes.

Issue LU 1.2 Regional infrastructure, public facilities, and ~~industrial~~ large scale energy generation and transmission projects are often proposed in rural and low-income areas. These large projects can degrade and fragment ranch lands, neighborhoods, highly valued visual resources, scenic viewsheds, ridgelines, and native habitat, including those on tribal, public, and protected lands.

Goal LU 1.2 The protection of the integrity and value of the visual, historical, cultural, and natural resources along with agricultural, ranch, and public lands. All of which make Boulevard a nice place to live, work, and play.

Policy LU 1.2.1 Encourage and promote local and on-site energy conservation, residential-scale renewable energy production, and zero waste recycling goals that will help ~~eliminate~~reduce the need for ~~industrial~~ large scale energy generation projects and facilities.

Policy LU 1.2.2 Require development, including regional infrastructure~~,~~ and public facilities, ~~and industrial scale energy generation and transmission projects,~~ to comply and maintain a rural bulk and scale in accordance with Boulevard's community character. Renewable energy projects, such as wind and solar projects, are not "regional infrastructure or public facilities" for purposes of this policy.



BOULEVARD RURAL VILLAGE BOUNDARY

San Diego County General Plan

Figure 3

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1.2 Community Growth Policy

Issue LU2.1 Maintaining and protecting Boulevard's rural and rustic charm, and reliance on a tourism/recreation based economy, requires the avoidance of dense, cookie-cutter style urban/suburban housing, and the homogenized franchise outlets/amenities that go with them and tend to gut unique community character and appeal.

Goal LU 2.1 Increased community activity involving the designation of Historic Route 80 and increased opportunities for small business, recreation, and tourism to display the historic, natural, and cultural resources that are prevalent through out the region.

Policy LU 2.1.1 Promote Boulevard's unique community character, resources, ambiance, and appeal to encourage and support business opportunities in Boulevard that display the historic, natural, and cultural resources that are prevalent through out the region.

1.3 Community Conservation and Protection

a. Groundwater & Surface water resources

A complete discussion of Groundwater and Water Resources in the Boulevard Community Plan is located in the Conservation and Open Space Element of the San Diego County General Plan.

b. Dark Skies

Issue LU 3.1 Boulevard is within one of the last dark sky areas remaining in the southwest. The San Diego Astronomy Association Observatory is located on Tierra Del Sol Road and attracts stargazers, photographers, scientists, and researchers from around the world. Dark skies are a valuable asset that brings in visitors and businesses. This resource will be protected from light pollution through reduced development and community education and outreach regarding the use of proper lighting and light shielding.

The Boulevard Planning Group is seeking designation as a Dark Sky Community and supports efforts to expand the Tierra Del Sol Observatory or to relocate it to a larger property. The Planning Group can serve as a public forum to help educate the community on the aesthetic and scientific value of dark skies and the need to prevent and correct light pollution.

Goal LU 3.1 Protection as a Dark Sky Community through preservation of the dark skies in Boulevard to support the continued operation of the San Diego Astronomy Association and Tierra Del Sol Observatories and to continue to attract stargazers, photographers, scientists, and researchers from around the world.

Policy LU 3.1.1 Encourage development to preserve dark skies with reduced lighting and increased shielding requirements

Policy LU 3.1.2 Encourage increased resources or methods for enforcement for the preservation of dark skies

> Regulations for Class I, II, and III lighting are found in Ordinance No. 9716, AN ORDINANCE AMENDING THE SAN DIEGO COUNTY CODE, MAKING CLARIFICATIONS AND CORRECTIONS TO LIGHTING REGULATIONS.

c. Oaks and native habitat

Issue LU 3.2 Oak trees, riparian areas, wetlands, and chaparral are recognized as significant and highly valued historical, aesthetic, and ecological resources that contribute to Boulevard's distinctive community character, as do the extensive mature stands of Manzanita, Redshank, Scrub Oaks, chamise, and other native habitat.

Goal LU 3.2 Preservation of the native and riparian habitat to retain the distinctive character of the Boulevard community.

Policy LU 3.2.1 Require development to minimize impacts to the native and riparian habitat.

d. Historical and Cultural Resources

Issue LU 3.3 Existing historic structures, early Native American sites, and early American settler sites, such as the McCain Ranch House on McCain Valley Road, the Miller Ranch Adobe house in Miller Valley, and the rock and rammed earth buildings built by Derwood Johnson in the early 1900's, should remain as an example of the rich cultural history of the Boulevard area. Management and protection of these sites, including non-compatible encroachment, will be the responsibility of the appropriate county, state, or federal agencies and / or non-profit group. The Boulevard Planning Group will pursue and support the historic designations and monitor the management and protection of these historic and cultural resources for the benefit of the community and visiting public.

Goal LU 3.3 The protection, preservation, and management of historic structures and sites in Boulevard.

Policy LU 3.3.1 Encourage the designation, protection, and long-term management of historic sites in the Boulevard area.

1.4 Areas of Change: Development Infill and Intensification

Major "infill" or "intensification" projects are not feasible in the Boulevard / Live Oak Springs area due to a lack of water, sewer and other infrastructure, and water quality issues in areas of existing high-density. Development of existing "grandfathered" lots and the potential for minor subdivisions will most likely occur in the areas around Boulevard's Rural Village and in the Tierra Heights, Jewel Valley, Ribbonwood, and Tierra Del Sol neighborhoods.

1.5 Community Facilities

Boulevard is in dire need of a new multi-use community building to help serve the many needs that are currently unmet (See 3.2 Parks and Recreation section).

Issue LU 5.1 The Boulevard Fire and Rescue Department needs improvements and upgrades of its current facilities, including sleeping quarters and a kitchen overhaul for the volunteers. An emergency generator, large enough to run the building and the wells to pump the water for the trucks and to keep the kitchen and bathroom facilities operation for emergency shelter volunteers and customers, is also needed. A proper and secure fuel storage tank is also needed to serve vehicles and generators during emergencies and extended power blackouts, which can last for a week or more.

The Campo Band of Mission (Kumeyaay) Indians has a full-time fire department that provides service to the entire area under mutual aid agreement. Additional coordination with the Campo Indian reservation is needed to assure continued funding.

Goal LU 5.1 Adequate facilities, infrastructure, and equipment that enable the Boulevard Fire and Rescue Department to fulfill its mission.

Policy LU 5.1.1 Seek funding and promote efforts to provide the necessary facilities, infrastructure, and equipment to support the Boulevard Fire and Rescue Department.

1.6 Other Topics/Issues

Housing:

The majority of residences and businesses are serviced by individual septic systems and wells. The potential for multi-family units is unlikely, (see Groundwater section for a discussion of historic land use decisions). Many additional housing needs can be met through second dwelling units, granny flats, and the multiple Recreational Vehicle (RV) parks located in the Boulevard area.

Commercial and Industrial

Issue LU 6.1 Commercial ~~and~~, industrial development and large scale energy generation projects in the rural community of Boulevard can negatively impact ~~property values,~~ community character, natural resources, and the overall quality of rural lifestyle.

Goal LU 6.1 Boulevard retains its community character by limiting any commercial or industrial development that negatively impacts our community and its resources.

Policy LU 6.1.1 Require commercial, industrial development and large scale energy generation projects to mitigate adverse impacts to ~~avoid detracting from or negatively impacting~~ the rural community character, charm, quiet ambiance and life-style, or the natural resources, wildlife, and dark skies of Boulevard, if feasible, in accordance with the California Environmental Quality Act.

Policy LU~~-~~6.1.2 ~~Require~~ Encourage commercial, industrial development and large scale energy generation projects to create and maintain adequate buffers ~~to~~between residential areas ~~from~~and incompatible activities that create heavy traffic, noise, infrasonic vibrations, lighting, odors, dust and unsightly views and impacts to groundwater quality and quantity.

Policy LU 6.1.3 ~~Require~~ Encourage commercial, industrial development and large scale energy generation projects to provide buffers from public roads, adjacent and surrounding properties and residences, recreational areas, and trails.

~~**Policy LU 6.1.4** Prohibit industrial or commercial development with unmitigated and unmitigable impacts to the Boulevard area, such as:~~

- ~~Unregulated maintenance and operation of equipment that poses health and safety concerns to the general public, including fires ignited from malfunctioning industrial wind turbines and related equipment;~~
- ~~Insufficient setbacks to minimize shadow flicker;~~
- ~~Inadequate setbacks from adjacent private property relative to tower height to mitigate against tower collapse and blade shedding;~~
- ~~Impairment of visual resources and the rural community character;~~
- ~~Insufficient setbacks to mitigate noise impacts, as defined by Safety Element Tables N-1, Noise Compatibility Guidelines, and Table N-2, Noise Standards;~~
- ~~Seismic wave impacts, ground vibrations, and chemical and oil spills;~~
- ~~Light pollution of dark sky resources and shadow flicker effect that create a nuisance, and result in negative impacts to health and quality of life.~~

~~**Adverse health impacts and industrial wind turbines:** Often quoted for analysis of wind turbine projects is the American / Canadian Wind Energy Association report: Wind Turbine Sound and Health Effects An Expert Panel Review, December 2009, which serves as a basis of their claim that industrial wind turbines create no adverse health impacts. Other studies are available that offer refuting or contradictory evidence, available from the Society for Wind Vigilance: http://www.windvigilance.com/awea_media.aspx~~

~~**Adverse property values and industrial wind turbines:** The Department of Energy's Lawrence Berkeley National Laboratory report titled "The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi- Site Hedonic Analysis" released December 2009 generated media headlines claiming "Wind farms have no effect on property value," is often referenced by wind energy projects. Additional information is available, including an expert analysis of that DOE report, "Wind Farms, Residential Property Values, And Rubber Rulers" by Albert R. Wilson, a valuer of environmental impacts on business and real estate, with 25 years experience including 10 years of teaching and writing on the subject, states that the underlying methods used in the development of the DOE study raise serious questions concerning the credibility of the results. See the Wilson report here: http://www.arwilson.com/pdf/newpdfs/WindFarmsResidentialPropertyValuesandRubberRulers.pdf~~

2. Circulation and Mobility (CM)

2.1 Integrated Mobility and Access

Along with the existing road system, Boulevard's residents and visitors would be well served with an approved non-motorized trails system, interconnecting with other local and regional trails systems. Trails can serve as a healthy form of activity and for social and group activities. Trails and pathways can also serve as a means of travel that does not require a vehicle.

2.2 Local Road Network

Issue CM 2.1 The current road network is expected to be sufficient to serve the community of Boulevard for the next decade or more, unless a major development requiring a General Plan Amendment, or significant commercial or industrial project is approved.

Any improvements and/or maintenance will maintain the rural atmosphere and natural drainage channels to prevent erosion.

Goal CM 2.1 A safe and efficient road network designed to be safe for all users, while maintaining the rural community character.

Policy CM 2.1.1 Prohibit paved sidewalks, curbs and gutters, paved road shoulders, and street lighting, unless necessary to meet safety requirements.

Policy CM 2.1.2 Develop rural design guidelines and standards to ensure compatibility with the existing rural environment.

Policy CM 2.1.3 Encourage the use of permeable pavement and design factors that allow for local recharge of precious rainwater and help prevent runoff and erosion.

2.3 Fire Access/Egress Routes

Issue CM 3.1 Due to the prolific and ongoing human and drug smuggling activities in the Boulevard/border area, the dangerous criminal element, high-speed traffic, and even gunfire, which is associated with those activities, even fully deeded secondary fire access roads will be gated and locked at the request of those impacted property owners. Having a locked gate is not just a privacy issue; it is an issue of public health and safety in regards to keeping the organized and disorganized criminal element from accessing private roads, which are meant only to serve those with deeded ingress/egress rights.

Goal CM 3.1 Avoid the proliferation of unauthorized access to private property via improperly located, authorized, or secured fire access routes.

Policy CM 3.1.1 Require secondary fire access/egress routes to connect to a public road, when feasible.

2.4 Local Transit

The lack of reliable and affordable public transportation is a reality that impacts Boulevard and all backcountry communities, especially for those who do not possess a driver's license and those who do not have access to a vehicle. Opportunities for increased efficiencies, grant monies to supplement transit operations, and construction of park and ride facilities should be explored through coordination, including working with the County, Metropolitan Transit System (MTS) and Tribal Governments.

(Refer to the Public Transit section of the Mobility Element for goals and policies)

2.5 Bicycle, Pedestrian, and Trail Facilities

Most of Boulevard's roads and commercial areas have wide enough shoulders for pedestrians to travel safely. Boulevard's rural roads are attractive to many bicycle enthusiasts and planned events. Better marked and maintained bicycle lanes and timely announcements informing the community of planned events would benefit both the bicycle riders and the drivers who have to maneuver around them, often times on blind corners or hills. Outreach and education directed at bicycle organizations, regarding road courtesy and public safety would also be beneficial.

(Refer to the Bicycle, Pedestrian, and Trail Facilities section of the Mobility Element, for goals and policies)

2.6 Aviation (where relevant)

Boulevard had been considered as a site to relocate the San Diego Regional Airport. After much controversy, the Regional Airport Authority rejected the proposal. However, once a plan has been made public and a report produced, there is a potential that the plan will be unearthed and reintroduced at a later date.

Boulevard has several unauthorized private air strips sited on ranch lands that are subject to development proposals. The airstrip at the old Chargers training camp on McCain Valley Road was closed down by a previous owner and marked as closed (x'd out). A new owner tried to reopen the airstrip but was shut down after neighbors and the Boulevard Planning Group complained.

A second airstrip exists on private land at the southern end of Jewel Valley Road. Officials have not acknowledged that the airstrip is indeed an airstrip, and it is unclear if it qualifies for protection under the grandfather clause. Neighbors complained when healthy oak trees and the airstrip was graded and extended to accommodate larger airplanes and a helicopter pad was added. Controversial development plans have proposed the construction of an 80 hangar facility at this airstrip.

Due to concerns with public health and safety with airstrips in close proximity to rural residences and concerns that private airstrips located so close to the volatile US/Mexico border in a heavy drug and human trafficking area, which can be used to aide and abet criminal activities, the construction and/or use of either private or public airstrips and airports are discouraged.

Issue CM 6.1 There are airports in the Boulevard Subregional Group area that are not properly permitted, recognized by authorities, or reflected as impacts in Figure M-1: Airport Locations in the Mobility Element of the General Plan.

Goal CM 6.1 Airports that supplement the health and safety of the community and respect legal processes

Policy CM 6.1.1 Make it a priority to investigate and coordinate with appropriate agencies to restrict potentially illegal airport activities.

2.7 Parking

Issue CM 7.1 Big rigs and trailer parking along the shoulder of Hwy 94 and Historic Route 80, especially near dangerous intersections or close to Clover Flat Elementary causes decreased visibility and increased hazards. A majority of the trucks that park along the road ways appear to be in transit to and from the Tecate Port of Entry.

Goal CM 7.1 A safe environment along the rural state highway in the Boulevard Rural Village

Policy CM 7.1.1 Seek a big rig and trailer parking prohibition on SR-94 / Old Highway 80 in the Boulevard Rural Village Boundary

2.8 Infrastructure and Utilities

a. Water, Sewer and Septic

The Boulevard area is completely dependent on groundwater resources with no viable alternative or replacement source of water. Most residents are served via individual wells. Some water is provided through small water districts or shared wells, most of which were approved and installed many years ago and have existing and recurring problems. The groundwater in the Boulevard area consists mostly of fractured rock aquifers. Some areas of Boulevard have groundwater that is located in sedimentary aquifers. Boulevard and the rest of the backcountry are subject to a feast and famine cycle of rainfall. During El Nino events, up to 40 inches of rain have been recorded locally in a 12 month period. Several years of El Nino rains generally leads to artesian well conditions along with running streams and creeks. Even gopher holes have appeared to produce about 20 gallons per minute. During these wet years, septic tanks can stop functioning due to inundation. In a 1993 well monitoring report by the County, 25 of 30 wells in the Tierra Del Sol area were at or near ground surface, with some flowing artesian. Numerous springs were reported as well.

On the other hand, during extended drought conditions water tables can and do drop significantly. Wells, springs, creeks, and streams can and do go dry often requiring the very expensive drilling of a new and deeper well. This drop in water tables also negatively impacts wetlands, riparian areas, and native vegetation, and the wildlife that depends on it across the board. Projects studied during extended droughts often fail to recognize or identify the potential for native flora and fauna species to return once the rains return and water and soil moisture levels rise.

There are two main drainages or watersheds in the Boulevard area. The Tecate Divide separates the two. The drainage to the west of the Tecate Divide was federally designated in 1993, as the Campo-Cottonwood Sole Source Aquifer. This designation allows the United States Environmental Protection Agency review to any project that is financially assisted by federal grants or federal loan guarantees. The drainage to the east of the Tecate Divide ultimately flows into the Salton Trough and the Sea of Cortez. Boulevard is split between the San Diego Regional Water Quality Control Board (west) and the Colorado River Water Quality Control Board (east).

Groundwater resources in the Boulevard area are not expected to be supplemented through any outside resource. Therefore, it is imperative that the community of Boulevard must be able to comfortably function on the resources it has plus any recharge that occurs in the changing global climate.

Groundwater resources in the Boulevard area will be conserved, protected and preserved from over-extraction and pollution. The exportation of water from the Boulevard area is of great concern. Surface water in seasonal and ephemeral creeks will not have their courses changed or altered by construction of berms, dams, piping, or over diversion devices. New development will utilize permeable surface materials, such as new paving options, gravel, or decomposed granite. Community outreach and education on the importance and value or this irreplaceable resource will be conducted to help promote and ensure all viable conservation measures are understood and implemented, such as low flow shower heads and appliances and drip irrigation.

Issue CM 8.1 Groundwater is the life blood of Boulevard and the entire backcountry. Boulevard has a sole source aquifer that should be protected, as there are no alternate water supplies available to replace existing supplies in the event of contamination or overdraft conditions. Surface water and groundwater are interconnected. Surface runoff is too meager and variable to be used as a water supply and the availability and quantity of groundwater varies widely from neighborhood to neighborhood and well to well. Due to the highly fractured nature of the bedrock, most groundwater basins are interconnected via water bearing fractures. Those water bearing fractures can act as conduits for contamination, which can travel rapidly. Once contaminated, it is incredibly difficult, if not impossible, to remediate groundwater in a fractured rock environment.

Water wells can be negatively impacted from a variety of natural and manmade sources, including earthquakes, blasting, and the drilling of other wells, well collapse, and contamination from a variety of spills and improperly sited and managed projects and facilities. This finite, vulnerable, and incredibly valuable resource requires respect and diligent protection from contamination, degradation, diversion, exportation, and overuse.

Wetlands, meadows, creeks, streams, and existing ponds all represent different parts of the groundwater cycle and the circle of life. Nature's balance is so delicate that interference, whether it be manmade or an act of nature, with any one of these interlinked natural cycles can throw off that balance and disrupt the cycle. This can result in a cascade of impacts to the human and natural world that can be problematic as least and catastrophic at worst.

Goal CM 8.1 Preservation of the quality and quantity of ground and surface water resources to serve the Boulevard community.

Policy–CM 8.1.1 Prohibit development and the exportation or sale of groundwater that would adversely impact the ground and surface water resources.

Policy CM 8.1.2 Coordinate with LAFCO to oppose the development of new water districts and annexation to existing water districts to avoid growth inducement and overdraft conditions.

Issue CM 8.2 Historic Land Use decisions has resulted in an impacted water supply.

Goal CM 8.2 Prevention of like or similar projects that have closely spaced septic systems feeding and infiltrating the same aquifer that is used for withdrawal of drinking water.

Policy CM 8.2.1 Require that any new proposed development require sufficient set back from each other to avoid the potential to contaminate and/or overload the aquifer with pollutants.

Issue CM 8.3 Water imported to the area has the potential to contaminate the local surface and groundwater resources, including water that is used to fill water storage / fire reserve tanks, regardless of their capacity. A ruptured or otherwise compromised tank can result in contaminated water spilling onto the ground and negatively impacting ground water and surface water resources Contaminated or highly saline water imported from outside the area can also result in contamination of the soil and destruction of native cover and habitat.

Goal CM 8.3 Protection of existing groundwater resources from intrusion of potentially contaminated imported water.

Issue CM 8.3.1 Require that the source and quality of water that is imported into the area via tanker trucks or other means, for use on major construction projects, will be verified and validated to avoid contamination of local surface and groundwater resources.

<u>b. Sewer/Septic</u>

Issue CM 8.4 Historic Land Use decisions have resulted in septic systems in close proximity and the overloading of nitrates in the Rural Village area of Boulevard. The vast majority of Boulevard properties rely on individual septic systems that are responsibility of the individual owners. Proper maintenance and service is highly recommended to insure proper operation of septic systems.

Most professionals recommend that, on average, most septic tanks need be pumped out every two years to prevent the leach lines from clogging up.

In areas, such as Live Oak Springs, Witcher's Grove ,Calexico Lodge, and the Boulevard Post Office complex, where small water districts and water quality and service issues already exist, legitimate, and viable efforts to upgrade those services in a non-growth inducing manner will be supported

Goal CM 8.4 Enhancement of sewage disposal resources for the health and safety of residents, while limiting unplanned growth from development of sewer systems.

Policy CM 8.4.1 Coordinate with LAFCO to oppose the development of any new sewer district and/or annexation to existing districts that would be growth inducing, and could represent groundwater contamination at the point of disposal/release.

Policy CM 8.4.2 For projects, such as the Golden Acorn and La Posta Casinos, support the funding and use of artificial wetlands as an environmentally friendly means to further cleanse the effluent prior to recharging the groundwater, provided they are properly funded, engineered, constructed, maintained, and managed.

c. Storm Drainage

Issue CM 8.5 Maintaining existing and proper drainage is critical to balance soil and to sustain riparian resources in our rural area. Soil erosion is an issue of significant concern. The prevention of erosion requires that proper engineering, design, and best management practices being implemented and enforced.

Significant erosion from culverts related to the construction of Interstate I-8 serve as an example of what to avoid. Similar erosion issues are present at other road and railroad drainage channels.

Goal CM 8.5 The avoidance of erosion, the displacement of soil, the loss of topsoil, and the denied and/or displaced recharge of on-site groundwater resources

Policy CM 8.5.1 Prohibit development from altering natural drainage patterns.

Policy CM 8.5.2 Require all engineered drainage projects to maximize stormwater filtration on-site to prevent the loss groundwater recharge and unnecessary erosion.

d. Energy (natural gas and electricity)

Issue CM 8.6 Boulevard hosts SDG&E's 500 kilovolt (kV) Southwest Powerlink, and the Boulevard Substation. Two more SDG&E substations exist on the Campo Reservation which serve the 50 Megawatt (MW) Kumeyaay Wind Facility.

There is concern by residents that energy and transmission projects represent potential wildfire ignition sources. Fires started in the backcountry can and do burn their way into the suburban and urban areas.

Residential-scale solar panels and wind turbines result in less significant local impacts than region-serving generation facilities. In addition, rooftop solar panels have less significant impacts over wind turbines, due to the setback requirements and noise and infrasonic vibrations generated from wind turbines. Some studies have shown that energy is best produced closest to the consumer to void the need for large scale[1].

Goal CM 8.6 Local residential scale renewable energy projects that are technically feasible and environmentally sensitive

Policy CM 8.6.1 Encourage the use of existing right-of-way when construction of new transmission lines is required, where technically and economically feasible. Additionally, encourage existing right-of-way over new right-of-way alignments for construction of new transmission lines, when existing right-of-way is insufficient.

Policy CM 8.6.2 Encourage the use of solar and residential scale wind turbines~~, while discouraging new energy corridors for new transmission lines and fuel pipelines in fire prone and groundwater dependant areas.~~

~~**Implementation Program CM 8.6.1** A comprehensive public review, including complete environmental reports and local public hearings held in the impacted community, for all new and expanded energy projects in Boulevard.~~

e. Landfill

Issue CM 8.7 Due to the area's total reliance on groundwater resources, any new landfills are required to meet U.S. Environmental Protection Agency (EPA) standards, including the requirement to install a leachate collection system.

Several private companies provide dumpster service on a monthly basis. To help reduce the cost of private dumpsters, neighbors can cooperate and share the location and fees. Shared dumpsters and the coordinated use of one company in the same neighborhood, can reduce the number of truck trips and impacts.

Goal CM 8.7 A safe and healthy environment, for man and nature, free of unhealthy and unsightly litter, unnecessary waste, and improper disposal.

Policy CM 8.7.1 Encourage Zero Waste Management goals through increased recycling and reuse.

Policy CM 8.7.2 Seek funding opportunities to provide adequate and convenient recycling facilities, public drop off bin sites, and semi-annual community cleanup events for large items, appliances, tires and hazardous materials.

1 *San Diego Smart Energy 2020*, Bill Powers.

f. Telecommunications

All cell tower and other communication facilities will be properly sited, well camouflaged, and will have adequate backup generation, sound buffering, and setback from neighboring properties. Back up generators will be the most energy efficient, emission free, and most quiet available at the time of approval. Fuel storage will be carefully and properly located and designed to prevent groundwater contamination from any fuel spill or leak.

Issue CM 8.8 There is a need for increased access to high-speed internet service and cell service that works in our rural area adjacent to the US/Mexico border.

Goal CM 8.8 Improved access to high speed communication services, necessary to satisfy the needs of the Planning Area, in an environmentally safe and aesthetically pleasing manner.

Policy CM 8.8.1 Require cell tower and other communication facilities to be properly sited, well camouflaged, and to have adequate backup generation, sound buffering, and setback from neighboring properties. Require back up generators to be energy-efficient, emission-free, and sound attenuated and require fuel storage to be carefully and properly located and designed to prevent groundwater contamination from any fuel spill or leak.

3. Conservation and Open Space (COS)

3.1 Resource Conservation and Management

a. Agricultural Soils and Production

Issue COS 1.1 Soil resources in the Boulevard area vary from decomposed granite (DG) to rich clay loam. The loam material provides sustenance for small scale agricultural purposes and helps to sustain our native flora and fauna. To avoid negative impacts, existing and natural drainage patterns should not be altered (see policy CM 8.2.1). Maintaining existing drainage is critical to balance soil and support riparian resources in our rural area. Soil erosion is an issue of significant concern. The prevention of erosion requires that proper engineering, design, and best management practices being implemented and enforced.

Due to topography and limited waters supplies, Boulevard does not support large scale irrigated agricultural operations. Historically, agricultural operations have been livestock related and the dry land farming of grass and grain crops. Small scale operations are scattered throughout the area and include cattle, horses, goats, hogs, chickens, rabbits, ostriches, and small truck gardens and orchards.

Goal COS 1.1 Encourage the continuance of small scale environmentally sustainable agricultural uses in the Subregion.

Policy COS 1.1.1 Support the continuance and protection of small scale agricultural operations in Boulevard.

Policy COS 1.1.2 Promote the allowance of Farmer's Markets, preferably in commercially zoned areas with public road access.

b. Plant and Animal Habitats and Wildlife Corridors (e.g., woodlands, grass lands, riparian corridors, etc.)

(Refer to the General Plan Conservation and Open Space Element Biological Resources section for goals and policies)

c. Scenic Resources and Highways

Issue COS 1.3 Boulevard and the surrounding area is blessed with unique stunning and geographically extensive scenic views and landscapes. These visual and scenic resources are highly valued and play a major role in Boulevard's community character, quality of life, appeal to visitors and tourists, and local property values. Residents willingly sacrifice the conveniences and amenities of urban living to enjoy and benefit from the rural and scenic resources that represent the backcountry way of life and quality of life.

The Historic Route designation for Route 80 requires repairs to be implemented in a manner that reflects its original concrete slabs. Historic Route 80, SR-94, and Interstate 8 are part of the County Scenic Highway System and qualify for designation as State Scenic Highways.

Goal COS 1.3 Establish a network of scenic highway corridors within which scenic, historical, and recreational resources and community character are protected and enhanced.

Policy COS 1.3.1 Encourage State Scenic Highway designations for Historic Route 80, SR-94, and Interstate 8.

d. Surface, Groundwater, and Watersheds

Surface water and groundwater are interconnected. The highly fractured nature of the bedrock in the Boulevard area can lead to water bearing fractures acting as conduits for contamination which can travel rapidly. Once contaminated, it is incredibly difficult, if not impossible, to remediate groundwater in a fractured rock environment.

A complete discussion of Groundwater and Water Resources in the Boulevard Community Plan is located in the Conservation and Open Space Element of the General Plan.

e. Mineral Resources

Goal COS 1.4 Careful management of environmental resources in the area in order to prevent wasteful exploitation or degradation of those resources, which include soils of biological significance, land forms with scenic value, and carbon sequestration.

Policy COS 1.4.1 Encourage existing non-mechanized small scale mining operations and allow abandoned mining operations to be used as opportunities for tourism and education.

Policy COS 1.4.2 Require large industrial scale mining operations to fully mitigate any environmental and health impacts, such as damage to natural resources, heavy truck traffic, air quality impacts, depletion and contamination of ground and surface water resources, as well as limiting the health impacts of silica.

f. Air Quality

(Refer to General Plan Update Conservation and Open Space Element under the “Air Quality, Climate Change, and Energy” subheading 14 for requirements pertaining to air quality)

g. Energy

Energy Conservation: Energy conservation and efficiency features and standards, such as LEED, will be incorporated into new development projects and remodeling projects. This includes the use of dual pane windows, better insulation, energy efficient appliances, and arcade style porches or overhangs, which serve the dual purpose of adding shade and character to buildings. The replacement of inefficient lighting and appliances with more energy efficient versions will be encouraged as will the use of residential scale solar and wind energy generation. Due to potential noise related impacts on adjacent or surrounding properties, passive solar is the preferred option. Community education and outreach to provide helpful information and conservation tips and how to convert residences, public buildings, and businesses should be pursued. Local and state regulations already require increased energy conservation and efficiency.

Goals and policies requiring energy conservation in development are located in COS – 18.

3.2 Parks, Recreation, and Open Space

The Boulevard Planning Group has identified a need to acquire a site to accommodate a new multi-use building (community center, emergency shelter, kitchen facilities, library, child & senior day care, small museum, farmer's market, and school plays, events and ceremonies), ball fields, and facilities for staging equestrian, bicycle, and other events. The McCain Valley Conservation Camp has previously expressed their availability to help provide labor for maintenance and grounds keeping. The preferred site for this facility would have public road frontage and would be inside the Rural Village, in the vicinity of the proposed trail system, which runs along the section Ribbonwood Road between Interstate-8 and Historic Route 80. Also, the size of the lot would require adequate setback from neighboring residences and businesses. This area is also within easy walking distance of Clover Flat Elementary, as well as the Boulevard Fire and Rescue Department and the Sheriff's Substation. A multi-use community center could be used for school events, plays, and ceremonies, as well as small art and music events and other group activities and meetings.

Issue COS 2.1 While Boulevard is blessed with lots of open space and do-it-yourself recreation opportunities, it does not have a community park, library, or other community facilities. In the past, most of the Mountain Empire Park Land Dedication funds have gone to build parks and facilities in other communities. The closest community parks are located in Jacumba and Campo, both of which are approximately an eight to ten mile drive east or west.

Goal COS 2.1 Recreational and service opportunities that meet the community needs, and the enrichment of the lives and health of residents and visitors with the establishment of a balanced system of recreational facilities and services

Policy COS 2.1.1 Seek funding opportunities to acquire a site and construct a multi-purpose community center for Boulevard.

Issue COS 2.2 Currently there are two OHV parks in the Boulevard Subregional Group Area. The Lark Canyon OHV Park is located on BLM land in the McCain Valley Recreation Area and is supported by the community. Another motocross-track is located on the tribal lands of the Campo Kumeyaay Nation. Due to the impacts from these land uses an increase in OHV park facilities could create an unnecessary conglomeration and potential for conflicts.

Goal COS 2.2 Recreational Facilities that appropriately scaled to serve residents and a portion of regional recreation facilities, but does inequitably impede upon infrastructure and the quality of life of the residents.

Policy COS 2.2.1 Discourage and require any new commercial recreation facilities to mitigate impacts from an aggregation of potential nuisance uses, such as impacts to air quality, noise, traffic, and biological impacts.

3.3 Community Open Space Plan

Boulevard's wide open spaces, landscapes, and elevated location at the Tecate Divide provide for stunning views, which are 360 degrees in some places. Views to ridgelines both near and far, oak filled valleys, creek beds lined with cottonwoods and willows, chaparral covered hillsides, grazing lands, wetlands, and open meadows are all part of what makes Boulevard an appealing place to live and visit. Maintaining and protection the open landscapes and viewsheds in and around the McCain Valley Resource Management and Conservation Area, Land Cooperative, as well as other public and private lands play a critical role in Boulevard's community character and are important community assets. The need to protect these highly valued open spaces and the visual and natural resources from degradation, over-development and industrialization is the key to retaining our unique rural community charm and character and the quality of life that draws residents and visitors alike. It is also recognized that certain precautions are required to prevent and slow the spread of wild fires/fire storms. Therefore, the need to allow for legitimate and well designed and managed fire breaks and fuel modification measures needs to be recognized and supported.

(Refer to the Conservation and Open Space Element, Parks, Recreation, and Open Space section for goals and policies)

4. Safety (S)

4.1 Hazards/Risk Avoidance and Mitigation

~~a. Industrial Scale Wind Energy Turbines~~

~~Industrial wind may cause many impacts that are of concern to the residents of Boulevard, including:~~

- ~~Incompatible bulk and scale;~~
- ~~Impairment of view sheds and deterioration of aesthetic resources;~~
- ~~Unreasonable threats to the health and safety of wildlife; and~~
- ~~Insufficient setbacks from public roadways, utility lines, guy wires, and adjacent properties~~

~~Goals and Policies addressing industrial scale wind turbines are in Land Use 4.6 Industrial Land Uses~~

~~b~~a. Seismic and Geologic Risks

The Boulevard area is subject to earthquakes and liquefaction in some alluvium filled valleys, if the soil is saturated. Most of the major earthquakes in the area have occurred in the Imperial Valley to east, many of which are felt in the Boulevard area, like the major earthquake that occurred in 1892. In the memories of the Early Settlements by Ella McCain, she reported that the ground split open in McCain Valley and in Jewel Valley, with large boulders tumbling down in the area and in Mountain Springs. It was also reported that the ground appeared to have been sifted at a depth of several feet and that there were a reported 162 aftershocks over a period of four to five days. Wells and the water flow coming into them can be negatively impacted by earthquakes, aftershocks, or other forms of man-made or natural earth shaking events, which can result in collapsed wells and diverted water flow. In the early 1980's, a major earthquake in the Imperial Valley destroyed a well in the Tierra Del Sol area, while new and increased spring activity was reported in both Campo and Northern Baja just south of the border.

(Refer to the Safety Element Geological Hazards section for goals and policies)

~~c~~b. Flooding

Heavy winter storms, the remnants of tropical storms, such as Hurricane Kathleen in the mid 1970's, and intense thunder storms can and do result in flash flooding and the washout of private and public roads. During Hurricane Kathleen, flood waters were reported at one foot deep across local valleys. Local roads, Interstate-8, and the Arizona & Eastern Railroads washed out and were closed for an extended period of time.

(Refer to the Safety Element Flood Hazards section for goals and policies)

~~d~~c. Wildland Fire/Urban Fire

Boulevard is famous for its winds, which can approach triple digits. Interstate-8 is closed due to high winds on a regular basis. In addition, Boulevard is designated as a Very High Fire Threat Hazard area. The combination of wind and fire make a deadly combination. The nature of our native vegetation and extended drought conditions tend to exacerbate an already volatile situation. These conditions amplify the need for compliance with and enforcement of fire safe/prevention recommendations to properly trim brush, trees, shrubs, and grasses and to address other fire hazards around homes, businesses, industrial sites, and outbuildings.

~~e~~d. Toxic and Hazardous Materials

They pass through Boulevard on trucks every day on Interstate-8 and Highway 94. The Carrizo Railway also has the potential to carry hazardous and toxic materials. Truck traffic to and from the Tecate Port of Entry increases the risk of an accident and spill/release on winding and narrow Hwy 94.

(Refer to the Safety Element Hazardous Materials section for goals and policies)

~~f~~e. Law Enforcement & Fire Services

Issue S 1.1 There is a great need for increased law enforcement, fire protection, and emergency services in Boulevard. The limited staffing resources at the Boulevard Substation are required to serve an extensive territory, including three tribal reservations and two casinos

Goal S 1.1 Adequate law enforcement and emergency services and staffing to ensure timely response times and safe and secure environment for residents and visitors alike.

Policy S 1.1.1 Seek funding opportunities for year-round staffing of the Cal-Fire and Boulevard Fire and Rescue Department.

4.2 Emergency Preparedness and Response

Issue S 2.1 Members of the volunteer Boulevard Fire and Rescue Department and the Auxiliary provided emergency shelter (cots, blankets, food, water, and restrooms) for victims and refugees during the 2003 and 2007 firestorms. Due to extended power outages and lack of proper or coordinated communications or media coverage, many people looking for basic shelter needs were not aware that they were being provided locally. Extended power outages represent a significant need for better communication and coordination between emergency service providers and other groups to ensure adequate shelter and emergency sources of power and fuel. Boulevard's Red Cross emergency supply trailer has now been moved to Campo, leaving Boulevard without necessary supplies.

Goal S 2.1 Adequate emergency supplies and equipment to provide shelter and comfort during disasters and emergency situations.

Policy S 2.1.1 Seek funding opportunities and sponsors to secure emergency supplies and equipment, including emergency generators and adequate and safe fuel storage.

4.3 Border and Public Safety Issues

Due to the proximity of the US/ Mexico border, and the uncontrolled nature of the area, Boulevard has been subjected to high rates of drug and human trafficking. This criminal activity can lead to large groups of human cargo being smuggled through private properties on private roads and along public roadsides. These groups are some times accompanied by armed smugglers, especially if drugs are involved. Long waits at Border Patrol checkpoints, high speed chases on local roads and highways, gunfire, and dangerous confrontations, and road blocks during arrests are all part of the equation. Locals are advised to report any illegal activities or suspicious behavior to the proper authorities. The completion of the border fence and increased Border Patrol and other law enforcement staffing may or may not result in reduced trafficking. The Boulevard Planning Group has and will serve as a public forum for these types of issues by holding community meetings with law enforcement and elected representatives invited to answer questions and offer potential solutions.

Issue S 3.1 Willing, and often times absentee, landlords have resulted in the inappropriate and controversial placement of Sexually Violent Predators (SVP) in Boulevard and Jacumba, upon their release from mental hospitals or prisons. The community is concerned that absentee landlords will buy houses in the area solely to house SVPs.

Recommendation S3.1 The Boulevard Community Planning Group does not think that SVPs should be placed in rural neighborhoods with limited law enforcement, far from the medical services and treatment they need. Boulevard recommends a legislative resolution to this problem should be to be pursued, with SVP's housed in trailers on prison grounds far from schools and neighborhoods with children.

5. Noise (N)

5.1 Noise Sources

The construction and operation of ~~industrial~~ large scale wind energy turbines, commercial landfill, and mining operations pose the most significant potential sources of noise pollution and infrasonic vibration impacts. Irresponsibly operated off-road vehicles, communications facilities, utility infrastructure, such as transmission lines, substations, AC units serving utility and communication equipment, and emergency and backup generators, also represent major sources of noise pollution, discomfort, and irritation. Long exposure can ~~result in~~ negatively impact ~~health impacts, loss of property value~~, ~~quality of life~~, the quiet enjoyment of ones property, and ~~other issues~~ create a nuisance.

5.2 Noise Standards and Mitigation.

Issue N 2.1 Excessive and continuous noise levels and infrasonic vibrations can ~~result in~~ create a nuisance and disrupt the quiet enjoyment of one's property ~~significant health impacts in humans, wildlife, and livestock. They can also result in loss of property values.~~

Issue N 2.2 Noise complaints in the Boulevard area are difficult to deal with due to limited law enforcement.

Goal N 2.~~2~~1 The quiet enjoyment of the rural atmosphere, for man and nature, free from the intrusion of harmful and obnoxious noise levels.

Policy N 2.~~2~~1.1 Restrict the use of generators to power residences and businesses to cases of emergency only, unless in cases of severe hardship and/or where adjacent and surrounding property owners have signed off on the use.

Policy N 2.~~2~~1.2 Seek mitigation funding to increase code enforcement for noise relates issues in Boulevard

6. Specific Plans and Special Study Areas

There are no Specific Plans or Special Study Areas located in the Boulevard Planning Area.

7. Tule Wind Project

The Tule Wind Project, as described in Major Use Permit 3300 09-019, includes the development and operation of a wind turbine system that is located partially within the Mountain Empire Subregional Planning Area and the Boulevard Community Planning

Area. The part of the project located in these planning areas includes the following components: large wind turbines, collector lines, access roads, temporary lay down area, temporary batch plant, operations and maintenance building, on-site collector substation, and a 138 kV generation transmission tie line.

The purpose of General Plan Goal COS-18 and Policies COS-18.1 and 18.3 is to facilitate the development of alternative energy sources, such as renewable wind energy, that minimize their impacts to the community and environment. The Tule Wind Project is consistent with this General Plan goal and these policies because the project would provide renewable wind energy and incorporates a number of design and mitigation measures to reduce its impacts to the environment and the community. Furthermore, there are limited areas in the County that have sufficient wind resources for large wind energy projects. The proposed Tule Wind Project would be located in one of those areas. Because the Tule Wind Project is consistent with the General Plan goal and policies listed above, the project is exempt from, and is not subject to, the following goals and policies in the Mountain Empire Boulevard Subregional Plan (Boulevard Plan): Goal LU 1.1, Goal LU 6.1 and Policies LU 1.1.1, 1.1.2, 1.3.2, 6.1.1, 6.1.2, 6.1.3, 6.1.4, and CM 8.5.1. These goals and policies are intended to provide broad protections to the Boulevard community and environment. In providing this exemption, the County Board of Supervisors· has determined that the Tule Wind Project has appropriately addressed its potential adverse impacts to the community and environment.

Borrego Springs Community Plan, Chapter 3. Conservation and Open Space (COS) (Page 62).

c. Scenic resources and highways

In desert country, the resources of quiet, uninterrupted vistas and brilliant night skies are the signature of healthy communities and landscapes. Disturbance of the skyline, silhouettes of towers, power-lines, telephone poles, "cut and fill" road scars, "security" lights, agricultural burning and dust from off-highway vehicles during busy holidays are all impacts to the scenic quality of Borrego Valley and the surrounding State Park. Construction of highways on the steep slopes of our desert mountains has left our views scarred forever, but will hopefully lend a lesson for any future large-scale construction project which can negatively impact the views and vistas in the area.

Issue-COS 1.3 Human infrastructure in the CPA inevitably impacts scenic vistas.

Goal-COS 1.3 Scenic vistas maintained throughout the CPA for the enjoyment of visitors and residents in a natural environment.

Policy-COS 1.3.1 Require that physical impacts to the scenic vistas within the CPA be minimized to a level that does not create visual blight or degrade upland landscapes.

Policy-COS 1.3.2 Discourage new energy transmission towers within the CPA.

Policy-COS 1.3.3 Prohibit wind turbine projects with a rated capacity greater than 50 kilowatts ~~power generation towers~~ in areas where viewsheds would be adversely impacted.

> The County Zoning Ordinance classifies wind turbine projects with a rated capacity above 50 kilowatts as "large wind turbine". Montezuma Valley Road (S22), an important scenic resource is the only known area within the Borrego CPA with wind resources sufficient to support large wind turbine projects. It is the intent of this policy to prohibit large wind turbine projects within this important scenic resource.

Policy-COS 1.3.4 Develop methods to encourage builders and developers to fully consider the effects of their actions regarding clearing,

EXHIBIT
7

Am. Midl. Nat. 150:332–342

Mortality of Bats at a Large-scale Wind Power Development at Buffalo Ridge, Minnesota

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ABSTRACT.—In 1994 a major wind power development project was initiated in southwest Minnesota that may eventually produce 425 megawatts (MW) of electricity. The wind plant currently consists of 3 phases that total 354 turbines capable of generating 236 MW. During a study conducted from 1996–1999 to assess effects of wind power development on wildlife, 184 bat collision fatalities were documented within the wind plant. Hoary bats (*Lasiurus cinereus*) and eastern red bats (*L. borealis*) comprised most of the fatalities. After correcting bat fatality estimates for searcher efficiency and scavenger removal rates, we estimated that the number of bat fatalities per turbine ranged from 0.07 per y at the Phase 1 wind plant to 2.04 per y at the Phase 3 wind plant. The timing of mortalities, and other factors, suggest that most mortality involves migrant rather than resident breeding bats.

INTRODUCTION

Wind has been used to commercially produce energy in North America since the early 1970s [American Wind Energy Association (AWEA), 1995]. Recent advances in wind turbine technologies have reduced costs associated with wind power production (Hansen *et al.*, 1992), and wind power produced in the United States in 2001 was comparable in price to conventional power produced using natural gas [American Wind Energy Association (AWEA), 2001]. Commercial wind plants have been constructed in 26 states (Anderson *et al.*, 1999; AWEA, 2002). Although generally considered environmentally friendly, wind power has been associated with the deaths of birds colliding with turbines and other wind plant structures, especially in California. As a result of these concerns, state and federal agencies require monitoring of many new wind development areas to assess the extent of and potential for avian mortality from collision with turbines.

In 1999 development of a 354-turbine wind plant was completed on Buffalo Ridge in southwestern Minnesota (Fig. 1). Avian monitoring studies were initiated during completion of the first 73 turbine phase of the facility in 1994. An unexpected outcome of these monitoring studies was the discovery of 13 bat fatalities near turbines during the first 2 y of operation (Osborn *et al.*, 1996). We conducted additional monitoring studies at the expanded wind plant from 1996–1999. Although our study was designed primarily to assess effects of wind power development on birds, data collected during fatality searches also allowed us to address wind power impacts on bats. Our objectives were to estimate the number of bat mortalities attributable to collisions with wind turbines for the entire Buffalo

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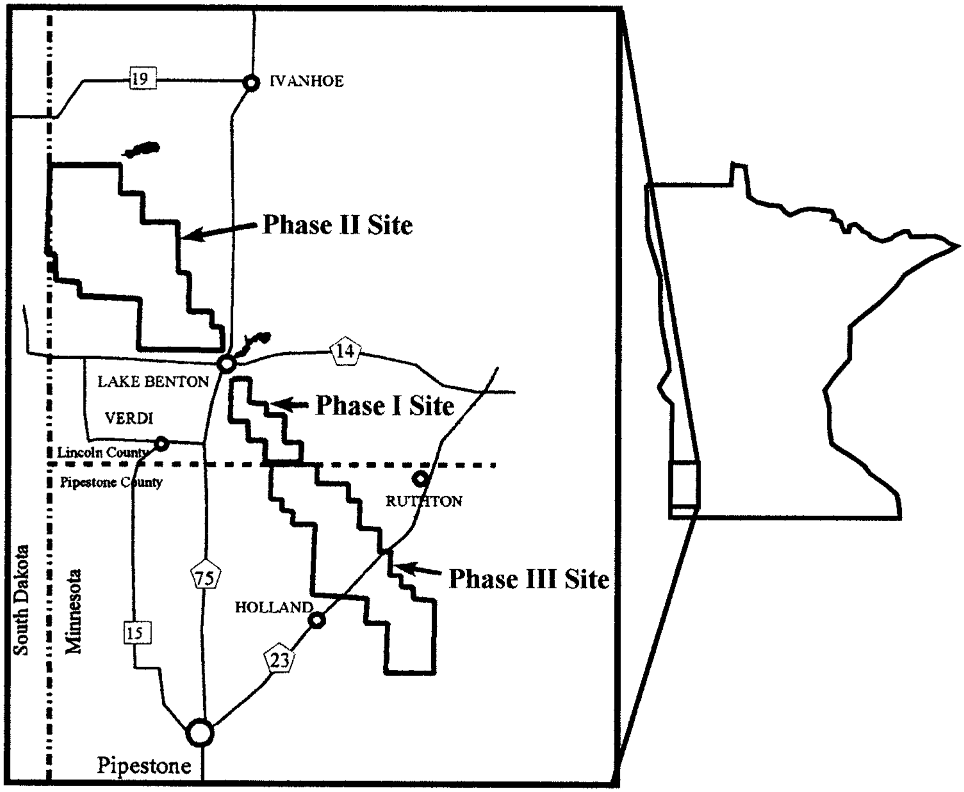

FIG. 1.—Location of the Buffalo Ridge Wind Development Area in Minnesota

Ridge wind plant, to determine the species and groups at highest risk and to determine what factors might be related to the collision mortality.

STUDY AREA

The study area was comprised of a large portion of Buffalo Ridge, a 100-km-long segment of the Bemis Moraine located in southwest Minnesota and northeast South Dakota (Fig. 1). Buffalo Ridge is located in the Coteau des Prairies, a major physiographic landform consisting of terminal moraines and stream-dissected lands (Coffin and Pfannmuller, 1988). The ridge runs diagonally from southeast to northwest and separates the Missouri and Mississippi river watersheds. Elevations range from 546 m to 610 m above sea level. Vegetation types consist primarily of corn, soybeans, small grains and hay; pasture; and Conservation Reserve Program (CRP) grasslands. Less prevalent vegetation types include deciduous woodlots associated with farmsteads, wooded ravines and wetlands. Vegetation, including vertical density and vegetation height, has previously been described for cropland, pasture and CRP habitats in the Buffalo Ridge study area (Leddy, 1996).

The wind plant currently consists of three major phases of development (Fig. 1). Phase 1, constructed in 1994, consists of 73 turbines and related facilities, including distribution lines, meteorological towers, communication systems, transformers, substations, roads and operations and maintenance facilities. Turbines in Phase 1 are arranged in 10 strings with 3–20 turbines spaced from 91 m to 183 m apart per string. Phase 1 turbines are installed on top of 36-m tubular towers and have blade diameters of 33 m. The rotor-swept height of Phase 1 turbines is 19.5 m to 52.5 m and the rotor-swept area is 855 m^2. Phase 2, consisting of 143 newer-generation 750 kilowatt (KW) turbines, was completed in July 1998. Phase 2 consists of 26 strings of turbines, with 2 to 12 turbines per string spaced at intervals from approximately 100 m to 200 m. Phase 2 turbines are installed on top of 50-m tubular towers and blade diameters are 46 m and 48 m. Therefore, the rotor-swept height of the Phase 2 turbines is either 26 m to 74 m or 27 m to 73 m and the rotor-swept area is either 1661 m^2 or 1809 m^2. Phase 3 is comprised of 138 of the same turbines used for Phase 2 and was completed in June 1999. Phase 3 consists of 36 strings of turbines, with 2 to 13 turbines per string spaced at intervals ranging from approximately 250 m to 500 m. None of the turbines at the Phase 1 wind plant are lighted. At the Phase 2 wind plant, 6 of the 143 turbines are lighted (3 at each end of the wind plant). Half of the turbines (every other one) within the Phase 3 wind plant are lighted due to their proximity to the Pipestone, Minnesota airport. Gravel access roads service all turbine strings and each turbine is placed on a gravel pad that averaged approximately 14 m in diameter at Phase 1 turbine sites, 24 m in diameter at Phase 2 turbine sites and 36 m in diameter at Phase 3 turbine sites.

METHODS

Fatality searches.—Fatality searches were conducted at 21 of the 73 turbines within the Phase 1 study area, 40 of the 143 turbines within the Phase 2 study area and 30 of the 138 turbines within the Phase 3 study area. Turbines were numbered consecutively in each phase, and we selected turbines for searching using a systematic design with a random start for the first turbine. Searches were conducted from 1996 through 1999 at Phase 1, in 1998 and 1999 at Phase 2 and in 1999 at Phase 3. Each turbine was searched every 14 d from 15 March to 15 November each study year. A 100 m × 100 m (1.0 ha) square plot was centered around each turbine to ensure all areas within 50 m of the turbine were searched (Anderson *et al.*, 1999). We used a square plot, rather than a circular one, to facilitate marking search boundaries and conducting the search. Transects were initially set at 6 m apart in the area to be searched, and the searcher initially walked at a rate of approximately 30–45 m/min along each transect searching both sides out to 3 m for fatalities (Johnson *et al.*, 1993). Transect width and search speed were adjusted based on visibility within each habitat type. On average, approximately 30 to 45 min were spent searching each plot.

Bat fatalities found incidentally at turbines not selected for searching also were recorded. For each bat fatality found we recorded species, date and time, location, distance to nearest turbine and condition (*i.e.,* intact, scavenged, dismembered). Injuries observed were recorded during a cursory field necropsy. A subset of fresh intact bat carcasses was aged and sexed. The mean number of fatalities per turbine and associated variance were calculated using standard formulas.

Fatality search biases.—Two primary sources of bias must be accounted for to improve the accuracy of fatality estimates; these include the proportion of carcasses removed by scavengers between search intervals and the proportion of carcasses present in the search plot but not detected by the observer. We conducted carcass removal trials to estimate the length of time bat fatalities remained in the search area. The trials were conducted at randomly-selected turbine locations but not within the same turbine plots where fatality searches occurred. Four trials were conducted, each with 10 fresh hoary bat (*Lasiurus cinereus*) carcasses found during the study.

To simulate bats that were both killed or wounded by turbine collision, carcasses were placed so that they were completely exposed, hidden or partially hidden. We monitored carcasses daily for 14 d (the interval between searches for carcasses on each plot) to determine scavenger removal rates. We used estimates of carcass removal to adjust fatality counts for removal bias. The mean length of time a carcass remained in the study area before it was removed and associated variance were calculated using standard formulas. Because several bat carcasses remained at the end of 14 d, the mean length of stay was estimated using statistical methods appropriate for censored data (Shumway *et al.*, 1989). We estimated carcass removal statistics as a function of major habitat type (*e.g.*, crop field, CRP grassland, gravel pad around turbines) within each of the three wind development areas.

We conducted searcher efficiency trials in the same areas in which fatality searches occurred to estimate the percentage of bat fatalities found by searchers. Carcasses used to represent the size and color of bats during searcher efficiency trials included juvenile (<7-d old) mallards (*Anas platyrhynchos*), juvenile (7 to 14 d old) northern bobwhites (*Colinus virginianus*) and adult house sparrows (*Passer domesticus*) and European starlings (*Sturnus vulgaris*). We did not conduct searcher efficiency trials with bats due to a shortage of suitable bat carcasses and because searcher efficiency data collected at another wind plant indicated that detectability of bats was very similar to that of small birds.

Personnel conducting searches did not know the location of searcher efficiency carcasses. We placed carcasses at random locations within areas being searched for fatalities before the search on the same day. Searcher efficiency trials were spread over the entire study period to incorporate effects of varying weather and vegetation growth. We placed carcasses in a variety of exposures to simulate a range of conditions as was described for carcass removal trials. The mean proportion of placed carcasses found by searchers and associated variance were calculated using standard formulas. We used results of searcher efficiency trials to evaluate effectiveness of the fatality search effort and to make adjustments for the final estimate of the total number of fatalities. A separate searcher efficiency rate was estimated for each major habitat.

Estimating the total number of fatalities.—The proportion of each major habitat type in each turbine plot was recorded and averaged for all plots. Because virtually all bat fatalities were found within 30 m of turbines, the habitat proportions for each turbine plot were estimated based on a 120 × 120 m search plot rather than the 150 × 150 m search plot actually used. To calculate the total number of bat fatalities, we weighted values used for searcher efficiency and scavenger removal rates based on the relative proportion of each habitat type in the search plots. The estimated total number of fatalities for the wind plant, m, was calculated by:

$$m = \frac{NxIxC}{kx\bar{t}xp}$$

where N is the total number of turbines, I is the interval between searches in days, C is the total number of fatalities found during the study, k is the number of turbines sampled, $\bar{t}$ is the mean length of time fatalities remain in the study area before being removed and p is the searcher efficiency.

The variance was calculated using the variance of a product formula (Goodman, 1960) and the variance of a ratio formula (Cochran, 1977). The variance of the product t and p is:

$$V(\bar{t}xp) = \bar{t}^2 xV(p) + p^2 xV(\bar{t}) - V(\bar{t})xV(p).$$

TABLE 1.—Number and total proportion of bat carcasses found associated with turbines at Buffalo Ridge, Minnesota, in 1998 and 1999

Species	Number of carcasses	Percent of identified fatalities
Hoary Bat (*Lasiurus cinereus*)	108	66
Red Bat (*Lasiurus borealis*)	37	23
Silver-haired Bat (*Lasionycteris noctivagans*)	6	4
Eastern Pipistrelle (*Pipistrellus subflavus*)	6	4
Little Brown Bat (*Myotis lucifugus*)	5	3
Big Brown Bat (*Eptesicus fuscus*)	1	0.6
Unidentified	21	NA
Total	184	

From this, the variance of *m* is:

$$V(m) = \frac{N^2}{k^2} xI^2 xm^2 x \left[\frac{V(\bar{t}xp)}{\bar{t}^2 x\bar{p}^2} + \frac{V(\overline{C})}{\overline{C}^2} \right].$$

Lights on structures have shown to increase collision mortality of nocturnal avian migrants (Manville, 2001). In addition, bats often forage at artificial lights (Wilson, 1965; Barclay, 1985; Geggie and Fenton, 1985; Furlonger *et al.*, 1987) where insect numbers are highest (Hickey and Fenton, 1990). To evaluate whether lights on turbines increased the probability of bat collisions, we tested the hypothesis that bat mortality at lighted turbines was higher than at unlit turbines using a *z*-test for equality of proportions.

RESULTS

Although 13 bat fatalities were documented in the Phase 1 wind plant in 1994 and 1995 (Osborn *et al.*, 1996), we did not document any further bat mortality at this site in 1996 and 1997. In 1998, however, we found 2 dead bats in the Phase 1 study area and 76 dead bats in the Phase 2 study area which became operational in the summer of 1998. In 1999 we found 106 bat fatalities, including five in the Phase 1 wind plant, 57 in the Phase 2 wind plant and 44 in the Phase 3 wind plant that became operational in the summer of 1999.

Twenty-one of the 184 bats found during the study were too decomposed to allow for positive identification. Of the 163 bats that could be identified, hoary bats comprised 66% and eastern red bats (*Lasiurus borealis*) comprised 23% of the fatalities. The remaining fatalities were comprised of small numbers of silver-haired bats (*Lasionycteris noctivagans*), eastern pipistrelles (*Pipistrellus subflavus*), little brown bats (*Myotis lucifugus*) and big brown bats (*Eptesicus fuscus*) (Table 1).

In 1998, 37 bats collected during the study were sexed, but age data were not collected. In 1999, 21 bats were both sexed and aged following criteria in Kunz (1988). Both the hoary and eastern red bat samples were comprised primarily of males. Two of the 8 hoary and 7 of the 11 eastern red bats in the sample were juveniles (Table 2). Bat fatalities were found during the period from 20 May to 19 October; however, 177 (97%) were found from 15 July to 15 September (Table 3).

All bat casualties were found associated with turbines and appeared related to turbine collisions. Injuries sustained by bats included fractured wings, legs and necks; head wounds; abrasions and abdominal injuries. Seventy of the bats (38%) were intact, 111 (60%) were scavenged, 1 (0.5%) was dismembered and 2 (1%) were observed with injuries, but not captured.

TABLE 2.—Sex and age composition of a subsample of bat carcasses found associated with turbines at Buffalo Ridge, Minnesota, during 1998 and 1999

1998				
Species	n	% male	% female	% juvenile
Hoary Bat (*Lasiurus cinereus*)	27	63	37	unknown
Eastern Red Bat (*Lasiurus borealis*)	7	57	43	unknown
1999				
Species	n	% adult male	% adult female	% juvenile
Hoary Bat (*Lasiurus cinereus*)	8	63	12	25
Eastern Red Bat (*Lasiurus borealis*)	11	27	9	64

Bat fatalities were fairly widespread throughout the study area. From 1998 to 1999 dead bats were found at 33 of the 40 turbine plots randomly selected for fatality searches in the Phase 2 study area, and fatalities were found incidentally at an additional 31 turbines. In the Phase 3 wind plant, bat fatalities were found at 20 of the 30 turbines randomly selected for sampling in 1999 and at an additional eight turbines during other study activities. The largest number of bats found at any one turbine was eight at a turbine in the Phase 2 study area; these bats were found over a 1-mo period (31 July to 31 August 1998). The largest number of bats found at one time was 5 at a single turbine on 13 August 1999. Fifty-four percent of all bat carcasses were found ≤10 m from a turbine, 43% were found from 10 m to 20 m, 3% were found from 20 m to 30 m and one (0.5%) was found >30 m from a turbine (34.8 m). Based on distribution of bat fatalities surrounding turbines, the 100 m × 100 m search plot was more than adequate to detect all bat fatalities associated with turbines (Gauthreaux, 1996). Lighted turbines comprised 22% of all turbines in the wind plant and 18% of the bat fatalities were found at lighted turbines. The mean number of bat mortalities

TABLE 3.—Timing of bat collision fatalities at the Buffalo Ridge, Minnesota Wind Resource Area. Data from 1998 and 1999 are pooled

Time period	Number of bat fatalities found
15–31 March	0
1–15 April	0
16–30 April	0
1–15 May	0
16–31 May	1
1–15 June	0
16–30 June	0
1–15 July	1
16–31 July	45
1–15 August	57
16–31 August	39
1–15 September	36
16–30 September	2
1–15 October	1
16–31 October	2
1–15 November	0

TABLE 4.—Estimates of turbine-related bat mortality for the Buffalo Ridge, Minnesota wind development area, March through November 1996–1998

Year	No. turbines searched	No. fatalities found	Total mortality estimate[a]	90% CI	No. fatalities per turbine per year	90% CI
Phase 1 Wind plant—73 turbines						
1996	21	0	0	na[b]	0	na
1997	21	0	0	na	0	na
1998	21	2	0[c]	na	0	na
1999	21	5	19	4–33	0.26	0.06–0.46
Mean	21	2	5	1–8	0.07	0–0.49
Phase 2 Wind plant—143 turbines						
1998	40	76	231	172–290	1.62	1.21–2.03
1999	40	57	277	219–335	1.94	1.53–2.35
Mean	40	67	254	213–295	1.78	1.61–1.95
Phase 3 Wind plant—138 turbines						
1999	30	44	282	199–365	2.04	1.46–2.62

[a] Mortality estimate calculated by extrapolating the number of fatalities found at a sample of turbines to all turbines in the wind plant, and then adjusting this number upwards to take into consideration the proportion of fatalities removed by scavengers prior to the search or not detected by the searchers

[b] na = not applicable

[c] The mortality estimate was 0 because no fatalities were found on the 21 randomly-selected study plots; 2 fatalities were found at non study plots in the wind development area

at lighted turbines was not significantly higher than the mean number of fatalities at unlit turbines ($z = -1.3$, $P = 0.9$).

During the study, 306 small birds were placed for searcher efficiency trials, 29.4% (SE = 0.04) of them were detected by searchers. The 40 bat carcasses used to measure scavenger removal rates lasted an average of 10.4 d (SE = 2.6) during the summer and fall seasons. Virtually all scavenging of bat carcasses was done by insects.

One hundred fifteen (63%) of the 184 bat casualties found in 1998 and 1999 were located during scheduled fatality searches; the remainder were found during other study activities. We used only fatalities found during scheduled fatality searches to estimate mean number of fatalities per turbine and total wind plant mortality. An estimate of total bat mortality in the Phase 1 study area could not be made in 1998 because neither of the two dead bats found were located on fatality search plots. In 1999 we found three bats during scheduled fatality searches in the Phase 1 study area. For all 4 study years combined, we estimated mean annual bat mortality at the Phase 1 wind plant to be 5, which is equivalent to a mean of 0.07 collisions per turbine per year (Table 4). We estimated bat mortality in the Phase 2 wind plant to average 254 per y in 1998 and 1999, which equates to 1.78 fatalities per turbine. The estimated total bat mortality in the Phase 3 study area in 1999 was 282, which equates to a mean of 2.04 bats killed per turbine (Table 4). For all three wind plants combined, we estimate that 541 bat collision fatalities occur each year.

DISCUSSION

Bat collision mortality is not unique to wind plants or to Buffalo Ridge. Previous studies have documented bats colliding with other man-made structures. The first report was that by

Saunders (1930), who reported that five bats of three species were killed at a lighthouse in Ontario, Canada. Five eastern red bats were reported killed by colliding with a television tower in Kansas (Van Gelder, 1956). Small numbers (≤ 5) of eastern red bat collision victims have also been reported at communication towers in Missouri (Anonymous, 1961), North Dakota (Avery and Clement, 1972), Tennessee (Ganier, 1962) and Saskatchewan, Canada (Gollop, 1965). One yellow bat (*Lasiurus intermedius*) collision victim was found at a Florida TV tower (Taylor and Anderson, 1973). During 25 y of monitoring a television tower in Florida, Crawford and Baker (1981) found 54 bat collision victims representing seven species. Over an 8-y period, 50 eastern red, 27 silver-haired, 1 hoary and 1 little brown bat collision victims were found underneath large windows at a convention center in Chicago, Illinois (Timm, 1989). Bats have also been documented colliding with powerlines (Dedon *et al.*, 1989) and fences (Iwen, 1958; Denys, 1972; Wisely, 1978).

Mortality at wind plants was first documented in Australia, where 22 white-striped mastiff-bats (*Tadarida australis*) were found at the base of turbines over 4-y (Hall and Richards, 1972). In 1999, 45 dead bats were found at a wind plant in Carbon County, Wyoming, 10 dead bats were found at a wind plant in Umatilla County, Oregon, and 34 dead bats were found within a 31-turbine wind plant in Wisconsin (Keeley *et al.*, 2001). Small numbers of dead bats have also been found at wind plants in California (Orloff and Flannery, 1992; Howell, 1997; Anderson *et al.*, 2000; Thelander and Rugge, 2000) and Colorado (R. Ryder, Colorado State University, pers. comm.). Most bat mortality documented at other wind plants occurred in late summer and early fall and involved tree bats, with hoary bats being the most prevalent fatality.

The near absence of collision mortality in June and early July when resident bats are breeding in Minnesota (Hazard, 1982) indicates that resident populations are not being impacted by the wind plant. Based on the timing of fall migration of hoary, red and silver-haired bats (Findley and Jones, 1964; LaVal and LaVal, 1979; Izor, 1979; Koehler and Barclay, 2000) as well as fall dispersal of eastern pipistrelles, little brown bats and big brown bats (Barbour and Davis, 1969; Humphrey and Cope, 1976), most of the collision mortality apparently involves migrant or dispersing bats. The presence of lighting on turbines did not increase the number of bat collision fatalities at the Buffalo Ridge wind plant.

Data collected by Koehler and Barclay (2000) in Manitoba indicate that hoary bats should be migrating through the Buffalo Ridge area in mid to late May if they follow similar routes in the spring and fall, yet we found only 1 fatality in May. Plots of museum occurrence records of hoary bats indicate extremely low densities of this species in Minnesota in May, with much higher densities in July and August. A similar pattern occurs for eastern red bat, whereas silver-haired bat abundance is fairly similar from mid May through mid September (P. Cryan, University of New Mexico, pers. comm.) These data indicate that hoary and red bats may use different migration corridors in the spring and fall, as do some species of birds (*e.g.,* Richardson, 1974, 1976). Behavioral differences between migrating hoary bats in the spring and fall also may be related to mortality patterns. Such differences have been reported; in Florida, autumn migration of hoary bats occurred in waves whereas the spring migration appeared to be far more scattered and less organized (Zinn and Baker, 1979).

The cause of bat collisions with wind turbines or other man-made structures is not well understood (Osborn *et al.*, 1996). According to Van Gelder (1956), most bat collisions at other man-made structures occur during migration and are normally associated with inclement weather and avian collision mortalities. However, at a communication tower in Florida, bat fatalities were found largely in the absence of associated avian mortalities (Crawford and Baker, 1981), and at Buffalo Ridge, we found very few avian fatalities during the time frame that most bat fatalities occurred. Migrating bats may navigate without use of echolocation (Crawford and Baker, 1981). Bats have good visual acuity (Suthers, 1966, 1970) and evidence indicates that bats depend on vision, rather than echolocation, for long-distance orientation (Mueller, 1968; Williams and Williams, 1970). If bats are flying through wind plants on Buffalo Ridge by sight only, then causes of bat mortality could be similar to causes of avian collision mortality at wind plants.

Potential population effects of wind power-related mortality cannot be quantified with available data. Based on the bat mortality documented at Buffalo Ridge, as well as at other wind plants in the United States, the potential for wind plants to impact bat populations should be addressed when siting new facilities, especially in areas where threatened or endangered bat species may occur. The wind power and utility industries are currently funding studies to examine bat mortality at wind plants. Future research should concentrate on determining the causes of collisions, potential population effects and development of mitigation strategies to avoid or minimize bat mortality at wind plants.

Acknowledgments.—This study was funded by Xcel Energy, Minneapolis, Minnesota. The authors would like to thank field biologists J. Jeffrey and J. Townsend who assisted with data collection in 1997. We greatly appreciate the cooperation of numerous landowners in Lincoln and Pipestone counties, Minnesota, who graciously allowed access to their land for study purposes. Personnel of the Xcel Energy Lake Benton office provided invaluable logistic support. Bat mortalities were sexed and aged, and food items were determined by D. Mork and his staff at St. Cloud State University, St. Cloud, Minnesota.

LITERATURE CITED

AMERICAN WIND ENERGY ASSOCIATION (AWEA). 1995. Avian interactions with wind energy facilities: a summary. Prepared by Colson & Associates for AWEA, Washington, D.C. 62 p.

———. 2001. Wind energy's costs hit new low, position wind as clean solution to energy crisis, trade group says. American Wind Energy Association News Release, AWEA, Washington, D.C. 4 p.

———. 2002. U.S. wind industry ends most productive year, more than doubling previous record for new installations. American Wind Energy Association News Release, AWEA, Washington, D.C. 2 p.

ANDERSON, R., M. MORRISON, K. SINCLAIR AND D. STRICKLAND. 1999. Studying wind energy/bird interactions: a guidance document. National Wind Coordinating Committee, Washington, D.C. 87 p.

———, D. STRICKLAND, J. TOM, N. NEUMANN, W. ERICKSON, J. CLECKLER, G. MAYORGA, G. NUHN, A. LEUDERS, J. SCHNEIDER, L. BACKUS, P. BECKER AND N. FLAGG. 2000. Avian monitoring and risk assessment at Tehachapi Pass and San Gorgonio Pass wind resource areas, California: Phase 1 preliminary results. Proceedings of the National Avian-Wind Power Planning Meeting, 3:31–46. National Wind Coordinating Committee, Washington, D.C.

ANONYMOUS. 1961. Large bird kills at TV towers. *Bluebird,* **28**:9.

AVERY, M. AND T. CLEMENT. 1972. Bird mortality at four towers in eastern North Dakota: Fall 1972. *Prairie Nat.,* **4**:87–95.

BARBOUR, R. A. AND W. H. DAVIS. 1969. Bats of America. University Press of Kentucky, Lexington. 286 p.

BARCLAY, R. M. R. 1985. Long- versus short-range foraging strategies of hoary (*Lasiurus cinereus*) and silver-haired (*Lasionycteris noctivagans*) bats and the consequences for prey selection. *Can. J. Zool.,* **63**:2507–2515.

COCHRAN, W. G. 1977. Sampling techniques, 3rd ed. John Wiley and Sons, New York, New York. 428 p.

COFFIN, B. AND L. PFANNMULLER (eds.). 1988. Minnesota endangered flora and fauna. University of Minnesota Press, Minneapolis. 473 p.

CRAWFORD, R. L. AND W. W. BAKER. 1981. Bats killed at a north Florida television tower: a 25-year record. *J. Mammal.,* **62**:651–652.

DEDON, M., S. BYRNE, J. AYCRIGG AND P. HARTMAN. 1989. Bird mortality in relation to the Mare Island 115-kV transmission line: progress report 1988/1989. Department of the Navy, Western Division, Naval Facilities Engineering Command, Office of Environmental Management, San Bruno, California. Report 443-89.3. 150 p.

DENYS, G. A. 1972. Hoary bat impaled on barbed wire. *Jack-Pine Warbler,* **50**:63.

FINDLEY, J. S. AND C. JONES. 1964. Seasonal distribution of the hoary bat. *J. Mammal.,* **45**:461–470.

FURLONGER, C. L., H. J. DEWAR AND M. B. FENTON. 1987. Habitat use by foraging insectivorous bats. *Can. J. Zool.,* **65**:284–288.

GANIER, A. F. 1962. Bird casualties at a Nashville TV tower. *Migrant,* **33**:58–60.

GAUTHREAUX, S. A., JR. 1996. Suggested practices for monitoring bird populations, movements and mortality in wind resource areas. Proceedings of the National Avian-Wind Power Planning Meeting, 2:88–110. National Wind Coordinating Committee, Washington, D.C.

GEGGIE, J. F. AND M. B. FENTON. 1984. A comparison of foraging by *Eptesicus fuscus* (Chiroptera: Vespertilionidae) in urban and rural environments. *Can. J. Zool.,* **63**:263–267.

GOLLOP, M. A. 1965. Bird migration collision casualties at Saskatoon. *Blue Jay,* **23**:15–17.

GOODMAN, L. A. 1960. On the exact variance of products. *J. Am. Stat. Assoc.,* **55**:708–713.

HALL, L. S. AND G. C. RICHARDS. 1972. Notes on *Tadarida australis* (Chiroptera: molossidae). *Australian Mammalogy,* **1**:46.

HANSEN, P., B. GRAND AND N. LANGE. 1992. Power to spare in the Upper Midwest. Izaak Walton League of America, Minneapolis, Minneapolis. 30 p.

HAZARD, E. B. 1982. The Mammals of Minnesota. University of Minnesota Press, Minneapolis. 280 p.

HICKEY, M. B. C. AND M. B. FENTON. 1990. Foraging by red bats (*Lasiurus borealis*): do intraspecific chases mean territoriality? *Can. J. Zool.,* **68**:2477–2482.

HOWELL, J. A. 1997. Bird mortality at rotor swept area equivalents, Altamont Pass and Montezuma Hills, California. *Trans. West. Sect. Wildl. Soc.,* **33**:24–29.

HUMPHREY, S. R. AND J. B. COPE. 1976. Population ecology of the little brown bat, *Myotis lucifugus,* in Indiana and north-central Kentucky. *Am. Soc. Mammal. Spec. Publ.* **4,** 81 p.

IWEN, F. A. 1958. Hoary bat the victim of a barbed wire fence. *J. Mammal.,* **39**:438.

IZOR, R. J. 1979. Winter range of the silver-haired bat. *J. Mammal.,* **69**:641–643.

JOHNSON, G. D., H. O. KRUEGER AND R. T. BALCOMB. 1993. Effects on wildlife of Brace® 10G applications to corn in south-central Iowa. Environ. Toxicol. Chem., **12**:1733–1739.

KEELEY, B., S. UGORETZ AND D. STRICKLAND. 2001. Bat ecology and wind turbine considerations. Proceedings of the National Avian-Wind Power Planning Meeting, 4:135–146. National Wind Coordinating Committee, Washington, D.C.

KOEHLER, C. E. AND R. M. R. BARCLAY. 2000. Post-natal growth and breeding biology of the hoary bat (*Lasiurus cinereus*). *J. Mammal.,* **81**:234–244.

KUNZ, T. H. (ed.). 1988. Ecological and behavioral methods for the study of bats. Smithsonian Institute Press, Washington, D.C. 533 p.

LAVAL, R. K. AND M. L. LAVAL. 1979. Notes on reproduction, behavior, and abundance of the red bat, *Lasiurus borealis. J. Mammal.,* **60**:209–212.

LEDDY, K. L. 1996. Effects of wind turbines on nongame birds in Conservation Reserve Program grasslands in southwestern Minnesota. M.S. Thesis, South Dakota State University, Brookings. 61 p.

MANVILLE, A. M., JR. 2000. The ABCs of avoiding bird collisions at communication towers: the next steps. Proceedings of the Avian Interactions Workshop, 2 December 1999, Charleston, SC. Electric Power Research Institute, Palo Alto, California. 15 pp.

MUELLER, H. C. 1968. The role of vision in vespertilionid bats. *Am. Midl. Nat.,* **79**:524–525.

ORLOFF, S. AND A. FLANNERY. 1992. Wind turbine effects on avian activity, habitat use, and mortality in Altamont Pass and Solano County Wind Resource Areas, 1989–1991. Final Report to Alameda, Costra Costa and Solano Counties and the California Energy Commission. California Energy Commission, Sacramento, California. 146 p.

OSBORN, R. G., K. F. HIGGINS, C. D. DIETER AND R. E. USGAARD. 1996. Bat collisions with wind turbines in southwestern Minnesota. *Bat Res. News,* **37**:105–108.

RICHARDSON, W. J. 1974. Spring migration over Puerto Rico and the western Atlantic: a radar study. *Ibis,* **116**:172–193.

———. 1976. Autumn migration over Puerto Rico and the western Atlantic: a radar study. *Ibis,* **118**: 309–332.

SAUNDERS, W. E. 1930. Bats in migration. *J. Mammal.,* **11**:225.

SHUMWAY, R. H., A. S. AZARI AND P. JOHNSON. 1989. Estimating mean concentrations under transformation for environmental data with detection limits. *Technometrics,* **31**:347–356.

SUTHERS, R. A. 1970. Vision, olfaction, and taste, p. 265–309. *In:* W. A. Wimsatt (ed.). Biology of bats, Vol. 2. Academic Press, New York. 477 p.

———. 1966. Optomotor responses by echolocating bats. *Science,* **152**:1102–1104.

TAYLOR, W. K. AND B. H. ANDERSON. 1973. Nocturnal migrants killed at a central Florida TV tower: autumns 1969–1971. *Wilson Bull.,* **85**:42–51.

THELANDER, C. G. AND L. RUGGE. 2000. Bird risk behaviors and fatalities at the Altamont Wind Resource Area. Proceedings of the National Avian-Wind Power Planning Meeting, 3:5–14. National Wind Coordinating Committee, Washington, D.C.

TIMM, R. M. 1989. Migration and molt patterns of red bats. Illinois Bull. Chicago Academy of Science.

VAN GELDER, R. G. 1956. Echo-location failure in migratory bats. *Trans. Kansas Acad. Sci.,* **59**:220–222.

WILLIAMS, T. C. AND J. M. WILLIAMS. 1970. Radio tracking of homing and feeding flights of a neotropical bat. *Anim. Behav.,* **18**:302–309.

WILSON, N. 1965. Red bats attracted to insect light traps. *J. Mammal.,* **46**:704–705.

WISELY, A. N. 1978. Bat dies on barbed wire fence. *Blue Jay,* **36**:53.

ZINN, T. L. AND W. W. BAKER. 1979. Seasonal migration of the hoary bat, *Lasiurus cinereus,* through Florida. *J. Mammal.,* **60**:634–635.

SUBMITTED 15 JANUARY 2002 ACCEPTED 14 MARCH 2003

EXHIBIT
8

United States Department of the Interior

FISH AND WILDLIFE SERVICE
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In Response Reply To:
FWS/R8/MB&SP

Amy E. Parsons
Senior Permitting Manager
Iberdrola Renewables
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Portland, OR 97209

AUG 01 2014

Dear Ms. Parsons,

The U.S. Fish and Wildlife Service (Service) is writing in response to the programmatic eagle take permit application under the Bald and Golden Eagle Protection Act (Eagle Act) for Phase II of the Tule Wind Project, LLC that we received from you on March 14, 2014. Your submission included a draft Eagle Conservation Plan (ECP) as the foundation of the application. We have reviewed this document and have determined that your application package is incomplete. Therefore, we are returning your application, along with your check for the permit application fee.

The application package does not include information on the entire Tule Wind Project; it only includes information on Phase II, the portion of the project located on the ridgeline. Your application states that Iberdrola is not seeking eagle take coverage for Phase I of the Tule Wind Project. This portion of the project is located adjacent to the turbines on the ridgeline, on lands administered by the Bureau of Land Management (BLM). Based on our prior assessment of the turbines proposed in the valley, the Service concluded that Phase I of the Tule Wind Project has the potential to take golden eagles (*Aquila chrysaetos*) during the anticipated lifespan of the project, and recommended that you seek an Eagle Act take permit (Memo to BLM dated October 4, 2011). When the BLM approved a ROW grant for Phase I of this project, your company agreed to construct and operate Phase I. Your company also agreed to gather additional information about eagle use of the area and eagle mortality associated with Phase I of the project to better inform the risk to eagles associated with the potential approval of turbines on the ridge (Phase II of the project). Although Phase I was approved by BLM in 2011, your company has not started construction on Phase I and has linked construction of the turbines in the valley (Phase I) to the construction of the turbines on the ridgeline (Phase II). Thus, the Service does not consider this project to be phased, relative to permitting take under the Eagle Act.

In the current draft ECP impact assessment that you recently provided, an evaluation of the risk associated with Phase I of the project is not included. Due to the close proximity of the turbines in the valley and along the ridge, all the proposed turbines associated with this project should be analyzed and considered together as a single project. In addition, since both phases of this project are connected actions and both pose a risk of take to eagles, your application will need to include an impact assessment for the entire project. The Service requests that the Draft ECP be modified to include both Phase I and Phase II of the project because we have determined the two portions are connected and not true stand-alone phases.

We characterize the entire Tule Wind Project as a Category 1 - High Risk Project because it poses a high risk to eagles and the potential to avoid or mitigate impacts is low (see our ECP Guidance). We recommend that when you apply for an Eagle Act permit, you consider a different turbine siting design for the proposed turbines on the ridgeline or moving the project to another location to minimize and avoid eagle take at the Tule Wind Project.

On June 22, 2012, we provided comments to the Bureau of Indian Affairs (BIA) regarding our review of the *Draft Avian and Bat Protection Plan for the Tule Reduced Ridgeline Wind Project* (Phase II). In this correspondence we reiterated our request that the eagle risk assessment incorporate the eagle observational data and juvenile eagle telemetry data to assess risk. Your draft ECP did not incorporate this data as requested. As a result, the model does not accurately reflect risk to eagles.

We request that you resubmit your application package with all the information necessary to process your application for the proposed turbines in the valley and along the ridgeline. In addition, any pertinent information contained in your ABPP for Phase I of the project should be incorporated into your application package. Your resubmission should include all the raw eagle use data collected for this project to date, including the telemetry data, for our review and use in developing a comprehensive mortality estimate.

We look forward to working with you on your application. If you have any questions regarding this project, please contact myself or Assistant Regional Director, Mr. Eric Davis, at (916) 978-6189.

Sincerely,

Regional Director

cc: Amy Dutschke, Regional Director, Pacific Region, Bureau of Indian Affairs
Chairman, Ewiiaapaayp Band of Kumeyaay Indians, Alpine, CA
Karen Goebel, U.S. Fish and Wildlife Service, Carlsbad, CA
Jennifer Deleon, California State Lands Commission, Sacramento, CA
Jim Kenna, California State Director, Bureau of Land Management, Sacramento, CA
Jill Birchell, USFWS, Office of Law Enforcement, Sacramento, CA

EXHIBIT
9

Adverse health effects of industrial wind turbines: a preliminary report

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INTRODUCTION

Guidelines and regulations for the siting of industrial wind turbines (IWT) close to human habitation are generally predicated on the need to protect the sleep of the residents. The recommended setback distances and "safe" external noise levels make the assumptions that IWT noise can be regarded as similar to other forms of environmental noise (traffic, rail and aircraft) and is masked by ambient noise. There has been no independent verification that these assumptions are justified and that the safeguards are sufficient to protect sleep.

Anecdotal complaints of annoyance and health effects from IWT noise have grown in number in recent years, not least because turbine size has increased and they have been placed closer to population centers. The predominant symptom of health complaints is sleep disturbance (Frey & Hadden 2007; Pierpont 2009; van den Berg et al. 2008; WindVOICe 2010). The consequences of sleep disturbance and the contribution of environmental noise are well documented (WHO 2009).

Complaints of adverse health effects were made shortly after IWT installations at Mars Hill and Vinalhaven, Maine, USA, began operating. A preliminary survey at Mars Hill, comparing those living within 1,400 m with a control group living 3,000-6,000 m away showed that sleep disturbance was the main health effect (Nissenbaum 2011, submitted for publication). A further study was therefore carried out at both Mars Hill and Vinalhaven using validated questionnaires and comparing those living within 1.5 km of the turbines with a control group living 3,500-6,000 m away.

METHODS

General study design

A questionnaire was offered to all residents meeting inclusion criteria living within 1.5 km of an IWT and to a random sample of residents meeting inclusion criteria living 3 to 7 km from an IWT between March and July of 2010. The protocol was reviewed and approved by IRB Services, Aurora, Ontario, Canada.

Questionnaire

The questionnaire comprised validated instruments relating to mental and physical health (SF-36v2) (QualityMetric Inc.), sleep disturbance (Pittsburgh Sleep Quality Index (PSQI) (Buysse et al. 1989) and the Epworth Sleepiness Scale (ESS) (Johns 1991), in addition to headache functional inquiry questions and a series of attitudinal questions relating specifically to changes with exposure to IWT noise. Only the results from the validated instruments are presented here.

Participant selection

The Mars Hill site is a linear arrangement of 28 General Electric 1.5 megawatt turbines, sited on a ridgeline. The Vinalhaven site is a cluster of three similar turbines, sited on a flat tree covered island. All residents living within 1.5 km of an IWT at each site were identified via tax maps, and approached either door to door or via telephone and asked to participate in the study. Homes were visited up to three times or until contact was made. Those below the age of 18 or with a diagnosed cognitive disorder were excluded. A random sample of households in a similar socioeconomic area 3 to 7 km away from IWTs at each site was chosen to participate in the study as a control group. Households were approached door-to-door until a similar number of participants were enrolled.

Data handling and validation

Questionnaire results were coded and entered into a spreadsheet (Microsoft Excel 2007). The distance from each participant's residence to the nearest IWT was measured using satellite maps. SF36-V2 responses were processed using QualityMetric Health Outcomes™ Scoring Software 3.0 to generate Mental (MCS) and Physical (PCS) Component Scores. Missing values were verified and outliers were individually assessed. Data quality of the SF36-V2 responses was determined using QualityMetric Health Outcomes™ Scoring Software 3.0. All SF36-V2 data quality indicators (completeness, response range, consistency, estimable scale scores, internal consistency, discriminant validity, and reliable scales) exceeded parameter norms.

Statistical analysis

All analyses were performed using SAS 9.22. Descriptive and multivariate analyses were performed to investigate the effect of the main independent variable of interest (distance to nearest IWT) on the various outcome measures.

Significance of binomial outcomes was assessed using either the GENMOD procedure with binomial distribution and logit link; or when cell frequencies were small (<5), Fisher's Exact Test. When assessing significance between variables with a simple score as the outcome (eg. 1-5), the exact Wilcoxson Score (Rank Sums) test was employed using the NPAR1WAY procedure. Significance of continuous outcome variables was assessed using the GENMOD procedure with normal distribution. When using the GENMOD procedure, age, gender and site were forced into the model as fixed effects. The potential effect of household clustering on statistical significance was accommodated by using the REPEATED statement.

Independent variables assessed included the following: Site (Mars Hill, Vinalhaven); Distance to IWT (both as a categorical and continuous variable); Age (continuous variable); Gender (categorical variable). Significance of Site as an effect modifier was assessed by fitting an interaction term (Site*distance).

Dependent variables assessed include the following: Epworth Sleepiness Scale (ESS), Pittsburgh Sleep Quality Index (PSQI), SF36-v2 Mental Component Score (MCS), SF36-v2 Physical Component Score (PCS).

For the purpose of interpreting statistical significance, the following were used: P-value < 0.05 = Significant; P-value 0.1 – 0.05 = Moderately significant; P-value > 0.1 = Not significant

Effect of Site on outcome parameters

The effect of Site was assessed by fitting Site (Mars Hill vs Vinalhaven) as a fixed effect, and as an interaction term with the main independent variable of interest (distance). Among all outcomes investigated, Site, and Site*Distance were not significant.

RESULTS

Study participants

33 and 32 adults were identified as living within 1,500 m of the nearest IWT at the Mars Hill (mean. 805 m, range 390-1,400) and Vinalhaven sites (mean 771 m range 375-1,000) respectively. 23 and 15 adults at the Mars Hill and Vinalhaven sites respectively completed questionnaires. Recruitment of control group participants continued to approximately the same number as study group participants, 25 and 16 for Mars Hill and Vinalhaven respectively.

There were no significant differences between the groups with respect to household size, age, or gender (Table 1).

Table 1: Demographic data

	Distance range from residence to nearest IWT (mean) in meters			
Parameter	375-750 (601)	751-1,400 (964)	3,300-5,000 (4,181)	5,300-6,600(5,800)
Sample size	18	20	14	27
Household clusters	11	12	10	23
Mean age	50	57	65	58
Male/Female	10/8	12/8	7/7	11/16

Sleep quality and health

The study group had worse sleep as evidenced by significantly higher mean PSQI and ESS scores and a greater number with PSQI >5 (Table 2). More subjects in the study group had ESS scores >10 but the difference did not reach statistical significance (p=0.1313).

The study group had worse mental health as evidenced by significantly higher mean mental component score of the SF36. There was no difference in the physical component scores.

Table 2: Sleep and mental health parameters

Parameter	Distance to IWT: Range (mean) m		p
	375-1,400 (792)	3,000-6,600 (5,248)	
PSQI Mean (LSmean)	7.8 (7.6)	6.0 (5.9)	0.0461
% PSQI >5	65.8	43.9	0.0745
ESS Mean (LSmean)	7.8 (7.9)	5.7 (5.7)	0.0322
% ESS >10	23.7	9.8	0.1313
SF36 MCS Mean (LSmean)	42.0 (42.1)	52.9 (52.6)	0.0021

ESS, PSQI and SF36 scores were modeled against distance from the nearest IWT using the equation: Score = ln(distance) + gender + age + site [controlled for household clustering] and are shown in Figures 1-3. In all cases, there was a clear and significant relationship with the effect diminishing with increasing distance from the IWT.

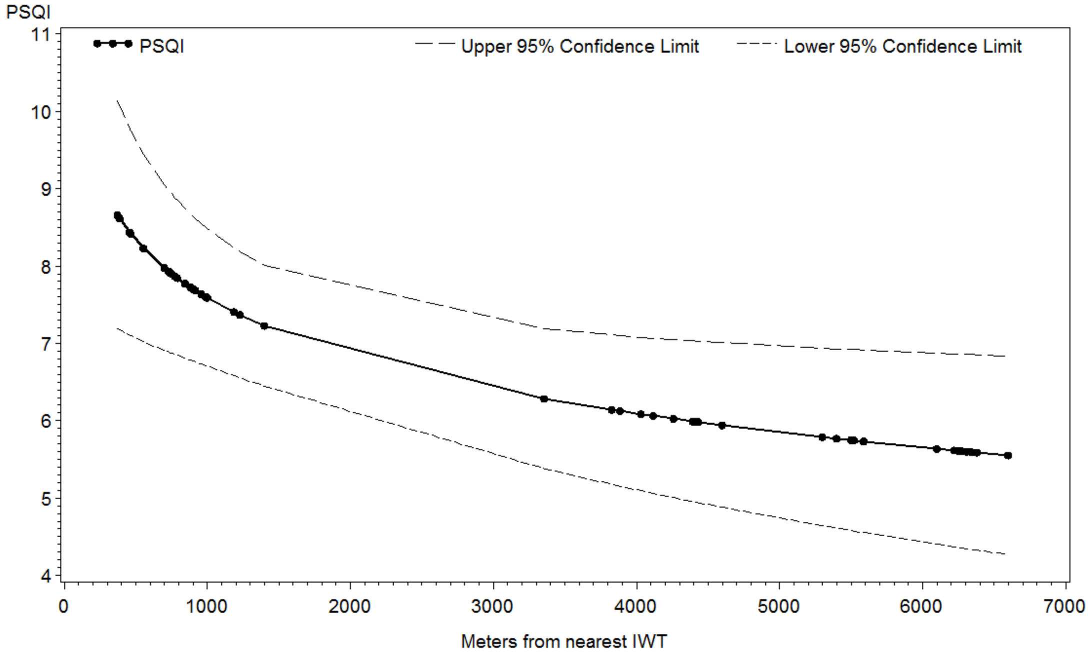

Figure 1: Modeled Pittsburgh Sleep Quality Index (PSQI) vs Distance (mean and 95 % confidence limits), p-value=0.0198

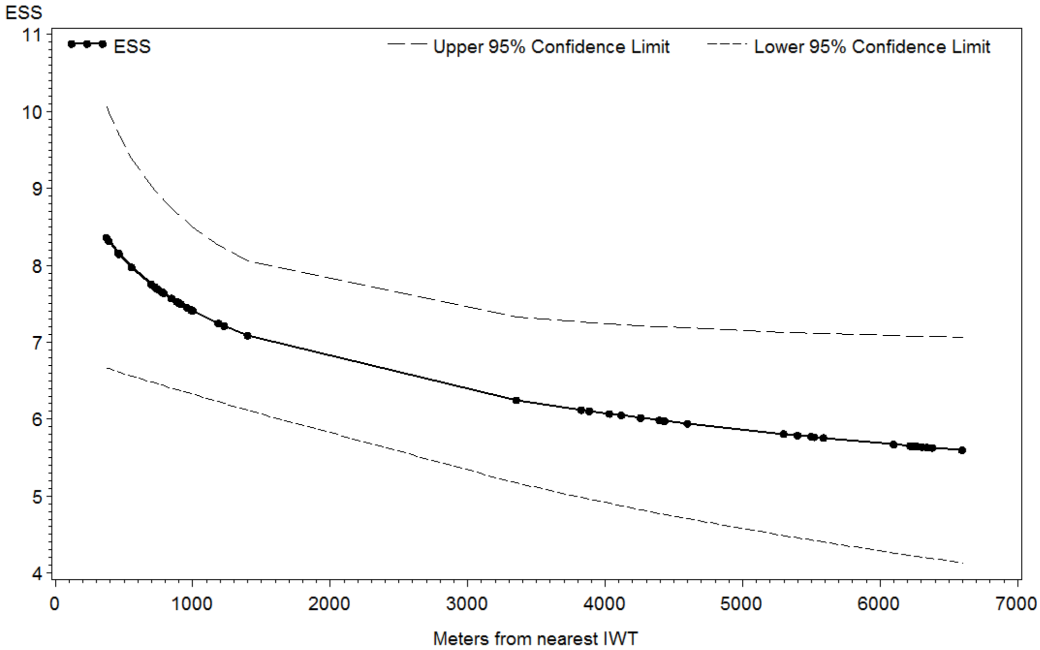

Figure 2: Modeled Epworth Sleepiness Scale (ESS) vs Distance (mean and 95 % confidence limits), p-value=0.0331

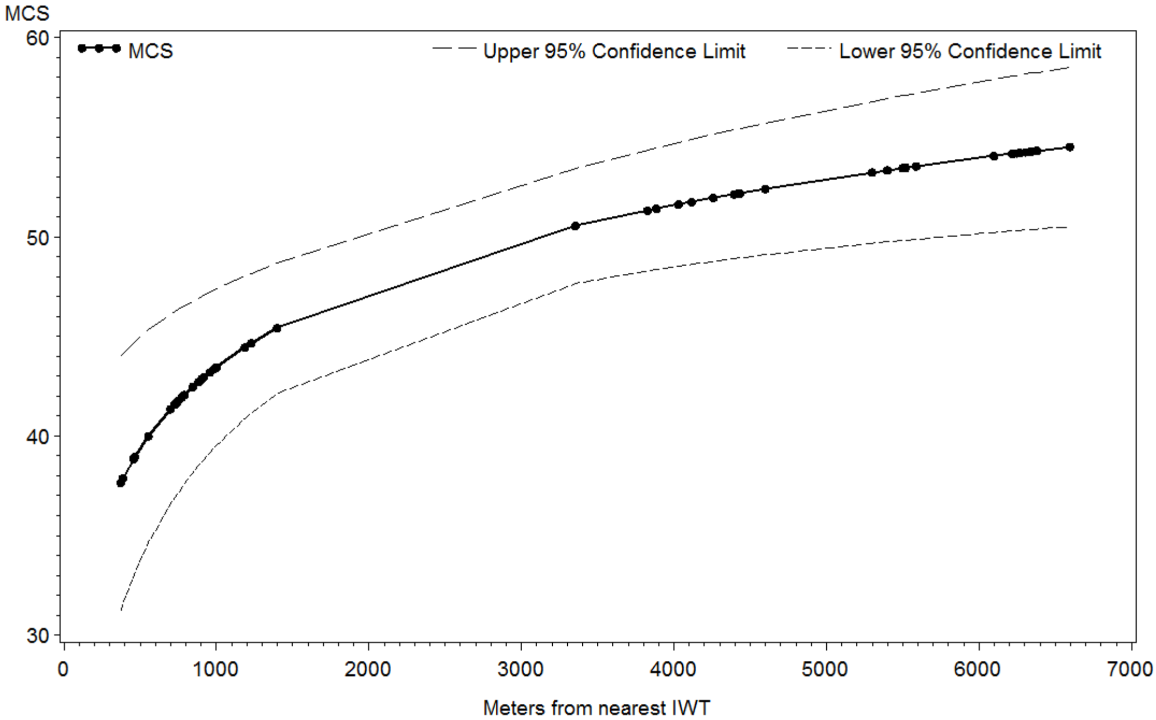

Figure 3: Modeled SF36 Mental Component Score (MCS) vs Distance (mean and 95 % confidence limits), p-value=0.0014

DISCUSSION

This study, which is the first controlled study of the effects of IWT noise on sleep and health, shows that those living within 1.4 km of IWT have suffered sleep disruption which is sufficiently severe as to affect their daytime functioning and mental health. Both the ESS and PSQI are averaged measures, i.e. they ask the subject to assess their daytime sleepiness and sleep quality respectively, over a period of several weeks leading up to the present. For the ESS to increase, sleep must have been shortened or fragmented to a sufficient degree on sufficient nights for normal compensatory mechanisms to have been overcome. The effects of sleep loss and daytime sleepiness on cognitive function, accident rate and mental health are well established (WHO 2009) and it must be concluded that at least some of the residents living near the Vinalhaven and Mars Hill IWT installations have suffered serious harm to their sleep and health.

The significant relationship between the symptoms and distance from the IWTs, the subjects' report that their symptoms followed the start of IWT operations, the congruence of the symptoms reported here with previous research and reports and the clear mechanism is strong evidence that IWT noise is the cause of the observed effects.

IWT noise has an impulsive character and is several times more annoying than other sources of noise for the same sound pressure level (Pedersen & Persson Waye 2004). It can prevent the onset of sleep and the return to sleep after a spontaneous or induced awakening. Road, rail and aircraft noise causes arousals, brief lightening of sleep which are not recalled. While not proven, it is highly likely that IWT noise will cause arousals which may prove to be the major mechanism for sleep disruption. It is possible that the low frequency and infrasound components of IWT noise might contribute to the sleep disruption and health effects by other mechanisms but this remains to be determined and further research is needed.

Attitudes to IWT and visual impact have been shown to be factors in annoyance to IWT noise (Pedersen et al. 2009) but have not been demonstrated for sleep disturbance. Most respondents in the present study welcomed the IWT installations as offering economic benefits. The visual impact of IWT decreases with distance, as does the noise impact making separation of these factors impossible.

We conclude that IWT noise at these two sites disrupts the sleep and adversely affects the health of those living nearby. The current ordinances determining setback are inadequate to protect the residents and setbacks of less than 1.5 km must be regarded as unsafe. Further research is needed to determine a safe setback distance and to investigate the mechanisms of causation.

REFERENCES

Buysse DJ, Reynolds CF, Monk TH et al. (1989). The Pittsburgh Sleep Quality Index (PSQI): A new instrument for psychiatric research and practice. Psychiatry Res 28: 193-213.

Frey BJ, Hadden PJ (2007). Noise radiation from wind turbines installed near homes: effects on health. www.windnoisehealthhumanrights.com

Johns MW (1991). A new method for measuring daytime sleepiness: the Epworth sleepiness scale. Sleep 14: 540–545.

Nissenbaum M. (2011). Health effects of industrial wind turbines – a preliminary study. Submitted for publication.

Pedersen E, Persson Waye K (2004). Perception and annoyance due to wind turbine noise—a dose-response relationship. J Acoust Soc Am 116: 3460–3470.

Pedersen E, van den Berg F, Bakker R et al. (2009). Response to noise from modern wind farms in The Netherlands. J Acoust Soc Am 126: 634-643.

Pierpont N (2009). Wind turbine syndrome. A report on a natural experiment. Santa Fe, NM: K-selected books.

van den Berg GP, Pedersen E, Bouma J et al. (2008). Project WINDFARMperception. Visual and acoustic impact of wind turbine farms on residents. FP6-2005-Science-and-Society-20. Specific Support Action Project no. 044628. Final report. http://www.windaction.org/?module=uploads&func=download&fileId=1615

WHO (2009). Night noise guidelines for Europe. Copenhagen: WHO Regional Office for Europe.

WindVOICe (Wind Vigilance for Ontario Communities). 2010. A self-reporting survey: adverse health effects with industrial wind turbine complexes and the need for vigilance. July 2010. http://www.healthywindwisconsin.com/Ontario%20Health%20Survey%20Abstract%20Results%20and%20Responses.pdf

EXHIBIT
10

Health aspects associated with wind turbine noise—Results from three field studies

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Wind farms are a new source of environmental noise. The impact of wind turbine noise on health and well-being has not yet been well-established and remains under debate. Long-term effects, especially, are not known, because of the short time wind turbines have been operating and the relatively few people who have so far been exposed to wind turbine noise. As the rate of new installations increases, so does the number of people being exposed to wind turbine noise and the importance of identifying possible adverse health effects. Data from three cross-sectional studies comprising A-weighted sound pressure levels of wind turbine noise, and subjectively measured responses from 1,755 people, were used to systematically explore the relationships between sound levels and aspects of health and well-being. Consistent findings, that is, where all three studies showed the same result, are presented, and possible associations between wind turbine noise and human health are discussed.

Primary subject classification: 14.5.4; Secondary subject classification: 62.5

1 INTRODUCTION

The rapid expansion of wind power in recent years has increased the interest in possible adverse health effects among residents in wind farm areas. However, this is not a new issue. Possible adverse health effects caused by noise from wind turbines have been a concern since the beginning of the modern wind power era in the 1970s. This concern could be due to commonplace skepticism towards new technologies, but it may also be traceable to bad experiences. The first commercial machines emitted not only aerodynamic noise but also noise from the machinery, giving them a reputation as noisy. Furthermore, some early versions were designed as downwind turbines with rather high levels of noise in the low frequency range that was negatively appraised[1]. The noise was therefore already a large issue thirty years ago. Moreover, wind turbines are often are placed in rural settings expected to be places of low exposure to environmental stressors. In such a setting technically induced noise, even at relatively low levels, could be perceived as a potential health risk. Several reports concerning the impact of wind farms on people living close by are cited in discussions regarding possible health effects that take place, for example, on the Internet. The reported symptoms are sometimes referred to as wind turbine syndrome. Results from studies of other community noise sources might hint at the kinds of effects that could be expected, although such effects are commonly found at higher sound levels than those associated with wind turbine exposure. The special characteristics of wind turbine noise and the settings in which they are placed indicate, however, that undesirable effects of wind turbine noise could be present at lower levels than expected. There is hence a need for epidemiological studies that examine the risk of adverse health effects for people living in the vicinity of wind turbines.

Response to community noise is commonly estimated in epidemiological studies as prevalence of annoyance, that is, the percentage of the studied population who are annoyed by the noise, comparing groups with increasing levels of exposure[2], and not by direct clinical health examinations. The definition of health set up by the World Health Organization (WHO) in 1948 is still the guiding principle in public health work. The definition reads as follows: Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity[3]. Such a definition suggests that, when studying the effects of an environmental exposure on health, it is necessary to not focus only on diseases or symptoms of impaired health, but to also measure well-being in a wider sense. Responding to noise by, for instance, becoming annoyed is, in light of the WHO definition, itself an

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adverse effect that should be avoided in order to retain well-being. However, annoyance could also be viewed as a measurable indicator of enhanced risk for chronic imbalance in the physiological stress system; an imbalance that could lead to more severe states, such as high blood pressure, and if prolonged, to cardiovascular diseases. The theory has been confirmed in studies where an association between high exposure to community noise, such as road traffic and aircraft noise, and high blood pressure has been found, for example, by Barregard et al.[4]. The exposure levels in these traffic studies were higher than those relevant for residents living in the vicinity of wind turbines, but it cannot be excluded that strong feelings of annoyance, despite sound levels, play a role in endocrine-influenced diseases, possibly as inhibitors of physiological restitution[5].

The indicator of community noise exposure commonly used both in scientific studies and as a basis for legislation is A-weighted equivalent sound pressure level, often transformed into values representing the diurnal rhythm of the exposure[2,6,7]. In the European Union, the Lden (annual average day-evening-night equivalent noise level), which assigns a penalty for evening and night noise exposure, has become the standard indicator for assessment of response to community noise, parallel with Lnight for predictions of noise-induced sleep disturbance[8]. However, it cannot be taken for granted that these indices are relevant also for wind turbine noise. There are several differences between wind turbine noise and noise from traffic and industry. The occurrence and the level of wind turbine noise at a dwelling are irregular. Because they depend on the wind speed at the hub of the turbine, there is no diurnal pattern[9]. Attempts to calculate Lden values for wind turbine noise have consequently resulted in values with an almost linear relationship to A-weighted equivalent sound pressure levels[10], with the transformation factor depending on the annual weather conditions at the site. C-weighted equivalent sound pressure level has also been put forward as a suitable estimator of the exposure dose for wind turbine noise, based on wind turbine sound comprising relatively high energies in the lower ranges of the sound spectra[9]. Though A-weighted levels are the dominant descriptor for community noise exposure, C-weighted levels have been used for estimations of community response to large amplitude single-event impulsive noise, such as sonic boom and artillery fire[11], of which the energies at the low frequencies at moments are of such magnitude that they could be registered by the human sensory system. However, the characteristics and the relatively low levels of wind turbine sound point towards using A-weighted levels. This approach also allows for comparisons with dose-response relationships for other community noise sources.

The objective of this paper was to explore the relationship between wind turbine noise and potential adverse health effects, using data from three epidemiological studies. The criterion used was that the relationship between exposure and a specified outcome should be statistically significant in all three studies in order to consider the outcome as a possible adverse health effect of wind turbine noise.

2 METHOD

All three studies were cross-sectional studies in which levels of wind turbine noise were compared to self-reported health status among people living in wind farm areas. Study SWE-00 was carried out in a flat, rural landscape in the south of Sweden in the year 2000[12]. Study SWE-05 also took place in Sweden, but in areas that differed in population density and topography, including suburban sites and hilly terrain[13]. Study NL-07 was carried out in the Netherlands 2007, also in a flat landscape, but with different degrees of road traffic intensity[14]. Annoyance and other health effects were measured in responses to a questionnaire conducted by postal mail. The questionnaire included questions about several potential environmental stressors, so as to not lead the respondent towards a focus on wind turbine noise. The questionnaires were delivered during the summer months, that is, when people supposedly spend time outdoors by their dwelling. The numbers of respondents in the three studies were 351, 754, and 725, respectively, for a total of 1,830. Some of the respondents did not answer all questions, and the number of respondents in this study was therefore limited to 1,755.

A-weighted sound pressure levels (corresponding to downwind conditions with wind speed 8 m/s at 10 m height) were calculated for each respondent from the sound power levels of all wind turbines nearby (logarithmically added). Two different algorithms were used for the calculations of the sound propagation, one for the Swedish studies[15] and another for the Dutch study[16]. The algorithms give similar results at the distances relevant in these studies[17] and will therefore in these analyses be treated as correct estimations of the exposure for all respondents outside their dwellings.

The data sets have, for this paper, been re-analyzed to assure similar treatment of the data. Only variables available from all three studies are included: response to noise (annoyance), diseases or symptoms of impaired health (chronic disease, diabetes, high blood pressure, cardiovascular disease, tinnitus, impaired hearing), stress symptoms (headache, undue tiredness, feeling tense or stressed, feeling irritable), and

Table 1—Association between A-weighted sound pressure levels (independent, continuous variable) and variables measuring response and/or effect (dependent, binary variable) tested with logistic regression. Statistically significant associations in bold numbers.

Symptoms	SWE-00[a] N[c] =319–333	SWE-05[a] N[c] =720–744	NL-07[b] N[c] =639–678
Annoyance outdoors	**1.24 (1.13–1.36)**	**1.14 (1.03–1.27)**	**1.18 (1.12–1.24)**
Annoyance indoors	**1.38 (1.20–1.57)**	**1.42 (1.17–1.71)**	**1.20 (1.13–1.27)**
Sleep interruption	**1.12 (1.03–1.22)**	0.97 (0.90–1.05)	**1.03 (1.00–1.07)**
Chronic disease	0.97 (0.89–1.05)	1.01 (0.96–1.07)	0.98 (0.95–1.01)
Diabetes	0.96 (0.79–1.16)	**1.13 (1.00–1.27)**	1.00 (0.92–1.03)
High blood pressure	1.03 (0.90–1.17)	1.05 (0.97–1.13)	1.01 (0.96–1.06)
Cardiovascular disease	0.87 (0.68–1.10)	1.00 (0.88–1.13)	0.98 (0.91–1.05)
Tinnitus	**1.25 (1.03–1.50)**	0.97 (0.88–1.07)	0.94 (0.85–1.04)
Impaired hearing	1.09 (0.93–1.27)	1.05 (0.95–1.15)	1.01 (0.94–1.10)
Headache	0.95 (0.88–1.02)	1.04 (0.99–1.10)	1.01 (0.98–1.04)
Undue tiredness	0.95 (0.88–1.02)	0.98 (0.93–1.03)	1.02 (0.99–1.05)
Tense and stressed	1.02 (0.94–1.10)	1.00 (0.95–1.05)	1.01 (0.98–1.04)
Irritable	1.03 (0.96–1.11)	1.00 (0.96–1.06)	1.01 (0.98–1.04)

[a]Adjusted for age and sex.
[b]Adjusted for age, sex, and economic benefits.
[c]Range of number of respondents in the analyses. Differences in number of respondents are due to missing cases, that is, the respondents not answering single questions in the questionnaire.

disturbed sleep (interruption of the sleep by any noise source). Variables measured in the questionnaires were answered either on binary scales (no/yes) or on ordinal 5-point scales. The latter was, for example, used for noise annoyance, with the scale “do not notice”, “notice, but not annoyed”, “slightly annoyed”, “rather annoyed”, and “very annoyed”. For the analyses the variables were dichotomized into “not annoyed” (“do not notice”, “notice, but not annoyed” and “slightly annoyed”) versus “annoyed” (“rather annoyed” and “very annoyed”). Sleep disturbance due to noise (any source) was measured differently in the three studies. In the Swedish studies, the scale used was binary (no/yes), while in the Dutch study the scale measured how often sleep disturbance occurred. Sleep disturbance once a month or more often was in this study considered as sleep disturbance.

The prevalence of health symptoms can vary with age and between males and females, which has to be taken into account. Associations between sound pressure levels and self-reported health were therefore tested with binary logistic regression. This method allows adjustments for known confounders, as several variables can be entered into the tested relationship at the same time. This method also tolerates binary and ordinal scales, and does not require normal distributed data. The binary logistic regression can be written as a linear function

$$\ln(p/(1-p)) = b_o + b_1 x_1 + b_2 x_2 + \ldots . + b_n x_n \quad (1)$$

where p is the probability of the outcome, $x_1 - x_n$ are the included independent variables, $b_1 - b_n$ their coefficients, and b_o the intercept (in this case of no interest). The outcome of a logistic regression is the odds ratio (OR) with a 95% confidence interval (95% CI). The OR is the probability of an outcome compared to no event occurring. The association between the regression and the OR is

$$p/(1-p) = e^{\mathbf{b}j} \quad (2)$$

where j indicates the variable studied. An OR above 1.00, with a 95% CI with the lower value also above 1.00, indicates a positive correlation between the dependent (health symptoms) and the independent variable (sound pressure level or annoyance) in the regression model.

The Dutch study differed from the others in that many of the respondents in the samples with the highest exposures of wind turbine noise reported that they benefited economically from the wind turbines. Almost none of these respondents reported noise annoyance. They also differed from the rest in being younger and healthier overall. The results from the Dutch study are therefore also adjusted for economic benefits by entering the binary variable “yes/no economic benefits” into all regression tests.

Table 2—Association between annoyance outdoors due to wind turbine noise (independent, continuous variable) and variables measuring response and/or effect (dependent, binary variable) tested with logistic regression. Statistically significant associations in bold numbers.

Symptoms	SWE-00[a] N[c] =319−333	SWE-05[a] N[c] =720−744	NL-07[b] N[c] =658−672
Sleep interruption	**2.26 (1.76–2.90)**	**1.71 (1.35–2.17)**	**1.78 (1.49–2.14)**
Chronic disease	0.90 (0.71–1.08)	0.90 (0.74–1.26)	0.98 (0.81–1.19)
Diabetes	0.69 (0.37–1.31)	0.71 (0.40–1.28)	**1.70 (1.14–2.56)**
High blood pressure	0.82 (0.55–1.22)	1.10 (0.84–1.45)	0.86 (0.64–1.17)
Cardiovascular disease	1.07 (0.58–1.98)	1.00 (0.64–1.55)	0.95 (0.65–1.38)
Tinnitus	1.55 (0.95–2.53)	0.88 (0.60–0.98)	0.82 (0.45–1.48)
Impaired hearing	1.03 (0.96–1.19)	0.78 (0.51–1.21)	1.13 (0.76–1.67)
Headache	**1.24 (1.01–1.51)**	1.04 (0.86–1.26)	**1.25 (1.04–1.50)**
Undue tiredness	**1.22 (1.00–1.49)**	1.12 (0.93–1.35)	1.10 (0.93–1.31)
Tense and stressed	**1.25 (1.00–1.56)**	**1.22 (1.00–1.50)**	**1.27 (1.07–1.50)**
Irritable	**1.36 (1.10–1.69)**	**1.22 (1.00–1.49)**	**1.27 (1.07–1.50)**

[a]Adjusted for age, sex, and A-weighted sound pressure levels.
[b]Adjusted for age, sex, A-weighted sound pressure levels, and economic benefits.
[c]Range of number of respondents in the analyses. Differences in number of respondents are due to missing cases, that is, the respondents not answering single questions in the questionnaire.

When many statistical tests are carried out at the same time, some will show an association between two variables that are in fact due to chance. Also, situational or temporary factors that are not general could have influenced the results in one of the studies. Consistent results from all three studies, and not only for one or two, were therefore interpreted as indicating a factual association.

3 RESULTS

3.1 Relationships between Sound Levels and Subjective Variables

A-weighted sound pressure levels were in all three studies related to annoyance outdoors due to wind turbine noise, as well as to annoyance indoors, that is, an increase of sound levels led to increase in the frequency of residents annoyed (Table 1). An increase of sound levels increased the odds for annoyance outdoors somewhat less in the second Swedish study and for annoyance indoors less in the Dutch study. The increase of annoyance was, however, rather consistent over the studies.

Sleep interruption was associated with sound levels in the first Swedish study and in the Dutch study, but not in the second Swedish study. The increase in odds with increased sound levels was relatively low. Inspection of the data revealed that the proportion of respondents who reported being interrupted in their sleep by a noise source was rather stable at all levels of wind turbine sound, except at the strongest levels. In the first Swedish study the increase of respondents who reported sleep interruption appeared at approximately 40 dB. The increase came at higher sound levels in the Dutch study, at around 45 dB.

No other variable measuring health or well-being was consistently related to sound pressure levels throughout the three studies. The prevalence of tinnitus was positively related to sound pressure levels in the first Swedish study, but no such relationship was found in the other two studies. An indication of a positive relationship between the prevalence of diabetes and sound pressure levels was found in the second Swedish study. The lower limit of the confident interval was, however, just above 1.00.

3.2 Relationships between Annoyance and other Subjective Variables

Several of the variables measuring symptoms of stress were associated with annoyance outdoors due to wind turbine noise, including when adjusting for A-weighted sound pressure levels (Table 2). Feeling tense or stressed, as well as irritable, was associated with noise annoyance in all three studies. Headache was associated with annoyance in the first Swedish study and in the Dutch study. Undue tiredness was associated with annoyance in only one study. The study

Table 3—Association between annoyance indoors due to wind turbine noise (independent, continuous variable) and variables measuring response and/or effect (dependent, binary variable) tested with logistic regression. Statistically significant associations in bold numbers.

Symptoms	SWE-00[a] N[c] =318−331	SWE-05[a] N[c] =719−743	NL-07[b] N[c] =624−659
Sleep interruption	**2.62 (1.90–3.61)**	**2.58 (1.79–3.71)**	**2.03 (1.66–2.47)**
Chronic disease	0.93 (0.69–1.25)	0.94 (0.68–1.31)	1.05 (.086–1.28)
Diabetes	0.73 (0.30–1.75)	0.59 (0.22–1.59)	**1.62 (1.10–2.40)**
High blood pressure	0.065 (0.36–1.19)	0.85 (0.52–1.38)	0.83 (0.59–1.16)
Cardiovascular disease	0.99 (0.46–2.17)	0.97 (0.49–1.94)	0.76 (0.47–1.22)
Tinnitus	1.25 (0.77–2.05)	0.57 (0.24–1.33)	0.67 (0.28–1.57)
Impaired hearing	1.14 (0.72–1.79)	0.56 (0.24–1.32)	1.20 (0.80–1.80)
Headache	1.07 (0.83–1.37)	1.11 (0.81–1.52)	**1.28 (1.06–1.54)**
Undue tiredness	**1.36 (1.05–1.77)**	1.00 (0.95–1.80)	1.15 (0.96–1.37)
Tense and stressed	1.03 (0.79–1.35)	1.07 (0.77–1.48)	**1.24 (1.04–1.48)**
Irritable	1.22 (0.93–1.61)	1.23 (0.80–1.72)	**1.26 (1.06–1.50)**

[a]Adjusted for age, sex, and A-weighted sound pressure levels.
[b]Adjusted for age, sex, A-weighted sound pressure levels, and economic benefits.
[c]Range of number of respondents in the analyses. Differences in number of respondents are due to missing cases, that is, the respondents not answering single questions in the questionnaire.

design does not allow conclusions to be made regarding cause and effect; annoyance could lead to stress, or stress could enhance the risk for annoyance. Also sleep interruption was found to be associated with sound levels, which was related to annoyance, indicating a two-way relationship.

Sleep interruption was associated even more strongly with annoyance indoors (Table 3). No other variables were related to annoyance indoors in all three studies.

4 DISCUSSION

When a large number of statistical tests are carried out, some will by random chance show significant relationships where there in fact are none; if a 95% confidence interval is chosen, theoretically, 1 of 20 tests will result in a dubious outcome. Consistent results from three studies enhance the certainty. Annoyance was the only response to wind turbine noise measured in these studies that was directly associated with A-weighted sound pressure levels in all three studies. The possibility of an increase in prevalence of annoyance with increased sound levels varied, however, between the studies. The highest odds ratio (lower limit of the confidence intervals) was found in the first Swedish study, which was carried out in a rural, flat landscape with possibly lower levels of background sound than in the two other studies. It is known from aircraft studies that annoyance response in low background noise regions are higher than those in high background noise regions, even though aircraft noise levels are the same[18]. Whether this is actually due to the noise or to other qualities in the rural landscape is not clear. Rather similar values were found in the Dutch wind turbine study. Common to the first Swedish study and the Dutch study was the flat landscape where wind turbines often are visible in several directions and hence have a substantial impact on the landscape, a factor that might enhance the adverse response[19]. The second Swedish study, which was carried out in areas with differentiated topography, showed a lesser increase of annoyance prevalence with increasing sound levels for outdoor annoyance, but larger for indoor annoyance. The confidence intervals were, however, wide, due to few respondents reporting annoyance, and also indicating a large variety in responses.

A rather high number of respondents reported that their sleep was interrupted by noise, a nuisance that was found to be related to levels of wind turbine noise in two of the studies (and also to road traffic noise that was additionally measured in the Dutch study, but not discussed in this paper[17]). The impact of noise did not increase gradually with noise levels, but rather had a sharp increase around 40 dB in the first Swedish study and around 45 dB in the Dutch study, corresponding well with the recommended highest exposure levels in the two countries. Sleep interruption was not common in the second Swedish study carried out mainly in more densely populated areas with suburban characteristics. It is not clear why sleep interruption was less common in these areas, but a combination of lowered expectations of quietness and higher levels of background noise (without incidents of heavy traffic at night) could be an explanation.

Stress was directly associated not with A-weighted sound pressure levels but with noise annoyance, in the three studies. There was a remarkable consistency among the studies in the relationship between feeling tense or stressed and annoyance. This should, however, not be taken as evidence of a causal relationship between wind turbine noise and stress, mediated by annoyance. The finding could be explained in the light of Lazarus and Folkman's cognitive stress theory[20], in which an individual appraises an environmental stressor, such as noise, as beneficial or not, and behaves accordingly. An individual already in a strenuous situation possibly appraises the noise as an additional threat to psycho-physiological restoration. As in the present case, wind turbine noise cannot be controlled by the individual, no action can be taken, and the response is manifested as annoyance. Being interrupted during sleep could possibly further increase the feeling of wind turbine noise as a threat.

This study has several limitations. All health symptoms were self-reported by the respondents. Health examinations carried out by professionals would have been a better way to assess the prevalence of possible health effects and is desired in future studies. The discrepancies between self-reported and diagnosed symptoms could, however, be hypothesized to be the same at all exposure levels (as the respondents did not know that the data would be analyzed in relation to wind turbines), and hence not influence the results. The estimations of exposure levels could also be questioned. Several other indices could have been used. The main method used here was to test whether *higher* exposure levels are related to *higher* prevalence of health symptoms, rather than to find specific thresholds. Such a method is not so sensitive to which dose indicator is chosen, as long as an increase in one indicator also means an increase in the other. It should be noted that the calculated exposure only reflected outdoor sound levels. It would have been ideal to have assessed indoor exposure in addition to the calculated outdoor levels used here, taking type of housing into account, especially as sleep disturbance was one of the reported effects.

The results of the studies are not alarming, but call for political action and further research. Annoyance due to wind turbine noise should in the future be avoided by applying proper regulations for shortest allowable distance between wind turbines and dwellings in the surroundings. Further scientific studies should explore the influence of wind turbine noise on sleep in different situations, as well as the interaction between sound exposure, noise annoyance, and stress. Longitudinal as well as experimental studies are needed, taking into account the methodological issues discussed above.

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6 REFERENCES

1. H. H. Hubbard, "Noise induced house vibrations and human perception", *Noise Control Eng. J.*, **19**, 49–55, (1982).
2. H. M. E. Miedema and H. Vos, "Exposure–response relationships for transportation noise", *J. Acoust. Soc. Am.*, **104**, 3432–3445, (1998).
3. *Preamble to the Constitution of the World Health Organization as adopted by the International Health Conference, 19–22 June 1948*, WHO, New York, (1948).
4. L. Barregard, E. Bonde and E. Öhrström, "Risk of hypertension from exposure to road traffic noise in a population-based sample", *Occup. Environ. Med.*, **66**, 410–415, (2009).
5. T. Åkerstedt and P. M. Nilsson, "Sleep as restitution: An introduction", *J. Intern Med.*, **254**, 6–12, (2003).
6. T. J. Schultz, "Synthesis of social surveys on noise annoyance", *J. Acoust. Soc. Am.*, **64**, 377–405, (1978).
7. H. M. E. Miedema and H. Vos, "Noise annoyance from stationary sources: Relationships with exposure metric day-evening-night level (DENL) and their confidence intervals", *J. Acoust. Soc. Am.*, **116**, 334–343, (2004).
8. *European Commission. European Parliament and Council Directive 2002/49/EC*, (2002).
9. E. Pedersen and F. van den Berg, "Why is wind turbine noise poorly masked by road traffic noise?", *InterNoise10*, (2010).
10. F. Van den Berg, "Criteria for wind farm noise: Lmax and Lden", *EuroNoise08*, (2008).
11. P. D. Schomer, "Evaluation of C-weighted Ldn for assessment of impulsive noise", *J. Acoust. Soc. Am.*, **62**, 396–399, (1977).
12. E. Pedersen and K. Persson Waye, "Perception and annoyance due to wind turbine noise—a dose-response relationship", *J. Acoust. Soc. Am.*, **116**, 3460–3470, (2004).
13. E. Pedersen and K. Persson Waye, "Wind turbine noise, annoyance and self-reported health and wellbeing in different living environments", *Occup. Environ. Med.*, **64**, 480–486, (2007).
14. E. Pedersen, F. van den Berg, R. Bakker and J. Bouma, "Response to noise from modern wind farms in the Netherlands", *J. Acoust. Soc. Am.*, **126**, 634–643, (2009).
15. *Ljud från vindkraftverk (Noise from wind turbines)*, Report 6241, Swedish Environmental Protection Agency, Stockholm, (2001). [In Swedish.]
16. *Attenuation of sound during propagation outdoors—Part 2: General method of calculation*, International Standard ISO 9613-2: 1996, International Organization for Standardization, (1996).
17. F. Van den Berg, E. Pedersen, J. Bouma and R. Bakker, *WINDFARM perception—Visual and acoustic impact of wind turbine farms on residents*, FP&-2005-Science-and-Society-20, Specific Support Action, Project no. 044628, (2008) www.rug.nl/wewi/.

18. C. Lim, J. Kim, J. Hong and S. Lee, "Effect of background noise levels on community annoyance from aircraft noise", *J. Acoust. Soc. Am.*, **123**, 766–771, (2008).
19. E. Pedersen and P. Larsman, "The impact of visual factors on noise annoyance among people living in the vicinity of wind turbines", *J. Environ. Psychol.*, **28**, 379–389, (2008).
20. R. S. Lazarus and S. Folkman, *Stress, appraisal and coping*, Springer, New York, (1984).

EXHIBIT
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The Sustainable Energy Utility (SEU) Model for Energy Service Delivery

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Climate change, energy price spikes, and concerns about energy security have reignited interest in state and local efforts to promote end-use energy efficiency, customer-sited renewable energy, and energy conservation. Government agencies and utilities have historically designed and administered such demand-side measures, but innovative third-party administrative models present new options to finance, market, and deliver sustainable energy services to energy end-users. This study outlines the concept of a new third-party administrative model, a sustainable energy utility (SEU), with the potential to achieve deep energy efficiency savings and a high penetration of customer-sited renewable energy. An SEU is characterized by central coordination, comprehensive programs, flexible incentives, financial self-sufficiency, competitive procurement, and a focus on delivering energy services rather than commodity energy.

Keywords: *renewable energy; energy efficiency; utility policy; climate change*

The Conventional Energy Problem

The challenges associated with U.S. reliance on fossil fuels have been brought into sharp focus by concerns over fuel price volatility, dependence on imported energy, peak oil, and air pollution. The climate crisis has also increasingly emerged as a topic of public concern amid mounting scientific evidence of the role of anthropogenic greenhouse gas emissions (IPCC, 2007; Schneider & Lane, 2006), with public attention further reinforced by events such as the Wilkins ice shelf collapse (Spotts, 2008) and a series of high-profile public awareness campaigns (e.g., Gore, 2006).

In response to these challenges, cities and states around the country are playing a leadership role in enacting innovative policies to promote energy sustainability (Byrne, Hughes, Rickerson, & Kurdgelashvili, 2007; Peterson and Rose, 2006; Rabe, 2004). Even without strong federal policies targeting climate change, state and local sustainable energy programs are projected to result in reductions in carbon dioxide emissions of nearly 670 million tons by 2010, and 1.7 billion tons by 2020 (Byrne et al., 2007). While these gains are encouraging, the current U.S. policy mix will not be sufficient to create a sustainable energy infrastructure or achieve climate stabilization. The primary mechanism for supporting renewable energy in the U.S., for example, is the renewable portfolio standard (RPS). Thirty-three states and the District of Columbia currently have an RPS or a renewable energy goal in place (DSIRE, 2008). Even if their respective targets are achieved, they will only address a fraction of U.S. electrical load growth between 2006 and 2020 and will not significantly alter the existing U.S. energy supply infrastructure (Wiser, Namovicz, Gielecki, & Smith, 2007).

Meanwhile, other problems with more traditional energy systems in the U.S. center on their relative lack of a participant-oriented focus. Conventional energy suppliers are very capable of marketing and delivering energy products – electricity, natural gas, and other fuels. By contrast, energy users interested in improving energy efficiency, lowering their

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energy bills, and using renewable energy are faced with a fragmented array of equipment distributors, consulting firms, contractors, and energy services companies. They often have little access to financing for sustainable energy choices, and must navigate complex, bureaucratic labyrinths to secure funds. Because of the complexity of these conditions, more traditional approaches for supplying sustainable energy services can in practice discourage prospective participants. These trends have given rise to the concept of the *sustainable energy utility,* which was first established through legislation by the State of Delaware in 2007.

What Is an SEU?

A sustainable energy utility (SEU) is an independent and financially self-sufficient entity responsible for delivering energy efficiency, energy conservation, and customer-sited renewable energy to end users. An SEU targets all sectors and fuels, including electricity, transportation, and heating. This is a major departure from supply-side approaches and from traditional demand-side policies, which tend to address only certain types of fuels (e.g., electricity, but not heating or transportation), or limited "silos" of end users (e.g., residential but not municipal consumers). An SEU streamlines customer-sited energy service delivery.

Simply stated, a sustainable energy utility is the point-of-contact for efficiency and self-generation in the same way that conventional utilities are the point-of-contact for energy supply. The most important feature of an SEU is that energy users throughout a city or state can build a relationship with a single organization whose direct interest is to help residents and businesses use less energy and generate their own clean energy. As a nonprofit umbrella entity at a city or state level, an SEU relies on a third-party management model, competitive contracting, and performance incentives to deliver sustainable energy services across all sectors and customer classes. As such, an SEU is publicly accountable and can be financially self-sufficient; it has access to a range of potential funding sources and revenue streams and can achieve energy savings without raising taxes or utility rates.

This article explains the theoretical framework for an SEU, draws comparisons between an SEU and other models of sustainable energy service delivery, and reviews the evolution of the sustainable energy utility concept and the structure of the nation's first SEU in Delaware.

The SEU and Market Transformation

Current supply-side energy policies in the U.S., such as the federal renewable energy production tax credit, have been criticized for supporting renewable energy development in a way that reinforces a commodity-focused energy system by which utility-scale power plants are promoted to the exclusion of robust demand-side policies. Such types of policy frameworks have been represented as supportive of limited "incremental" (Letendre, 1997) or "conservative" change (Hirsch & Serchuk, 1996), rather than the deep and fundamental structural change to energy services-based policies that are required to create a sustainable energy system. By contrast, a sustainable energy utility seeks to achieve its end goals by effecting four inter-related structural changes in the way that energy is delivered and consumed. These include a transition to carbon-free energy sources, a transition to energy service provision rather than energy commodity sales, a transition to a distributed energy infrastructure, and the direct involvement of end-users in the energy system.

Reorganizing Toward a Carbon Focus

Transitioning to a sustainable energy system in the U.S. will require a rapid transition to carbon free sources of energy, in order to achieve the climate stabilization scenario envisioned by the IPCC. This will require a focus on both renewable energy and energy efficiency for all types of energy usage, including transportation, electricity, and heating (Kutscher, 2006; Socolow, 2006). To date, energy efficiency and renewable energy have typically been targeted by separate sets of policies and deployed by distinct or separate organizations (Prindle, Eldridge, Eckhardt, & Frederick, 2007). The sustainable energy utility model is predicated on the simultaneous and synergistic pursuit of energy efficiency and renewable energy resources.

Transitioning from Energy Supply to Energy Services

A sustainable energy system will also require a shift away from the sale of energy as a commodity, which is socially, politically, economically, and environmentally problematic. As discussed by Byrne and Mun (2003), a focus on energy as a commodity has created an energy system that shifts decision-making power from the local to the national level, trends toward increasingly powerful energy oligarchies driven by short-term profits to the detriment of long-term public interest, and has led to rapid increases in both energy prices and greenhouse gas emissions with little public benefit. Indeed, the ideology of tying public benefit to market metrics "conceives social need in commodity terms, that is, as a good or service whose value is determined by individuals being able to afford more or less of it" (Byrne & Mun, 2003: 63). Similarly, Basalla (1980) has argued that one of the principal obstacles to a sustainable energy future is the myth that economic growth and social welfare are inextricably linked to energy consumption. In other words, progress toward sustainability is hindered by the false belief that greater and greater quantities of energy must be consumed by a group, region, or nation to promote economic and social welfare. This myth has been debunked through studies of energy intensity and economic development in California and elsewhere (Rosenfeld, 2003; Schipper and McMahon, 1995).

Lovins (1976) argues that the achievement of energy sustainability will require a new framework for energy development, one that acknowledges the independence of economic growth and energy consumption. The objective of such a reframed energy system would be to deliver *energy services* to end-users, rather than to maximize electricity sales. The term "energy services" as defined by Goldemberg and Johansson (1995) entails "the desired and useful products, processes, or services that result from the use of energy, for instance …comfortable indoor climate, refrigerated storage, transportation, appropriate temperatures for cooking...etc." Adopting an energy service perspective makes the end-user the ultimate beneficiary of the energy system. This bottom-up perspective recognizes that a wide variety of interchangeable energy sources and conversion processes can be used to provide the same energy service. By adopting an energy services orientation, energy planning can be undertaken in a way that deemphasizes commodity sales and simultaneously prioritizes sustainability. The goal of the sustainable energy utility model thus becomes the provision of sustainable energy services to end-users, rather than the sale of electricity, natural gas, or petroleum fuel in bulk.

From Centralization to Decentralization, With Consumers as Participants

An energy system built around networks of distributed generators and energy efficient technologies has significant technical, security, and environmental advantages over traditional centralized generation and transmission systems (Byrne et al., 2005; Lovins et al., 2002; Weinberg, Iannucci, & Reading, 1991). As supported by the sustainable energy utility model, one of the benefits of customer-sited distributed resources and infrastructure is their involvement of end-users as active participants in the energy system. Consumers are engaged to "start to think about energy as a product or service, rather than a utility" (Mitchell, 2003: 22), so that they seek their own customized energy services and contribute to a more wide-ranging, varying, and ultimately more diverse energy infrastructure. Centralized energy systems, by contrast, treat "utility users as homogenous and passive, effectively siting them at the end of supply chains … [with] only limited involvement in system management" (van Vliet and Chappells, 1999: 1). As a result, under the conventional model, it is difficult to engage "passive" end-users to make behavioral changes that contribute to more sustainable patterns of energy consumption.

The SEU Model and the Evolution of Public Benefit Administrative Structures

In order to support the structural changes detailed above, the Sustainable Energy Utility relies on a third-party, non-profit management model to deliver services across customer classes and fuel types. The decision to use a non-profit management structure has its theoretical roots not only in discussions of incremental vs. structural change, but also in the debate over energy efficiency delivery models. Before the advent of electricity restructuring in the U.S., energy efficiency and demand-side management (DSM) programs were the responsibility of vertically integrated utilities under Integrated Resource Planning (Eto, 1996; Kreith, 1993).

The introduction of retail electricity competition in the U.S., coupled with the unbundling of vertically integrated utilities, required a reconsideration of how energy efficiency should be delivered. Utilities in competitive states abandoned their energy efficiency programs, and energy efficiency funding declined from $1.76 billion in 1993 to $0.92 billion in 1998 (York and Kushler, 2002). In response, many argued that renewable energy and energy efficiency under retail electricity competition needed to be supported by policies such as portfolio standards and public benefits funds (Byrne et al., 2000a; Golove and Eto, 1996; Vine et al., 2003). Although momentum for state electricity competition in the U.S. slowed with the California energy crisis (Blumstein, Friedman, &

Green, 2002), virtually every state that did restructure[1] also established a public benefits fund to support energy efficiency (American Council for an Energy-Efficient Economy, 2007). The creation of public benefits funds raised the question of which entity would be most appropriate to manage them.

The three potential public benefit administrators are utilities, government agencies, and independent non-profit organizations. All three models are currently in place in the U.S. (Prindle et al., 2003), and several comparative analyses have been conducted to date in order to assess their relative appropriateness and effectiveness. Eto, Goldman, and Kito (1996) and Eto, Goldman, and Nadel (1998) laid out criteria for evaluating different administrative models, which included compatibility with broader public policy goals, accountability and oversight, administrative effectiveness, and transition issues. The findings of several different studies on comparative administrative structures, most of which have referenced the criteria of Eto et al. are summarized here:

Utility Administered

Eto et al. state that utilities meet most of the criteria noted above, in that they are experienced administrators with strong customer recognition, have access to detailed information on customer energy use, and can take advantage of economies of scale and existing billing infrastructure. On the other hand, utilities have an inherent conflict of interest in preserving the centralized, commodity-based nature of the energy system, especially when their profit model is based on commodity electricity sales (Schultz, 1996). Didden and D'haeseleer (2003) elaborate on this conflict by distinguishing between "artificial" and "natural" frameworks for energy efficiency delivery. Artificial frameworks, such as IRP, involve forcing or creating incentives for utilities that would typically resist reductions in energy consumption to administer energy efficiency programs. Didden and D'haeseleer argue that "natural" frameworks, in which an entity without inherent conflicts of interest manages energy efficiency delivery, are more appropriate.

State Managed

Eto et al infer that state agencies are not optimal managers of energy efficiency programs because state procurement regulations and budgets limit agency flexibility to respond to changing market conditions by crafting new programs or hiring new staff. Harrington and Murray (2003) further characterize state agency management as the "weaker third choice," because "State agencies are less likely to be able to maintain the required flexibility to be effective efficiency entrepreneurs … State agents are also vulnerable to governmental and political events that are external to the energy efficiency efforts themselves."

Non-profit Managed

With regard to non-profits, for example, Eto et al argue that "(1) the organizational form, structure, and mission…could be very compatible with public-policy goals for energy efficiency… (2) market participants are unlikely to perceive conflicts of interest, (3) flexible planning and competitive procurement processes can be employed, and (4) the organization may be able to attract highly motivated, skilled technical and administrative staff relatively rapidly" (Eto et al., 1998: 53). Although a perceived additional benefit of non-profit models is that it is more difficult for states to "raid" their funds for other budgetary purposes (see, e.g., National Center for Appropriate Technology, 2003), Harrington and Murray (2003: 10) argue that no administrative model is wholly raid-proof.

Given the potential for conflicts of interest with utility administrators, as well as the limitations of governmental models, the non-profit administrative model appears, from the literature, to be the most advantageous model for sustainable energy service delivery.[2] The achievements of Efficiency Vermont, discussed further below, seem to suggest likewise (Parker & Hamilton, 2008).

Although the SEU model is rooted in earlier discussions of energy efficiency delivery models, it represents a significant departure from the design of traditional public benefit funds, in that its goal is to serve all fuel types and all customer types. As a result, the independent non-profit model is an optimum choice, not only because it provides programmatic flexibility, but also because it would be awkward from both an administrative and a regulatory perspective for single-fuel utilities (e.g., electrical or gas utilities), or statutorily constrained public agencies, to attempt to deliver sustainable energy services targeting all fuel types across the electricity, heating, and transportation sectors.

Developing the First SEU in Delaware

This section reviews the evolution of Delaware's current SEU structure. The concept of the SEU has its origins in the efforts of California, Massachusetts, New Jersey, Vermont and other states to establish an organizational framework that could most effectively deliver energy efficiency and customer-sited renewable energy to energy end-users. As conceived in Delaware, an SEU is the final step in the transition from utility-administered energy efficiency programs (California and Massachusetts) to third-party managed sustainable energy services (Vermont and others).

Delaware's SEU was a product of opportunities and constraints common to most political environments. In Delaware's case, a looming increase in electricity prices created the political momentum to focus attention on possibilities for a new energy policy framework. Price caps dating back to electricity restructuring laws from 1999 were set to expire in May 2007, with residential electricity rates initially expected to increase more than 59% overnight (Cabinet Committee on Energy, 2006). Neighboring states Maryland and Washington D.C., which had taken a similar approach to electricity deregulation, faced comparable price spikes.

Compounding the pending price increases, most of Delaware's demand-side management (DSM) programs had been discontinued with electricity restructuring laws in 1999, and there was very little DSM activity in the state when the rate caps came off. Moreover, there was no mandate for the Delaware Public Service Commission, the state's main investor-owned utility, or executive agencies to deploy energy efficiency programs. As a result, Delaware lacked energy service delivery infrastructure that could have been used to insulate consumers from electricity price shocks.

Although the state lacked a program for energy efficiency delivery, the policy framework for sustainable energy services had gradually been put in place. In 2000, Delaware had created a Climate Change Action Plan (Byrne et al., 2000b) that identified strategies to reduce greenhouse gas emissions 15-25% from 2000 levels by 2012. The Governor's Delaware Energy Task Force (2003) had also made a broad range of renewable energy and energy efficiency policy recommendations. In 2005, Delaware enacted a renewable portfolio standard (RPS) with a goal of 10% renewables by 2019, administered by the state's Public Service Commission. The RPS was complemented by a Green Energy Fund, whose revenues funded renewable energy incentives administered by the Delaware Energy Office (Delaware Energy Office, 2008). The Fund collected revenues of $1.6 million annually, through a surcharge of $0.00178 per kWh. Another executive agency, Delaware Health and Social Services, oversaw Delaware's Weatherization Assistance Program.

SEU Task Force

As a partial response to the likelihood of dramatically changing energy prices in the state, the Delaware General Assembly created the Sustainable Energy Utility Task Force in 2006,[3] a bi-partisan research effort to recommend best-practice sustainable energy policies. The SEU Task Force (2007a,b) examined sustainable energy policy frameworks and administrative models across the U.S. They compared policies by type and by magnitude of mandate and achievement, and characterized administrative models according to criteria such as structure, governance, funding, and target customers and fuel types.

With regard to a possible policy framework and funding strategy, the Task Force concluded that public funding sources for a new sustainable energy program were comparatively limited. Delaware's Green Energy Fund surcharge was an order of magnitude less than alternatives found in leading states such as Massachusetts, New Jersey, and Vermont. For example, 2006 energy efficiency funding in Massachusetts was 0.25 cents per kWh, versus Delaware's 0.0178 cents per kWh (Union of Concerned Scientists, 2004). Even so, the imminent expiration of price caps in Delaware made the prospect of increasing the Green Energy surcharge to best-practice levels politically challenging. Furthermore, the State of Delaware had reached its bonding capacity, and little political support existed to amend tax policy as a means to fund sustainable energy services. If a sustainable energy framework in Delaware were to achieve significant energy savings, the legislature would have to put broad new mandates in place, and any increased public funding would have to be justified by the potential to leverage private sources of funding. The design of the Delaware SEU reflects the state Task Force's recommendations regarding how Delaware could best overcome these various political challenges.

To identify best-practices, the Task Force report ultimately focused on seven states, of which three – Massachusetts, New Jersey, and Vermont – are mentioned in this article as representative of the then-existing approaches to sustainable energy service delivery. Each of these three states, as of 2008, has seven or more years of experience promoting sustainable energy. They also represent the three major types of sustainable energy administrative models. Massachusetts, like California, is noted for its utility-administered energy efficiency services. New Jersey has played a leadership role with its public sector approach, in which regulatory and economic development-focused agencies oversee sustainable energy service delivery. Vermont is acknowledged as the first jurisdiction to introduce an energy efficiency utility, planned and organized by a non-profit corporation that employs competitive bidding procedures to implement goals set by a public regulatory body (Hamilton, Plunkett, & Wickenden, 2002).

Features of a Sustainable Energy Utility

After more than a year of hearings and stakeholder input, and based on its analysis of experience in other states, the Task Force articulated the core characteristics of a sustainable energy utility:

- Central coordination: Sustainable energy services are coordinated by a single point of contact.
- Comprehensive programs: Programs target efficiency, conservation, and renewable energy across all fuels (electricity, heating, transportation) and customer classes (low-income, government, industrial, commercial, residential, etc.), regardless of utility service territory.
- Flexible incentives: Sustainable energy services are not constrained by strict programmatic criteria that might exclude, or inadequately serve, certain customer groups.
- Financial Self-sufficiency: A financing plan ensures long-term self-sufficiency by generating revenue through the supply of customer-sited sustainable energy services.
- Competitive Procurement: A governance system is based on competitive contracting of independent management services.

Although these characteristics represent innovations over other existing administrative models, an SEU does not supplant other private-sector activities, but seeks to complement them by providing a focal point for energy efficiency, affordable energy and renewable energy, including information, incentives, and services. The following sections discuss each of the five areas of innovation, as they relate to other states, in greater detail.

Innovation One: Coordinated Sustainable Energy Services

Central coordination is essential to avoid customer confusion, create cross-benefits among incentives, and reduce administrative costs. Central coordination will only become more crucial if climate policy increasingly becomes the animating force behind energy policy decisions in the next decade and cuts across different sectors of the economy and jurisdictional boundaries. One can look at the importance of coordination from a customer's perspective and from the perspective of administrative efficiency.

Massachusetts provides a case study of how uncoordinated energy programs can serve as a barrier to customer participation and market development. Massachusetts currently has three different systems for renewable energy, energy efficiency, and affordable energy services.[4] Moreover, on the energy efficiency side, energy service delivery is further subdivided by utility service territory and fuel. To a certain extent, the state has tried to organize efficiency resources through clearinghouses such as MassSAVE, an online tool for assisting customers with navigating utility incentives.[5] However, these resources do not cover the full spectrum of available services, since MassSAVE only serves residential customers. A commercial customer attempting to procure sustainable energy services for its facility, for example, would most probably have to submit separate applications: one to the Massachusetts Technology Collaborative (MTC) for renewable electricity; one to a gas utility for thermal efficiency; and one to an electric utility for electrical efficiency (personal communication, Bradford Swing, Director of Energy Policy, City of Boston). The transaction and learning costs of this process can be a barrier to sustainable energy technology adoption, while the lack of coordination across programs can cause significant customer confusion and create unnecessary programmatic discrepancies and administrative costs.

Vermont has sought to partially address these types of problems through the creation of its quasi-governmental energy efficiency utility, Efficiency Vermont (Hamilton et al., 2002). Efficiency Vermont replaced a patchwork of twenty-two separate programs, administered by small, individual utilities. Efficiency Vermont's approach to service delivery represents a significant innovation. At present, Efficiency Vermont only targets electricity efficiency measures, but its ongoing evolution (Hamilton, 2008b; Vermont Act 92,

2008) suggests that Efficiency Vermont may emerge looking much like a sustainable energy utility – an entity that serves as a central clearing house and point of contact for *all* statewide sustainable energy services, regardless of fuel, and with the authority to access private capital markets and revenue-generating business models to achieve significant scale.

Innovation Two: Market-Responsive Programs That Target All Fuels and All Customers

Another of Efficiency Vermont's innovations is to move away from a rigid, programmatic model of energy service delivery. Delivering services to specifically-defined customer classes naturally excludes, or inadequately serves, customers that do not fit neatly into predetermined categories. An SEU adopts a flexible, market-responsive stance similar to Efficiency Vermont, expanded to include all fuel types and income levels. The Delaware SEU is empowered, and required by law, to provide customers with a comprehensive set of sustainable energy services, customized to a participant's needs. This includes targeting different customer decision points (e.g., purchase/replacement, retrofits, new construction, etc.) and targeting different end-uses (electricity, heating, and transportation). Policy makers and an oversight board establish high-level performance targets, but an SEU has the flexibility to respond to customer needs and market changes to achieve deep savings.

An SEU takes a building-based approach to efficiency: it looks for the synergies that are possible in each participant's circumstance, including opportunities for building envelope, electric and gas appliance, heating and cooling, and transportation efficiency. This approach allows the SEU to supply services that are usually not possible under more rigidly defined programs. For example, SEU funds can be used to target the installation of reflective roofs on low-income households, where federal affordable energy programs cannot. Similarly, an SEU can support the simultaneous installation of PV and solar water heating systems at sites that have high electrical and hot water demand. The MTC by contrast, has historically been limited to providing incentives only for renewable electricity, and has not been able to support renewable heat. As a result, many customers seeking to install technologies like solar water heating are not eligible for an incentive in Massachusetts.[6]

Innovation Three: Flexible Incentives

An SEU has the flexibility to deploy financing programs to serve all income levels: programs can be designed to cover the full incremental cost of sustainable energy services for certain customers, and incentives can be adjusted to more deeply subsidize affordable energy clients. In many states, the cost-share required under sustainable energy service programs prevents many low-income end-users from taking advantage of the system benefits charge-funded incentives that they help to support. By contrast, an SEU has the flexibility to respond quickly and creatively to changing market forces and customer needs.

Innovation Four: A Financing Plan for Self-sufficiency

An SEU addresses the two fundamental financial challenges that slow the expansion of sustainable energy services: overcoming the upfront cost of sustainable energy measures, and structuring sustainable energy programs to grow without significantly increasing rate impacts, general funding commitments, and public liability. An SEU requires public-purpose funding to lower the initial capital costs of sustainable energy services. However, an SEU has the mandate to consider innovative approaches, including strategies to encourage third-party financing or to leverage customer contributions to the cost of program measures. An SEU also has the flexibility to operate much like an enterprise, where revenue streams from program activities repay liabilities, replenish public incentive funds, and enable program expansion.

Delaware's Legislature granted the SEU authority to raise special purpose tax-exempt bonds of up to $30 million over 9 years to finance its program activities. The legislature also designated the SEU to administer existing public-purpose energy funds and future Regional Greenhouse Gas Initiative (RGGI) emissions auction proceeds. The ongoing operations of the SEU are predicated on two core revenue-generating activities: shared savings financing and renewable energy certificate (REC) aggregation and sales.

These revenue streams allow program budgets to expand, and allow the SEU to target deep efficiency opportunities without requiring exponentially large amounts of public funding. The challenges and risks are equally clear: an SEU must minimize risk of participant default; the SEU has a high burden to verify energy savings; and the SEU must create a value proposition attractive enough to encourage participation. With such a broad mandate, an SEU requires public oversight, exposure to competitive market forces, independent verification and auditing, funding sources insulated from political raiding, and the ability to represent a state or city government as a participant in regional energy and environmental markets – all aspects built by legislation into the structure of an SEU.

Innovation Five: Competitively Selected Independent Management

An SEU is managed by a competitively contracted entity independent of local utilities and power marketers. The SEU manager, however, can contract with any third-party, including utilities, to implement actual services. In Delaware's case, the SEU manager is under contract with the Delaware Energy Office, an Executive Agency, whose jurisdiction extends beyond electricity and natural gas markets.

This high-level independence is necessary to ensure that an SEU has an incentive to maximize public adoption of energy efficiency and customer-sited renewable energy, which in many states have the impact of reducing utility sales and revenues. Utilities often lack an incentive to exceed energy efficiency and renewable energy targets mandated by law or regulation. Even in a state like California, where utility revenue is decoupled from energy sales (Risser, 2006), utilities still have conflicting interests that complicate long-term planning: the extent to which a utility will proactively target efficiency savings, and especially deep savings versus cream-skimming, depends on whether regulation and energy prices make it profitable to invest in efficiency versus other capital projects. Government-administered programs may have an unambiguous mandate like an SEU, but they are shielded from the pressure of market forces which drives efficiency and rapid innovation, and can be hindered by cumbersome public contracting and procurement rules. A shift in management to independent entities sidesteps the conflict of trying to force supply-focused institutions to achieve market-transforming reductions in commodity consumption.

Tables 1 and 2 summarize the discussion above and compare the SEU model with sustainable energy service program coordination, service provision, financing, and management in Massachusetts, New Jersey, and Vermont. More detailed descriptions of each of these state programs can be found in SEU Task Force (2007a).

Structure of an SEU: Roles and Responsibilities

The above innovations are built into the mandate of an SEU and its relationship to other parties. In Delaware's case, the enabling legislation (SB 1, 2007) defined several roles:

- Executive Agency (Delaware Energy Office): holds contract with the SEU Administrator
- SEU: A nonprofit "entity" with authority to raise special purpose tax-exempt bonds
- SEU Administrator: a competitively selected contractor that develops the core strategy of the SEU and runs day-to-day operations; must be independent of local utilities and energy providers
- Oversight Board: a mix of public officials and industry experts with general oversight, evaluation, and goal-setting responsibilities over the SEU Administrator
- Implementers: any business or organization selected by the SEU Administrator to deliver services (this can include local utilities)
- Monitoring and Verification: performed by outside parties under contract to the Oversight Board
- Fiscal Agent: a third-party that holds and disburses funds as needed

A key structural difference between Delaware's SEU and Efficiency Vermont is that the SEU is under contract with the executive branch and has a policy-setting oversight board, while Efficiency Vermont is under contract with the state's Public Service Commission (Hamilton, 2008b). Jurisdictional limits represented a significant justification for this decision: while Delaware's Public Service Commission is limited to regulating electricity and natural gas markets, the Delaware Energy Office has the ability to target transportation initiatives, whole-building efficiency including heating fuels, codes and standards, and multi-state initiatives like RGGI. As Efficiency Vermont's experience demonstrates (Hamilton, 2008a,b), an SEU under contract with a typical regulatory body would face a range of constraints, including being restricted to limited target markets, an inability to participate as a party to regulatory proceedings, and limited ability to raise funding from private sources. The Vermont Legislature

Table 1
Program Coordination

State	Energy Efficiency: Electricity and Gas	Energy Efficiency: All Other	Renewable Energy	Affordable Energy
SEU Model	Sustainable Energy Utility			
Massachusetts	Utilities (programs distinct)	N/A	MTC	DHCD (federal) and Utilities (state)
New Jersey	New Jersey Clean Energy Program	N/A	New Jersey Clean Energy Program	NJ Department of Human Services
Vermont	Efficiency Vermont	N/A	Department of Public Service	Department of Children and Families.
Cambridge, MA[a]	Cambridge Energy Alliance and NSTAR	N/A	Cambridge Energy Alliance and MTC	DHCD, and NSTAR

[a]Cambridge Energy Alliance programs are still under development.

Table 2
Program Structure

State/City	Service Approach	Financing Plan	Program Management
SEU Model	• All fuels targeted • Flexible programs • Incremental cost covered	• Self-sufficient through revenue generating activities • Initial funding provided through bonding • Renewable + Efficiency + Low-income SBC	Third party
Massachusetts	• Electricity and gas targeted • Rigid programs	• Renewable SBC • Energy efficiency SBC	• Utility for energy efficiency • Quasi-government entity for renewable electricity
New Jersey	• Electricity and gas • Rigid programs	• Renewable + Efficiency SBC • Low-income SBC	Third party
Vermont	• Electricity, gas, some heat targeted • Flexible programs	• Efficiency and low-income SBC • MOU with utility for RE	Third party
Cambridge, MA	• All fuels targeted • Flexible programs	• Self-sufficient through revenue generating activities • Initial funding provided by foundations	Third party

addressed these constraints in part by significantly expanding the regulatory purview of the Public Service Commission (Hamilton, 2008b; Vermont Act 92, 2008) – a prospect no doubt made politically easier after three successful Efficiency Vermont program cycles.

The Policy Framework

In order to improve Delaware's sustainable energy policy framework and support the SEU's work, the SEU Task Force also made several recommendations which were incorporated into legislation and passed in 2007. According to the Task Force, the policy foundation necessary to make an SEU possible includes the following:

- An RPS with a solar requirement or other mechanism that explicitly encourages distributed generation and/or creates a market for renewable energy certificates
- Public purpose funding (e.g., ratepayer-funded incentive funds to lower capital costs of energy efficiency and renewable energy measures)
- Interconnection and net-metering rules that allow for commercial-scale installations and

that fairly value customer-sited generation (at least equaling retail electricity prices).

- Emissions auction proceeds that are committed to bolstering sustainable energy funding

Based on SEU Task Force recommendations, the Delaware legislature doubled the RPS to 20% by 2019 with a 2% solar requirement; doubled the Green Energy Fund surcharge (which is still an order of magnitude less than leading states like Massachusetts and California); and expanded the net-metering caps to encourage commercial-scale renewable energy installations. The SEU Task Force also noted that appliance efficiency standards, green building mandates, and clean vehicle incentives are best-practice policies that should also be in place to enhance the chances of success for an SEU.

Expansion of the SEU Model

During the past decade, renewable energy and climate change policies, such as renewable portfolio standards (Wiser & Barbose, 2008) have diffused rapidly from state to state in the United States. Recent examinations of clean energy policy diffusion, for example the widespread adoption of net metering laws, has further demonstrated that the likelihood of one state adopting a policy if its neighbors do so plays an important role in regional policy diffusion (Stoutenborough & Beverlin, 2008).

The Sustainable Energy Utility model, although a comparatively recent policy innovation, is already beginning to diffuse regionally. The second U.S. government to formally adopt a Sustainable Energy Utility structure, after Delaware, is the District of Columbia. The District, although not a state government, shares many of the same energy regulatory structures as a state, and has developed a clean energy policy framework similar to that of mid-Atlantic states.

In 2007, Washington, DC, began exploring how to adapt Delaware's SEU structure to meet its own policy objectives. The District Department of Environment actively consulted with Delaware SEU Task Force members, and eventually requested a scoping study for a DC SEU from the Center for Energy and Environmental Policy at the University of Delaware (Byrne et al., 2008a). The scoping study reviewed Delaware's SEU design decisions and legislative initiatives and discussed how they might be applied within the District context.

On July 15, 2008, the Council of the District of Columbia passed the Clean and Affordable Energy Act,[7] which empowered the District Department of Environment to create a third-party administered nonprofit SEU, and an Oversight Board. The SEU was tasked to "design and deliver comprehensive end-use energy efficiency and customer-sited renewable energy services to households and business in Washington, D.C."

The SEU and its programs will be funded partially by a public bond – in the District's case $100 million – and partially by revenues from a public benefits fund. The SEU will also be responsible for disbursing revenues earned through the regional carbon market, the Regional Greenhouse Gas Initiative (RGGI), if the District signs on to RGGI. In terms of structure, governance, and financing strategy, the District's SEU is very similar to the SEU currently in place in Delaware.

The District additionally followed Delaware's lead by using the SEU design process as an opportunity to revisit and revise its clean energy policy framework. In the District's SEU legislation, the Council expanded the District's renewable portfolio standard from 11% by 2022 to 20% by 2020, and slightly increased the solar-specific target from 0.386% by 2022 to 0.4% by 2020. The legislation also raised the District's net metering cap from 100 kilowatts to 1 MW, and replaced the existing Reliable Energy Trust Fund with the Sustainable Energy Trust Fund (Office of the People's Counsel, 2008).

Conclusion

Now that both Delaware and the District of Columbia have established Sustainable Energy Utilities, and New Jersey has converted some of its sustainable energy programs from utility-managed to third-party managed, the mid-Atlantic region of the U.S. is emerging, alongside Vermont, as a hub for innovation in sustainable energy service delivery models. While it remains to be seen whether the initial momentum behind the regional diffusion of the SEU model will be sustained in the coming months, the model is already diffusing internationally. In 2007-2008, for example, the Center for Energy and Environmental Policy undertook an SEU design study for Seoul in Korea (Byrne, Kurdgelashvili, Partyka, & Rickerson, 2008b). While developments such as this indicate that the SEU model is attractive in different locations and at different levels of government, it is likely that the SEU model will remain dynamic and will continue to evolve, drawing on international best practices, such as those described in other articles within this journal.

Notes

1. With the exception of Virginia.

2. Blumstein et al. (2005) argue to the contrary that "no single administrative structure has yet emerged in the U.S. that is clearly superior to all of the other alternatives" and that the considerations of different administrative models to date are "missing…a more fundamental discussion on the underlying strategy to create a vibrant, long-term energy-efficiency services infrastructure, particularly one that serves residential and small commercial customers." Blumstein et al. do not anticipate the emergence of an SEU model with its cross-cutting approach to all fuels and all customer types, which would limit the effectiveness of incumbent, single-fuel utilities to serve as administrators.

3. Delaware Senate Concurrent Resolution No. 45 of 2006

4. Which are administered by a quasi-state agency, individual utilities, and a state agency, respectively.

5. http://www.masssave.com/

6. National Grid offers rebates for solar heating applications (water heating and air heating) as part of its natural gas energy efficiency programs, but similar programs are not available statewide (National Grid, 2008). The Green Communities Act of 2008 approved the use of MTC funds for solar hot water, but rebates for renewable heat have not been developed by the MTC to date. *See also http://www.mass.gov/legis/laws/seslaw08/sl080169.htm,* Section 49.

7. Council Bill 17-492, Codification District of Columbia Official Code, 2001 Edition. *See also* http://www.dccouncil.washington.dc.us/images/00001/20080819161530.pdf

References

American Council for an Energy-Efficient Economy. (2007). *Summary table of public benefit programs and electric utility restructuring (August 2007)*. Retrieved March 31, 2008, from http://www.aceee.org/briefs/mktabl.htm

Basalla, G. (1980). Energy and civilization. In C. Starr & P. Ritterbush (Eds.), *Science, technology and the human prospect*. New York, NY: Pergamon Press.

Blumstein, C., Friedman, L., & Green, R. (2002). *The history of electricity restructuring in California* (CSEMWP-103). Berkeley, CA: University of California Center for the Study of Energy Markets.

Blumstein, C., Goldman, C., & Barbose, G. (2005). Who should administer energy-efficiency programs? Energy Policy, 33(8), 1053-1067.

Byrne, J., Bouton, D., Gregory, J., Rosales, J., Sherry, C., Boyle, T., et al. (2000a). *Environmental policies for a restructured electricity market: A survey of state initiatives*. Newark, DE: Center for Energy and Environmental Policy. Prepared for the Science, Engineering and Technology Services Program.

Byrne, J., Wang, Y.-D., Redlin, D., Bertram, E., Clouse, M., Glover, L., et al. (2000b). *Delaware climate change action plan*. Newark, DE: Center for Energy and Environmental Policy. Prepared for the Delaware Climate Change Consortium

Byrne, J., Wang, Y.-D., Yu, J.-M., Kumar, A., Kurdgelashvili, L., & Rickerson, W. (2008a). *Sustainable energy utility design: Options for the City of Seoul*. Newark, DE: Center for Energy and Environmental Policy. Prepared for the Seoul Development Institute

Byrne, J., Glover, L., Takahashi, K., Baker, S., & Kurdgelashvili, L. (2005). *Policy options to support distributed resources*. Newark, DE: Center for Energy and Environmental Policy. Prepared for Conectiv Power Delivery.

Byrne, J., Hughes, K., Rickerson, W., & Kurdgelashvili, L. (2007). American policy conflict in the greenhouse: Divergent trends in federal, regional, state, and local green energy and climate change policy. *Energy Policy, 35*(9), 4555-4573.

Byrne, J., Kurdgelashvili, L., Partyka, E., & Rickerson, W. (2008b). *Sustainable energy utility design: Options for the District of Columbia*. Newark, DE: Center for Energy and Environmental Policy. Prepared for the District Department of Environment.

Byrne, J., & Mun, Y.-M. (2003). Rethinking reform in the electricity sector: Power liberalisation or energy transformation? In N. Wamukonya (Ed.), *Electricity reform: Social and environmental challenges* (pp. 48-76). Roskilde, Denmark: UNEP-RISØ Centre.

Cabinet Committee on Energy. (2006). Ensuring Delaware's energy future: A response to Executive Order Number 82. Dover, DE: Cabinet Committee on Energy.

Database of State Incentives for Renewables and Efficiency (DSIRE). (2008). *Renewables Portfolio Standards for Renewable Energy (Summary Table)*. Retrieved October 20, 2008, from http://www.dsireusa.org/summarytables/reg1.cfm?&CurrentPageID=7&EE=1&RE=1

Delaware Energy Office. (2008). *Green Energy Program*. Retrieved October 20, 2008 from http://www.delaware-energy.com/green-energy-program-home.htm

Delaware Energy Task Force. (2003). Bright ideas for Delaware's energy future: Delaware Energy Task Force Final Report to the Governor. Dover, DE: Delaware Energy Task Force.

Didden, M. H., & D'haeseleer, W. D. (2003). Demand side management in a competitive European market: Who should be responsible for its implementation? *Energy Policy, 31*(13), 1307-1314.

Eto, J. (1996). *The past, present, and future of US utility demand-side management programs* (LBNL-39931). Berkeley, CA: Lawrence Berkeley National Laboratory.

Eto, J., Goldman, C., & Kito, S. (1996). *Ratepayer-funded energy-efficiency programs in a restructured electricity industry: Issues, options, and unanswered questions* (LBNL-40026). Berkeley, CA: Lawrence Berkeley National Laboratory.

Eto, J., Goldman, C., & Nadel, S. (1998). *Ratepayer-funded energy efficiency programs in a restructured electricity industry: Issues and options for regulators and legislators* (LBNL-41479). Berkeley, CA: Lawrence Berkeley National Laboratory.

Goldemberg, J., & Johansson, T. B. (1995). Overview. In J. Goldemberg & T. B. Johansson (Eds.), *Energy as an instrument for socio-economic development*. New York, NY: United Nations Development Programme.

Golove, W., & Eto, J. (1996). *Market barriers to energy efficiency: A critical reappraisal of the rationale for public policies to promote energy efficiency* (LBNL-38059). Berkeley, CA: Lawrence Berkeley National Laboratory.

Gore, A. (2006). *An inconvenient truth: The planetary emergency of global warming and what we can do about it*. New York, NY: Rodale.

Hamilton, B., Plunkett, J., & Wickenden, M. (2002). *Gauging success of the nation's first efficiency utility: Efficiency Vermont's first two years.* Proceedings of the American Council for an Energy-Efficient Economy Summer Study on Energy Efficiency in Buildings, Pacific Grove, CA.

Hamilton, B. (2008a). *Playing with the bid boys: Energy efficiency as a resource in the ISO New England forward capacity market*. Proceedings of the 2008 ACEEE Summer Study on Energy Efficiency in Buildings, Pacific Grove, CA.

Hamilton, B. (2008b). *Taking the efficiency utility model to the next level*. Proceedings of the 2008 ACEEE Summer Study on Energy Efficiency in Buildings, Pacific Grove, CA.

Harrington, C., & Murray, C. (2003). *Who should deliver ratepayer funded energy efficiency? A survey and discussion paper*. Montpelier, VT: Regulatory Assistance Project.

Hirsch, R. F., & Serchuk, A. H. (1996). Momentum shifts in the American electric utility system: Catastrophic change - or no change at all? *Technology and Culture, 37*(2), 280-311.

Intergovernmental Panel on Climate Change. (2007). *Climate change 2007: The physical science basis summary for policy makers*. Geneva, Switzerland: Intergovernmental Panel on Climate Change Secretariat.

Kreith, F. (1993). Integrated resource planning. *Journal of Energy Resources Technology, 115*, 80-85.

Kutscher, C. F. (Ed.). (2006). *Tackling climate change in the U.S.: Potential carbon emissions reductions from energy efficiency and renewable energy by 2030*. Boulder, CO: American Solar Energy Society.

Letendre, S. (1997). *Photovoltaic technology for sustainability: An investigation of the distributed utility concept as a policy framework.* Unpublished Doctoral dissertation, University of Delaware, Newark.

Lovins, A. (1976). Energy strategy: The road not taken? *Foreign Affairs, 55*(1), 65-96.

Lovins, A., Datta, E. K., Feiler, T., Rábago, K. R., Swisher, J. N., Lehmann, A., et al. (2002). *Small is profitable: The hidden economic benefits of making electrical resources the right size*. Snowmass, CO: Rocky Mountain Institute.

Mitchell, C. (2003). *Renewable energy: Step change in theory and practice.* Proceedings of the Economic & Social Research Council Energy Research Conference, London, UK.

National Center for Appropriate Technology. (2003, Fall). States raid system benefits, conservation and low-income funds to balance budgets. *National Energy Affordability and Accessibility Project On-line Journal*.

National Grid. (2008). *Think smart, think green: Home energy savings with efficiency for gas customers*. Retrieved October, 20, 2008, from http://www.thinksmartthinkgreen.com/homegas.html

Parker, S., & Hamilton, B. (2008). *What does it take to turn load growth negative? A view from the leading edge.* Proceedings of the 2008 ACEEE Summer Study on Energy Efficiency in Buildings, Pacific Grove, CA.

Peterson, T. D., & Rose, A. Z. (2006). Reducing conflicts between climate policy and energy policy in the US: The important role of the states. *Energy Policy, 34*(5), 619-631.

Prindle, B., Eldridge, M., Eckhardt, M., & Frederick, A. (2007). *The twin pillars of sustainable energy: Synergies between energy efficiency and renewable energy technology policy* (Report Number EO74). Washington, DC: American Council for an Energy-Efficient Economy.

Prindle, W. R., Dietsch, N., Elliott, R. N., Kushler, M., Langer, T., & Nadel, S. (2003). *Energy efficiency's next generation: Innovation at the state level* (E031). Washington, DC: American Council for an Energy Efficient Economy.

Rabe, B. G. (2004). *Statehouse and greenhouse: The emerging politics of American climate change policy*. Washington, DC: The Brookings Institution Press.

Risser, R. (2006, August 2). *Decoupling in California: More than two decades of broad support and success*. Proceedings of the National Association of Regulatory Utility Commissioners Workshop on Aligning Regulatory Incentives with Demand-Side Resources, San Francisco, CA.

Rosenfeld, A. H. (2003). *The California vision: Reducing energy intensity 2% per year.* Proceedings of the American Council for an Energy-Efficient Economy Conference on Energy Efficiency as a Resource, Berkeley, CA.

Schipper, L., & McMahon, J. (1995). *Energy efficiency in California: A historical analysis*. Washington, DC: American Council for an Energy-Efficient Economy.

Schneider, S. H., & Lane, J. (2006). An overview of 'dangerous' climate change. In H. J. Schellnhuber, W. Cramer, N. Nakicenovic, T. Wigley, & G. Yohe (Eds.), *Avoiding dangerous climate change* (pp. 7-23). Cambridge, UK: Cambridge University Press.

Schultz, D. (1996). *Achieving energy efficiency objectives through a competitive energy efficiency service*. Proceedings of the American Council for an Energy-Efficient Economy 1996 Summer Study on Energy Efficiency in Buildings, Pacific Grove, CA.

Socolow, R. (2006). Stabilization wedges: An elaboration of the concept. In H. J. Schellnhuber, W. Cramer, N. Nakicenovic, T. Wigley, & G. Yohe (Eds.), *Avoiding dangerous climate change* (pp. 347-354). Cambridge, UK: Cambridge University Press.

Spotts, P. N. (2008, March 28). Antarctica's Wilkins ice shelf eroding at an unforeseen pace; scientists say the breakup is a harbinger of what's to come if the region continues warming. *The Christian Science Monitor*.

Stoutenborough, J. W., & Beverlin, M. (2008). Encouraging pollution-free energy: The diffusion of state net metering policies. Social Science Quarterly, *89*(5), 1230-1251

Sustainable Energy Utility Task Force. (2007a). *Sustainable Energy Utility Task Force briefing booklet*. Dover, DE: Delaware General Assembly, Sustainable Energy Utility Task Force. Prepared for the Delaware State Legislature.

Sustainable Energy Utility Task Force. (2007b). *The sustainable energy utility: A Delaware first*. Dover, DE: Delaware General Assembly, Sustainable Energy Utility Task Force. Prepared for the Delaware State Legislature.

Union of Concerned Scientists. (2004). *State public benefits funding for energy efficiency, renewables, and R&D* (as of December 2004) (Table D-1). Cambridge, MA: Union of Concerned Scientists.

van Vliet, B., & Chappells, H. (1999). The co-provision of utility services: Resources, new technologies & consumers. In E. Shove, D. Southerton, & H. Chappells (Eds.), *Consumption, everyday life and sustainability reader for the Summer School of 1999*. Strasbourg, France: European Science Foundation, Tackling Environmental Resource Management Programme.

Vermont Energy Efficiency and Affordability Act No. 92. (2008). *Laws of the State of Vermont, 2008.* S.209.

Vine, E., Hamrin, J., Crossley, D., Maloney, M., & Watt, G. (2003). Public policy analysis of energy efficiency and load management in changing electricity businesses. *Energy Policy, 31*(5), 405-430.

Weinberg, C. J., Iannucci, J. J., & Reading, M. M. (1991). The distributed utility: Technology, customer and public policy changes shaping the electrical utility of tomorrow. *Energy Systems and Policy, 15*(4), 307-322.

Wiser, R., & Barbose, G. (2008). Renewables portfolio standards in the United States: A status report with data through 2007 (LBNL-154E). Berkeley, CA: Lawrence Berkeley National Laboratory.

Wiser, R., Namovicz, C., Gielecki, M., & Smith, R. (2007). The experience with renewable portflio standards in the United States. *The Electricity Journal, 20*(4), 8-20.

York, D., & Kushler, M. (2002). *State scorecard on utility and public benefits energy efficiency programs: An update*. Washington, DC: American Council for an Energy-Efficient Economy.

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EXHIBIT
12

Attachment J

Summary of Planning Commission Hearings/Workshop

The Planning Commission held a total of five public hearings and one full day workshop related to the development of the Wind Energy Ordinance Amendment project. A brief summary of each hearing/workshop is provides as follows:

April 13, 2012 – Planning Commission Hearing: Staff presented an overview of the project and public testimony was received from 27 individuals. The Planning Commission voted unanimously to schedule a workshop to review the various project issues that came up at the hearing in greater detail and become more informed prior to making a recommendation on the proposed project. The item was continued to the April 27, 2012 meeting and Staff was directed to return and present a workshop format as well as options for workshop dates and to look into opportunities for the Commission to visit a large turbine project.

April 27, 2012 – Planning Commission Hearing: Staff reviewed the issue areas discussed at the April 13th hearing and recommended focusing the workshop on two main topic areas Biology and Noise and the following subset of issues:

Biology

- What are the sitting criteria for small turbines?
- Small Turbines in PAMA
- Wildlife agency concerns with small turbines
- What are the anticipated mitigation measures for a wind farm project?
- Are CEC guidelines mandatory, when do they apply?

Noise

- Characteristics of low frequency noise propagation (ground borne vs. air borne)
- Low frequency noise demonstration
- Review setback maps/setback implications. Provide setbacks from wind resource areas
- Clarify information provided by speakers at hearing concerning low frequency noise
- Are these measures really streamlining or are projects better off navigating the existing regulations?
- What is being experienced in other CA Counties and other States?
- Why are existing methods utilized in other CA Counties not appropriate in San Diego?
- Other trends, recent research concerning wind turbine noise

The Planning Commission concurred with staff's recommendation and set a workshop date for May 11, 2012. Staff also conveyed arrangements made to allow the Commissioners to tour the Kumeyaay Wind Project located on the Campo Indian reservation

May 11, 2012 – Workshop: Staff provided responses to the noise and biology related issues previously identified by the Commission at the April 13th hearing and provided a live audio demonstration of low frequency noise. The Commission identifying additional noise and biology questions to be furthered researched and directed staff to:

- Prepare an overview of currently available health impact research related to wind turbines
- Determine what percentage of the County's overall energy could be produced through wind and how it corresponds to other energy sources

- Provide a comparative analysis of utility scale solar versus utility scale wind. The Commission continued the item to the July 20, 2012 Planning Commission hearing.

July 20, 2012 – Planning Commission Hearing: Staff responded to and clarified the issue areas identified at the May 11th workshop. The Commission voted 4-2 to recommend approval of the project with the incorporation of the following modifications:

- Update the small turbine certification provision to specify reliance on the California Energy Commission's, May 23, 2102 List of Eligible Equipment
- Update the pure tone provision related to large turbines to incorporate the following language "repeating sources of sound, including single or multiple frequencies"
- Limit possible noise setback waivers to north of Interstate 8 in the Boulevard Community area
- Incorporate ordinance language to allow applicants to utilize an alternative turbine manufacture/model after a Major Use Permit application has been filed.
- Include ordinance language to ensure that large turbine sites are maintained and keep clean of debris/turbine parts;
- Clarify the ridgeline definition and sensitive species setback provision related to small turbines
- Include ordinance provision to require discretionary permits for small turbine within the PAMA.
- Report back to the Planning Commission in three years with a literature review of the most current research regarding human health effects from wind turbine.

October 5, 2012 – Planning Commission Hearing: Subsequent to the Planning Commission's July 20th action, the Board of Supervisors adopted amendments to the same sections of the Zoning Ordinance in connection with the private Tule Wind project on August 8, 2012. Under the State Government Code, these changes were referred back to the Planning Commission as they were not previously considered by the Commission. Prior to the October 5th Planning Commission hearing, Iberdrola Renewables, the Tule wind project applicant, submitted a letter requesting a continuance and contended that the Tule wind project was grandfathered under the existing Zoning Ordinance and requested to be exempted from the proposed Wind Ordinance. A continuance was granted to allow staff and the applicant an opportunity to further discuss and analyze the request before returning to the Planning Commission.

October 19, 2012 – Staff conveyed that the Tule Wind project was not grandfathered under the Zoning ordinance and can comply with the proposed ordinance changes. The Commission considered Tule wind's exemption request and elected to not include it into the project. The commission voted 5-1 to approve the Form of Ordinance which incorporates the previously approved Tule Wind project Zoning amendment language into the Wind Energy Ordinance Amendment.

EXHIBIT
13

COUNTY OF SAN DIEGO
BOARD OF SUPERVISORS
WEDNESDAY, MAY 15, 2013

MINUTE ORDER NO. 8

SUBJECT: CONTINUED NOTICED PUBLIC HEARING: WIND ENERGY ZONING ORDINANCE AMENDMENT AND GENERAL PLAN AMENDMENT TO THE MOUNTAIN EMPIRE SUBREGIONAL PLAN (BOULEVARD SUBREGIONAL PLANNING AREA) AND BORREGO SPRINGS COMMUNITY PLAN TO ALLOW WIND ENERGY DEVELOPMENT, POD 10-007 (DISTRICTS: ALL)

OVERVIEW:
On May 8, 2013 (1) the Board of Supervisors continued the item to May 15, 2013 at 9:00 a.m.

On February 25, 2009 (2), the Board of Supervisors directed staff to develop a new regulatory framework for wind turbines that would simplify processing and bring regulations in line with current wind turbine technologies. The Board's direction included the establishment a 50 kilowatt rated capacity as the threshold between the two tiers. Wind turbine systems that generate 50 kilowatts or less would be defined as "small wind turbine," and systems with a cumulative capacity of more than 50 kilowatts would be defined as "large wind turbine." The project being considered is composed of a series of amendments to the County's Zoning Ordinance related to wind turbines and meteorological testing (MET) facilities that implement the Board's direction.

The project also includes a General Plan Amendment to modify the Boulevard Subregional Planning Area of the Mountain Empire Subregional Plan (Boulevard Community Plan) to increase opportunities for large wind turbine projects through the Major Use Permit process. Changes are also proposed to the Borrego Springs Community Plan to allow opportunities for small wind turbine development.

FISCAL IMPACT:
N/A

BUSINESS IMPACT STATEMENT:
The proposed project will further County, state and federal goals of utilizing alternative renewable energy resources. The proposed ordinance streamlines and clarifies existing wind energy regulations and will increase development opportunities for both small and large wind turbines, while ensuring that such improvements do not adversely impact the environment, public health/safety, or the livability of the community.

RECOMMENDATION:
CHIEF ADMINISTRATIVE OFFICER
1. Certify that the Final Environmental Impact Report (EIR) dated January 2013 on file with the Department of Planning and Development Services as Environmental Review Number

2009-00-003 prepared for the Wind Energy Ordinance Amendment POD 10-007 has been completed in compliance with the California Environmental Quality Act (CEQA) and State CEQA Guidelines, that the EIR was presented to the Board of Supervisors and that the Board of Supervisors reviewed and considered the information contained therein before approving the project, and that the EIR reflects the Board of Supervisors' independent judgment and analysis (Attachment H).

2. Adopt the CEQA Findings Regarding Significant Effects of the project prepared pursuant to CEQA Guidelines Section 15091 (Attachment G).

3. Adopt the Mitigation Monitoring and Reporting Program prepared pursuant to CEQA Guidelines Section 15097 (Attachment G).

4. Adopt the Statement of Overriding Considerations prepared pursuant to CEQA Guidelines Section 15093 (Attachment G).

5. Adopt the Decision and Explanation Regarding Recirculation of the EIR prepared pursuant to CEQA Guidelines Section 15088.5 (Attachment G).

6. Adopt the Statement of Location and Custodian of Documents prepared pursuant to CEQA Guidelines Section 15091(e) (Attachment G).

7. Direct the Director of Planning and Development Services and Director of Public Works to implement the mitigation measures within their respective jurisdictions that are adopted in the CEQA Findings Regarding Significant Effects for the County of San Diego Wind Energy Ordinance Amendment POD 10-007.

8. Adopt the attached Ordinance entitled:

   AN ORDINANCE AMENDING THE SAN DIEGO COUNTY ZONING ORDINANCE RELATED TO WIND ENERGY TURBINES. (Attachment A)

9. Adopt the attached resolution entitled: RESOLUTION OF THE SAN DIEGO COUNTY BOARD OF SUPERVISORS ADOPTING GENERAL PLAN AMENDMENT (GPA) 12-003, which adopts amendments to the Regional Land Use Element, Mountain Empire Subregional Plan (Boulevard Chapter) and Borrego Springs Community Plan. (Attachment B)

10. Provide direction to staff regarding the five policy issues summarized at the end of this report.

11. Adopt the Wind Resources Map. (Attachment E).

ACTION 8.1:
ON MOTION of Supervisor R. Roberts, seconded by Supervisor Horn, the Board closed the Hearing and took action as recommended in the Chief Administrative Officer's Recommendations 1 through 7.

AYES: Cox, D. Roberts, R. Roberts, Horn
NOES: Jacob

ACTION 8.2:
ON MOTION of Supervisor R. Roberts, seconded by Supervisor Jacob, the Board took the following action:

- Approved the elements of Recommendation 8, that pertain to small wind turbines (referred to as Recommendation 8a), adopting Ordinance No. 10261 (N.S.) entitled: AN ORDINANCE AMENDING THE SAN DIEGO COUNTY ZONING ORDINANCE RELATED TO SMALL WIND ENERGY TURBINES;

- Approved the elements of Recommendation 9, that pertain to small wind turbines (referred to as Recommendation 9a), adopting Resolution No. 13-051 entitled: RESOLUTION OF THE SAN DIEGO COUNTY BOARD OF SUPERVISORS ADOPTING GENERAL PLAN AMENDMENT (GPA) 12-003 A, which adopts amendments to the Regional Land Use Element, Borrego Springs Community Plan;

- Approved Recommendation 10, Policy Decision 1 (section F.1 in the Board Letter), allowing small wind turbines in the Pre-Approved Mitigation Areas with administrative permits.

AYES: Cox, Jacob, D. Roberts, R. Roberts, Horn

ACTION 8.3:
ON MOTION of Supervisor R. Roberts, seconded by Supervisor Horn, the Board took the following action:

- Approved the elements of Recommendation 8, that pertain to large wind turbines (referred to as Recommendation 8b), adopting Ordinance No. 10262 (N.S.) entitled: AN ORDINANCE AMENDING THE SAN DIEGO COUNTY ZONING ORDINANCE RELATED TO LARGE WIND ENERGY TURBINES, adding an exemption for the Tule Wind Project;

- Approved the elements of Recommendation 9, that pertain to large wind turbines (referred to as Recommendation 9b), adopting Resolution No. 13-052 entitled: RESOLUTION OF THE SAN DIEGO COUNTY BOARD OF SUPERVISORS ADOPTING GENERAL PLAN AMENDMENT (GPA) 12-003 B, which adopts amendments to the Regional Land Use Element, Mountain Empire Subregional Plan (Boulevard Chapter);

- Approved Recommendation 10, Policy Decision 2 (section F.2 in the Board Letter), limiting setback waivers to the wind resource areas north of Interstate-8 in the Boulevard area;

- Approved Recommendation 10, Policy Decision 3 (section F.3 in the Board Letter), confirming that the proposed project adequately addresses public health concerns;

- Approved Recommendation 10, Policy Decision 4 (section F.4 in the Board Letter), confirming that the proposed project adequately addresses concerns related to fire;

- Approved Recommendation 10, Policy Decision 5 (section F.5 in the Board Letter), confirming that the Tule Wind Project is exempt from the proposed Wind Energy Ordinance Amendment;

- Approved Recommendation 11, adopting the Wind Resources Map; and

- Directed the Chief Administrative Officer to return to the Board annually with a report on the implications of this Ordinance.

AYES: Cox, D. Roberts, R. Roberts, Horn
NOES: Jacob

- - -

State of California)
County of San Diego) §

I hereby certify that the foregoing is a full, true and correct copy of the original entered in the Minutes of the Board of Supervisors.

THOMAS J. PASTUSZKA
Clerk of the Board of Supervisors

By Andrew Potter
Andrew Potter, Chief Deputy

EXHIBIT
14

SUBJECT: WIND ENERGY ZONING ORDINANCE AMENDMENT AND GENERAL PLAN AMENDMENT TO THE MOUNTAIN EMPIRE SUBREGIONAL PLAN (BOULEVARD SUBREGIONAL PLANNING AREA) AND BORREGO SPRINGS COMMUNITY PLAN TO ALLOW WIND ENERGY DEVELOPMENT, POD 10-007 (DISTRICTS: ALL)

Memorandum for the Record

The following brief analysis is provided in response to the Volker letter received on May 7, 2013. The letter does not raise new issues that had not previously been considered nor does it change the conclusion of the Health and Human Services Agency (HHSA) Position Statement. HHSA staff members continue to monitor the literature on the possible health effects of wind turbines. More research on this topic is necessary to enlighten the scientific, medical, and legal communities, as well as the public. The analysis here concerns the **direct** effect of wind turbines on health, not possible **indirect** effects through annoyance and stress.

Infrasound and Low Frequency Noise (ILFN)

The Volker letter asserts "recent studies convincingly demonstrate that wind turbine-generated ILFN *does* have significant adverse health effects."[1] Exhibits are provided to support this assertion, however, the Volker letter misrepresents exhibit findings and does not balance them with reviews or research that present the prevailing consensus that ILFN has no demonstrated adverse health effects.

Exhibit 9 is a review article that presents no original research.[2] The article summarizes literature on annoyance and noise and the anecdotal literature on health effects, but does not demonstrate ILFN has significant health effects. A more recent review published in April 2013 by the Victoria (Australia) Department of Health reaffirms the current scientific consensus:

> Infrasound is audible when the sound levels are high enough. The hearing threshold for infrasound is much higher than other frequencies. Infrasound from wind farms is at levels well below the hearing threshold and is therefore inaudible to neighbouring residents. There is no evidence that sound which is at inaudible levels can have a physiological effect on the human body. This is the case for sound at any frequency, including infrasound.[3]

Other references that support this consensus are available.[4,5,6]

[1] Volker letter, page 11.
[2] Punch J, James R, Pabst D. Wind-Turbine Noise: What Audiologists Should Know. *Audiology Today*, 2010;July/August;20-31.
[3] Victoria Department of Health. Wind farms, Sound and Health. White paper published by the Victoria State Government, Australia. April 2103, page 19. Accessed May 10, 2013 at: http://docs.health.vic.gov.au/docs/doc/5593AE74A5B486F2CA257B5E0014E33C/$FILE/Wind%20farms,%20sound%20and%20%20health%20-%20Technical%20information%20WEB.pdf
[4] Bolin K, et al. Infrasound and low frequency noise from wind turbines: exposure and health effects 2011 *Environ. Res. Lett.* 6 035103 doi:10.1088/1748-9326/6/3/035103
[5] Roberts JD, Roberts MA. Wind turbines: is there a human health risk? *J Environ Health.* 2013;75(8):8-13, 16-7.

Exhibit 10 is also a review article that presents no original research.[7] The article cites anecdotal reports of health effects, but it does not conclusively link these reports with infrasound exposure. The article states that:

> Although current research provides no conclusive evidence for infrasound hearing perception by humans, it is nevertheless a worthy exercise to investigate infrasound sources in the immediate environment, as they may contain detectable harmonics. Typical infrasound sources include ocean waves, thunder, wind, machinery engines, slow speed fans, and driving a car with open windows.... It is not unlikely for humans to be exposed to high levels of infrasound. For example, a child on a swing may experience infrasound around 0.5 Hz at 110 dB SPL.[8]

Despite the acknowledgment that humans are likely to be subjected to infrasound from many sources, the article focuses on only one (wind farms) related to health outcomes. The article speculates regarding the possible links between outer hair cell (OHC) sensitivity infrasound observed in animal research findings and perceptions by individuals of paranormal activity and adverse health effects. The article does not scientifically demonstrate correlation or causation between infrasound exposure and health outcomes.

There are recent studies that show that infrasound produced by wind turbines is within the range of what humans interact with in the environment. The following table summarizes common sources of infrasound:

Natural environment	Household and industry	Human body
Waves	Air conditioning	Breathing
Wind	Rail traffic	Chewing
Waterfalls	Power plants	Heart beat
		Head movement

[9]

A recent Australian study showed that:

> measured G-weighted infrasound levels at rural locations both near to and away from wind farms were no higher than infrasound levels measured at the urban locations. The most significant difference between the urban and rural locations was that human activity and traffic appeared to be the primary source of infrasound in urban locations, while localised wind conditions appeared to be the primary source of infrasound in rural locations.... This study concludes that the level of infrasound at houses near the wind turbines assessed is no greater

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[6] Health Protection Agency (HPA). Health effects of exposure to ultrasound and infrasound: report of the independent Advisory Group on Non-ionising Radiation. White paper, HPA, Oxfordshire, UK. 2010. Accessed May 10, 2013 at: http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1265028759369

[7] Hsuan-hsiu AC, Narins P. Wind Turbines and Ghost Stories: The Effects of Infrasound on the Human Auditory System. *Acou Today*, 2012;8:51-56.

[8] Ibid. page 53.

[9] Op. Cit., Victoria, page 1.

than that experienced in other urban and rural environments, and is also significantly below the human perception threshold.[10]

Exhibit 11 is a research study reporting that OHC's in a guinea pig animal model are apparently sensitive to infrasound.[11] The Volker letter incorrectly states that the authors "have shown that there are at least three mechanisms through which OHC stimulation by ILFN **causes perceivable impacts**" (emphasis added).[12] The study only postulates mechanisms "that should be ruled out" and the authors state that their findings "may provide a physiologic basis for Krahé's psychoacoustical studies."[13] They do not demonstrate that OHC stimulation causes any health effect or perceivable impact. Although the authors extrapolate their findings to account for anecdotal reports that some types of noise may be more annoying than others, the paper does not demonstrate a connection between infrasound and annoyance.

Exhibit 12 has the same lead author as *Exhibit 11* and summarizes a theoretical argument regarding "possible ways that low frequency sounds at levels that may or may not be heard, could influence the function of the ear."[14] Although the paper speculates that OHC stimulation could lead to perception, it does not demonstrate adverse health effects and states in the conclusion:

> The fact that some inner ear components (such as the OHC) may respond to infrasound at the frequencies and levels generated by wind turbines does not necessarily mean that they will be perceived or disturb function in any way.[15]

Exhibit 13 also has the same lead author as the previous two exhibits.[16] Like the other two papers, the authors postulate, but do not demonstrate, that stimulation of OHC may be perceived by individuals without being consciously heard. The paper states:

> In contrast to other sounds, such as loud sounds, which are harmful and damage the internal structure of the inner ear, there is no evidence that low-level infrasound causes this type of direct damage to the ear. So infrasound from wind turbines is unlikely to be harmful in the same way as high-level audible sounds.[17]

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[10] Evans T, Cooper J, Lenchine V. Infrasound levels near windfarms and in other environments. White paper published by the Environmental Protection Authority, Adelaide, South Australia. 2013. Accessed May 10, 2013 www.epa.sa.gov.au/xstd_files/Noise/Report/infrasound.pdf

[11] Salt A, Lichtenhan J. Perception-based protection from low-frequency sounds may not be enough. A paper presented at InterNoise in New York City, New York. 2012;August 19-22, 2012.

[12] Volker letter, page 13.

[13] Op. Cit., Salt and Hullar, page 4.

[14] Salt A, Hullar T. Responses of the Ear to Low Frequency Sounds, Infrasound and Wind Turbines," *Hearing Res*, 2010;268: 12-21.

[15] Ibid. page 19.

[16] Salt A, Kaltenbach J. Infrasound from Wind Turbines Could Affect Humans. *Bull Sci Tech Soc*, 2011;31: 296-302.

[17] Ibid, page 300.

Exhibit 14 is a combination of ILFN measurements and anecdotal observations on the perceived health effects in proximity to wind turbines.[18] One investigator admits being "not qualified to make judgments regarding human response to normally subliminal sources of acoustic excitation,"[19] and it is unclear how the other investigators are qualified to assess health. The only investigator who reported symptoms is the investigator who interviewed residents regarding health effects. He is also a co-author of *Exhibit 15* where a similar occurrence of symptoms in the investigators was noted.[20] The ILFN measurements in both of these papers cannot be scientifically correlated with or inferred to be causal of any health effects.

It is worth noting that a recent paper from New Zealand may explain a mechanism that may account for symptoms in some individuals who believe that infrasound may be harmful. The article found that:

> Healthy volunteers, when given information about the expected physiological effect of infrasound, reported symptoms that aligned with that information, during exposure to both infrasound and sham infrasound. Symptom expectations were created by viewing information readily available on the Internet, indicating the potential for symptom expectations to be created outside of the laboratory, in real world settings. Results suggest psychological expectations could explain the link between wind turbine exposure and health complaints.[21]

The Volker letter includes *Exhibit 16* to illustrate the preference of G-weighted measurements compared to A-weighted measurements, however the conclusion of the article is not mentioned. The conclusion is:

> From a critical survey of all known published measurement results of infrasound from wind turbines it is found that wind turbines of contemporary design with the rotor placed upwind produce very low levels of infrasound. Even quite close to these turbines the infrasound level is far below relevant assessment criteria, including the limit of perception. **Such low infrasound levels are unimportant for the evaluation of the environmental effects of wind turbines.** Wind turbines with a downwind rotor generate considerably higher infrasound levels, which may violate relevant assessment criteria in distances up to several hundred metres. **At longer distances the level drops below these criteria, and it is questioned if the infrasound can be the objective cause of negative public reactions to large downwind turbines** (emphasis added).[22]

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[18] Walker B, Hessler GF, Hessler DM, Rand RW, Schomer P. A Cooperative Measurement Survey and Analysis of Low Frequency and Infrasound at the Shirley Wind Farm in Brown County, Wisconsin. Public Service Commission of Wisconsin Report #122412-1 dated December 24,2012.

[19] Ibid, Appendix A, page 11.

[20] Ambrose SE, Rand RW, The Bruce McPherson Infrasound and Low Frequency Noise Study: Adverse Health Effects Produced by Large Industrial Wind Turbines Confirmed. White paper dated December 14, 2011.

[21] Fiona Crichton, George Dodd, Gian Schmid, Greg Gamble, and Keith J. Petrie. Can Expectations Produce Symptoms From Infrasound Associated With Wind Turbines? *Health Psychol*, 2013; March 13 (E-publication ahead of print. Accessed May 3, 2013 at: http://www.scribd.com/doc/130279155/Can-Expectations-Produce-Symptoms-From-Infrasound-Associated-With-Wind-TurbinesChapman, et al. Spatio-temporal differences in the history of health and noise complaints about Australian wind farms: evidence for the psychogenic, "communicated disease" hypothesis. Pre-Print: March 27 2013. Accessed May 3, 2013 at: http://ses.library.usyd.edu.au/bitstream/2123/8977/4/Complaints%20FINAL.pdf

[22] Jakobsen J. Infrasound Emission from Wind Turbines. *Journal of Low Frequency Noise, Vibration and Active Control*, 24(3): 145-155. Page 154.

Exhibit 17[23] has been previous reviewed found not to have demonstrated a statistical link between wind turbines, distance, sleep quality, sleepiness and health. This paper has been criticized in the journal in which it was published for statistical and methodological flaws.[24,25]

In short, although one researcher has determined that OHC's in a guinea pig model appear to have a physiological response to infrasound, there is no conclusive evidence that demonstrates that low levels of infrasound are perceived by humans or have an adverse health effect.

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[23] Nissenbaum M, Aramini JJ, Hanning, CD. Effects of Industrial Wind Turbine Noise on Sleep and Health," *Noise Health*, 2012;14: 237-243.

[24] Ollson CA, Knopper LD, McCallum LC, Whitfield-Aslund ML. Letter to Editor: Are the findings of "Effects of industrial wind turbine noise on sleep and health" supported? *Noise Health*, 2013;15:148-50.

[25] Barnard M. Letter to Editor: Issues of wind turbine noise. *Noise Health*, 2013;15:150-2.

Electromagnetic Frequency (EMF)

The studies mentioned in the Volker letter by Milham and Morgan, and Havas and Colling do **not** scientifically demonstrate a causal health impact of EMF on health.

The Havas and Colling article contains only anecdotal information linking measurements of so-called "dirty electricity" to health effects, including electromagnetic hypersensitivity syndrome (EHS).[26] The article contains spectra measurements from Ontario and Palm Springs "near where people were unwell," but there is not enough detail on how the measurements were made and what actual symptoms were in these individuals. A correlation or causation between the measured findings and health cannot be inferred.

EHS is not an accepted medical diagnosis, nor is it clear that it represents a single medical problem. The World Health Organization (WHO) has concluded that:

> EHS is characterized by a variety of non-specific symptoms that differ from individual to individual. The symptoms are certainly real and can vary widely in their severity. Whatever its cause, EHS can be a disabling problem for the affected individual. EHS has no clear diagnostic criteria and there is no scientific basis to link EHS symptoms to EMF exposure.[27]

The Milham and Morgan study on the possible effects of electromagnetic frequency in a school setting does not adequately demonstrate a scientific link between EMF and cancer.[28] The flaws in the study have been documented in a 2010 review article by DeVocht.[29] In addition, the journal that published the study also published a letter to the editor that noted that the research was "biased" and contained "significant inaccuracies and objectional research practices."[30] The letter highlighted the failure of the authors to have the design study reviewed by an institutional review board.

The PHS position statement relies on the consensus of the scientific community regarding exposure to low level EMF. The current WHO statement on EMF is noted here:

> In the area of biological effects and medical applications of non-ionizing radiation approximately 25,000 articles have been published over the past 30 years. Despite the feeling of some people that more research needs to be done, scientific knowledge in this area is now more extensive than for most chemicals. Based on a recent in-depth review of the scientific literature, the WHO

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[26] Havas M, Colling D. Wind Turbines Make Waves: Why Some Residents Near Wind Turbines Become Ill. *Bull Sci Tech*, 2011;31:5414-426.
[27] WHO: http://www.who.int/peh-emf/publications/facts/fs296/en/ Accessed May 3, 2013.
[28] Milham S, Morgan L. A new electromagnetic exposure metric: High frequency voltage transients associated with increased cancer incidence in teachers in a California school. *Am J Ind Med*, 2008;51:579–586.
[29] DeVocht F. "Dirty electricity": what, where, and should we care? *J Expo Sci Environ Epidemiol*, 2010;20:399-405.
[30] Morgan JW. Letter to the Editor: RE: A new electromagnetic exposure metric: High frequency voltage transients associated with increased cancer incidence in teachers in a California school. *Am J Ind Med*, 2008;51:579–86.

concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields.[31]

The report submitted by Ms. Tisdale on May 5, 2013 entitled "Electromagnetic Field (EMF) Exposure at Campo and Manzanita Reservation Residences near the Kumeyaay Wind Turbines, and Ocotillo-Area residences near the Ocotillo Wind Energy Facility Wind Turbine Electric Generator Installation" was reviewed. The Volker letter asserts that this report showed "high levels of *local* wind turbine-generated EMF exposure in the residences."[32] A careful reading of the actual report indicates that this is untrue. The report clearly states on page 21 that "AC magnetic field levels noted in the survey were **very low and within the normal range** of residential buildings in Southern California.... RF levels detects were **low and well below levels commonly encountered** in metropolitan areas in San Diego County." (emphasis added). Indeed, **none** of the residences had magnetic field levels either indoors or outdoors that were higher than the average noted in the survey of American homes in the 1993 EPRI survey (median = 0.6 mG, mean = 0.9 mG).[33] In addition to the failure to demonstrate higher EMF measurements in Manzanita than in other San Diego residences, there is no correlation between the measurements and the local wind turbines.

The documents provided by Ms. Tisdale and Mr. Volker do not alter the conclusion of the HHSA position statement that EMF exposure from wind turbines presents no established health threat. Further, there is evidence that the constant suggestion that EMF may be harmful to health is in itself a cause of symptoms in individuals who believe that they are exposed to it (the so-called "nocebo" effect.)[34]

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May 13, 2013

[31] WHO: http://www.who.int/peh-emf/about/WhatisEMF/en/index1.html. Accessed May 3, 2013.
[32] Volker letter, page 19
[33] Electrical Power Research Institute (EPRI). Survey of Residential Magnetic Field Sources, Volumes 1&2. Technical Report 102759 published by EPRI, October 1993. Accessed May 3, 2013 at: http://www.epri.com/search/Pages/results.aspx?sq=1&k=TR-102759-V1
[34] Witthoft, M, GL Rubin. Are media warnings about the adverse health effects of modern life self-fulfilling? An experimental study on idiopathic environmental intolerance attributed to electromagnetic fields (IEI-EMF). *J Psychosomatic Research* 2013;74:206-12.