Appendix A: Renewable Energy

Introduction

Sonoma Clean Power (SCP) promises to be a powerful, game-changing innovation platform that provides significant opportunity for rapid GHG emissions reductions. Because only one other similar entity currently exists in California, SCP must either look to Marin Clean Energy for directly applicable model programs or invent its own. The following recommendations for taking advantage of SCP require ongoing analysis. The Climate Protection Campaign, in a parallel endeavor to this research paper, is investigating programs to optimize SCP.[1]

Key Recommendations:

	Recommendation	Communities Employing Recommendation	Sonoma County Status and Applicability
1.1	Optimize Sonoma Clean Power to significantly and rapidly reduce GHG emissions	Marin County	Sonoma Clean Power was established in July 2013. The first group of 20,000 customers began receiving service in May 2014, and most people will be eligible starting in early 2015.
1.2	Support local renewable energy development by reducing solar permitting fees, using online permitting, and requiring that all new developments are solar-ready	Anaheim, Berkeley, Boston, Boulder, King County, Montgomery County, Sacramento, San Francisco, Santa Monica, Silicon Valley	Solar Sonoma County has done considerable work to improve codes and standards and make Sonoma County a national leader. The City of Sebastopol passed an ordinance to require that all new developments are solar-ready.
1.3	Integrate local renewable energy development, energy efficiency, demand response, intelligent grid management, and financing	Chicago, Fort Bragg, Fort Collins, Germany, Junction City, Los Angeles, Marin County, Portland, San Jose, Silicon Valley, Vancouver, Washington D.C., Weld County	Sonoma County must use smart and micro grid technologies for demand response and energy efficiency in combination with renewable energy power generation at optimum locations to minimize fossil fuel use.
1.4	Continue to support current successful financing programs	NA	Sonoma County can use Property Assessed Clean Energy and Pay As You Save® financing to further its leadership.

1 "Planning Concepts for Sonoma Clean Power's Local Energy Resources Development," http://climateprotection.org/wp-content/uploads/2010/08/SCP-Local-Resource-Planning-Concepts-Jan-17.pdf

Recommendation 1.1 Optimize Sonoma Clean Power to significantly and rapidly reduce GHG emissions

Background

Because Sonoma Clean Power (SCP) has decision-making authority over sources of electric power generation, it can purchase 100 percent renewable power. However, to maintain its customer base, SCP must compete with PG&E. Given the early success of SCP to negotiate competitive rates, and given the rapid drop in the cost of solar energy, a goal of 100 percent renewable electric power may soon be attainable through SCP. Other communities such as Palo Alto and Washington, D.C. that are now moving toward 100 percent renewable power provide inspiration for this.

SCP also has an opportunity to create energy efficiency, demand management, and financing programs for its customers to further leverage its ability to reduce emissions. The optimization of SCP will also create competition among power generators, allow local control over the stationary power supply, help to control rates over the long term, and stimulate local job growth as more local renewable energy generators come online.

Strategies to Consider:

A. Set a goal for Sonoma Clean Power to use 100 percent renewable power
B. Execute strategies already in Sonoma Clean Power's plan
C. Maximize solar on public buildings

A. Set a goal for Sonoma Clean Power to use 100 percent renewable power

Sonoma County has a bounty of renewable energy supplies to be tapped, including base load energy at The Geysers. The Geysers, located in the Mayacamas Mountains along 45 square miles of the Sonoma and Lake County border, are the largest complex of geothermal power plants in the world.[2] In addition, solar and wind potentials in Sonoma County are far from realized to-date. Setting and achieving a goal of 100 percent renewable energy is doable, as a few leading communities have demonstrated. The goal of 100 percent renewable energy can initially be met by purchasing renewable power wherever it is available, as well as by purchasing renewable energy credits when needed.

In June of 2013, the **City of Houston** signed an agreement with Reliant Energy, an NRG Energy company, to purchase more than 140 MW of renewable power for the next two years, making the deal the largest purchase of solar energy in the nation to-date (although LA is now going to surpass Houston). This purchase of green power is projected to account for half of its annual electricity demand. The City will be using almost 623,000 MWh of green power per year, which is equivalent to the amount of kilowatt-hours needed to power more than 55,000 homes each year. This purchase put Houston as the largest municipal purchaser of renewable power in the nation, and in the top 10 overall in the nation, according to EPA estimates.[3] The City of Houston has also purchased renewable energy

2 http://www.geysers.com/geothermal.aspx
3 http://www.houstontx.gov/mayor/press/20130620.html

credits (RECs) that are Green-E certified. Taking advantage of more cost-effective and cost-competitive REC prices, the City has maintained a relatively flat power price while also increasing the percentage of renewable energy in its portfolio. The City has committed $2 million for this 2-year agreement, less than a $0.01 per kWh on top of the City's power price. [4]

In **Oberlin**, the city projects a 50 percent decrease in community emissions from 2007 by 2015, based on contracted renewable energy through their municipal utility (90 percent carbon-free energy in 2015, mostly landfill gas and hydropower). [5]

In **Palo Alto**, the PaloAltoGreen program supports 100 percent California-produced solar energy. Palo Alto was the first community in California to be certified as a Green Power Community by the U.S. Environmental Protection Agency. Now the City Council has voted to reconsider the best direction for the program, in light of the decision earlier this year for the City to only purchase carbon-neutral electric power for all customers. This action has brought down emissions dramatically for Palo Alto.[6]

In the **City of Portland**, installation of on-site renewable energy systems grew in 2011. In two years, the three-year Climate Action Plan goal of 10 megawatts of solar electric generation was exceeded. As of December 2011, there were 14.7 MW of total installed capacity. Installations by government agencies, businesses, and local residents all contributed to achieving this goal. The City supported two Solarize Portland campaigns in 2011, resulting in more than 120 new solar system installations (2011), and over 570 installations since the program's inception in 2009.[7]

Washington, D.C. has a 100 percent renewable energy mix, largely from a regional wind farm.[8]

B. Execute strategies already in Sonoma Clean Power's plan

Sonoma Clean Power can be a game-changing innovation platform to help Sonoma County reduce GHG emissions. Four strategies for doing so are already included in the SCP Implementation Plan and should be executed.

1. Net Energy Metering

   Customers with on-site generation eligible for net energy metering (NEM) from PG&E will be offered a NEM rate from SCP. NEM allows for customers with certain qualified renewable energy generation to be billed on the basis of their net energy consumption. SCP will pay customers for excess power produced from NEM generation systems in accordance with the rate designs adopted by the SCPA Board.[9]

2. Feed-in Tariff

   A feed-in tariff is a wholesale rate paid by a load serving entity for clean power fed into the grid at a guaranteed rate over a defined time period.

   Palo Alto CLEAN (Clean Local Energy Accessible Now) is a program to purchase electricity generated by solar electric systems located in CPAU's service territory, which coincides with the city boundaries.

4 http://www.houstontx.gov/mayor/press/20130620.html
5 Page 16 of Oberlin's CAP: http://www.cityofoberlin.com/images/omlps/2013%20cap%20online%20pdf.pdf
6 http://www.cityofpaloalto.org/gov/depts/utl/residents/sustainablehome/paloaltogreen/default.asp
7 Page 10-11 of Portland's CAP update: http://www.portlandoregon.gov/bps/article/268612
8 Survey
9 http://www.sonomacleanpower.org/files/managed/Document/186/Sonoma%20Clean%20Power%20CCA%20Implementation%20Plan%202013-08-20.pdf

Programs like this, known in the industry as "feed-in tariff" programs, involve a utility paying a fixed price (tariff) for the power that is "fed into" their electric grid from local generation systems. On December 17, 2012, the Palo Alto City Council approved changes to Palo Alto CLEAN, including raising the price, lowering the amount of capacity to be accepted, and removing the minimum project size. CPAU is now offering to purchase the output of up to 2 MW of new solar systems located in Palo Alto at a price of 16.5 cents per kilowatt hour (kWh) for 20 years. There is no minimum or maximum project size. [10]

In **Los Angeles** on January 11, 2013, the Board of Water and Power Commissioners (Board) approved the nation's most dramatic improvement among municipal utilities: a 100 MW FiT Set Pricing Program as the first component of a 150 MW FiT Program. LADWP's 100 MW FiT Set Pricing Program seeks to encourage renewable energy development within the Los Angeles Basin and help meet the 33 percent Renewable Portfolio Standard mandate by 2020. The FiT Program will allow the LADWP to partner with program participants to purchase, under a standard power purchase contract, energy generated from a participant's renewable energy generating system. These systems will be located within the LADWP's service territory and interconnected to the LADWP electrical distribution system. All the energy generated by these systems will be purchased at a fixed price, subject to time-of-delivery multipliers, for a term of up to 20 years.

The 100 MW FiT Set Pricing Program is the successor to the LADWP's 10 MW FiT Demonstration Program which was approved by the Board on April 17, 2012 and launched on May 17, 2012. The Demonstration Program helped gauge market pricing and test the initial program's structure. It restricted projects to solar energy systems between 30 kW to 999 kW. Projects under the Demonstration Program were selected under a bid pricing mechanism. LADWP received 26 applications totaling 7.2 MW, of which 14 were eligible for contract signing. The weighted average bid price of the 14 projects was $0.175/kWh.[11]

3. Green Energy Pricing (Deep Green)

Green Energy Pricing programs enable people to pay a special voluntary rate for a superior energy product. The product may be a higher proportion of renewable energy, or it may be for the purposes of funding new local renewable energy generation.

In **Marin County**, Marin Clean Energy's Deep Green customers can purchase all of their power from non-polluting, renewable sources. It's a voluntary program and it's available right now. Electricity customers in Marin County and Richmond can sign up today. The additional cost of Deep Green is just a penny more per kilowatt-hour than the Light Green rates. For the average residential customer, the additional cost of Deep Green is just $5 more per month. In 2012, wind resources from the Western U.S. were used to supply Deep Green power. The Power Content Label is updated periodically to reflect the most current locations of renewable energy generators. The Deep Green energy mix includes category 3 renewable energy certificates, which support the development of new renewable energy facilities in the western U.S. to reduce greenhouse gas emissions using the purchasing power of Marin and Richmond residents and businesses.[12]

10 http://www.cityofpaloalto.org/gov/depts/utl/business/sustainability/clean.asp
11 https://www.ladwp.com/ladwp/faces/ladwp/partners/p-gogreen/p-gg-localrenewableenergyprogram?_afrWindowId=null&_afrLoop=205373241318813&_afrWindowMode=0&_adf.ctrl-state=frdrvbf2r_4#%40%3F_afrWindowId%3Dnull%26_afrLoop%3D205373241318813%26_afrWindowMode%3D0%26_adf.ctrl-state%3Djs5t9mx8q_4 and http://www.icleiusa.org/blog/iclei-applauds-los-angeles-for-historic-increase-in-renewable-power
12 https://mcecleanenergy.com/deepgreen

In the **City of Austin**, GreenChoice is Austin Energy's renewable energy program that allows customers to receive their electricity from 100 percent renewable energy sources (primarily Texas wind power). The Austin community's goal is to derive 35 percent of their power from renewables by 2020.[13]

In **Sacramento**, SMUD's SolarShares® allows both owners and renters to go solar. SolarShares is also 100 percent local with the solar farm located in the service area. When a resident joins SolarShares, a portion of the solar power produced at the local solar farm will be credited to their monthly SMUD bill. They get the benefit of solar energy without having to install solar panels on their home. Their monthly bills will be offset by a credit for the solar electricity they get each month, which reduces the amount they would otherwise pay for non-solar power – after the cost of their program participation is deducted. Participation costs generally run between $5 and $65 a month, depending on the customer's typical energy use and the size of SolarShare that they choose.[14]

In the **City of Seattle**, Green Up is Seattle City Light's voluntary green power program for residential and business customers. By enrolling in Green Up, customers purchase green power for a portion of their electricity use and demonstrate their support for wind power and other new renewable energy projects in the Northwest. The Green Up program is Green-e Energy certified and fulfills LEED™ Project green power requirements. Through Green Up customers may also purchase green power for special events. When a customer joins Green Up, Seattle City Light buys electricity on their behalf from independent companies that produce energy from renewable resources in the region. Green Up has also sponsored more than 30 solar demonstration projects, including high-profile installations at Jefferson Park, Woodland Park Zoo, and the Pacific Science Center. Residential customers may purchase green power in increments of 25 percent, 50 percent or 100 percent of their electricity use for $3, $6 or $12 per month. Business customers may participate at any level and earn Silver, Gold or Platinum Partner recognition based on their annual electricity (kilowatt-hour) use or purchase green power for LEED™ credits.[15]

4. Virtual Net Metering (Retail Solar Cooperative)

Virtual net metering, available for customers of California's investor-owned utilities since mid-2012, allows electric load at multiple meters to be offset by solar generation at a single meter elsewhere, so long as all meters are behind the same utility service delivery point. This program expands solar opportunity for retail customers and multi-family housing facilities, which have traditionally been limited to generating electricity and offsetting load at a single electric meter.[16]

With virtual net metering, multiple tenants at a property can share the electricity produced by a single solar energy system. This makes it easier for residential and commercial rental properties to reduce tenant utility bills and create a revenue stream for landlords. It also makes it simpler for condominium and tenancy in common owners to share the benefits of an onsite solar system. Tenants benefit from the solar electricity by receiving a credit directly on their bill. The system owner gives the utility a list of participating tenants, known as benefiting accounts, indicating the percentage of the system's output to be credited to each tenant.[17]

C. Maximize solar on public buildings

13 https://www.austinenergy.com/energy%20efficiency/Programs/Green%20Choice/faq.htm#question2
14 https://www.smud.org/en/residential/environment/solar-for-your-home/solarshares/
15 http://www.seattle.gov/light/Green/greenPower/greenup.asp
16 http://www.recsolar.com/trend/virtual-net-metering-available-for-pge-sce-and-sdge-customers
17 http://www.sfenvironment.org/sites/default/files/fliers/files/solar_at_multitenant_buildings-virtual_net_metering.pdf

The County of Sonoma is engaged in ongoing efforts to make municipal operations as sustainable as possible. However, Sonoma County still has a lot of municipal buildings where solar could be installed.

In the **City of Benicia**, a 10-site City Facility Solar Project (1.67MW) led to 604MTCO2 reduced (March 2012 – October 2013) at an estimated cost of $9 million. The City contracted with Chevron Energy Solutions. The City tracks energy, GHG, and cost savings, and maintains the systems.[18]

In the **City of San Jose,** approximately 4.3 MW have been installed on municipal buildings (fire stations, community centers and libraries). All of the installations are privately funded through various means, including power purchase agreements.[19]

In **Snohomish County**, there are several public sites with solar panels that are generating electricity, including their largest 16.4 kW system on the roof of the County Campus Administration Building. The County also has a 4.2 kW solar system at its Cathcart facility, and a 1.2 kW system at River Meadows Park in Arlington.[20]

Recommendation 1.2 Support local renewable energy development by reducing solar permitting fees, using online permitting, and requiring that all new developments are solar-ready

Background

In Sonoma County solar and energy efficiency professionals, local government building inspectors, and fire safety officials have created a groundbreaking solar permitting process. Solar companies can now use the same permit application for residential solar projects anywhere in the county, and building officials all over the county follow the same standardized solar permitting guidelines. [21] However, Solar Action Alliance (SAA) recommends taking these revisions even further by moving to online permitting. SAA estimates that online permitting would save approximately $800,000 annually.[22] Sonoma County should also consider either charging solar permit fees based on cost recovery, or eliminating fees altogether. The savings from moving permitting online could be applied toward the losses from reduced permitting fees. Sonoma County can go even further by requiring new developments to be solar-ready, which would give the local solar industry a much needed boost in a market that has always favored fossil fuels. The City of Sebastopol already passed an ordinance requiring all new developments to be solar-ready.[23] Other Sonoma County jurisdictions can do the same.

Strategies to Consider:

A. Incentivize solar with reduced fees
B. Move to online permitting

18 Survey
19 Phone call with Mike Foster at the City of San Jose, 10/15/2013
20 http://www1.co.snohomish.wa.us/County_Services/Climate_Energy/
21 http://www.solarsonomacounty.org/Resources/Solar-Permits.aspx
22 Ibid
23 http://www.pressdemocrat.com/article/20130507/articles/130509624

C. Require solar on new developments (county-wide)

A. Incentivize solar with reduced fees

Sonoma County jurisdictions could charge solar permit fees based on cost recovery or eliminate fees entirely. Jurisdictions can develop fee rates that recover the costs of billable staff time and other resources expended while reviewing a permit or completing an inspection. Cost rates can also align the services rendered with the size and complexity of the system under review. This can differentiate between simple residential permit review and complex large commercial systems requiring significant personnel time to review. The California Legislature has also passed two bills – AB1801 and SB1222 – to prohibit excessive solar permit fees or base the costs of solar permits on the valuation of the PV system.

The Cities of **Sacramento and San Francisco** both use cost recovery fees.

The Cities of **Santa Monica and Anaheim** have gone further and entirely eliminated solar PV permit fees to encourage solar installations in their region.[24]

B. Move to online permitting

According to Solar Action Alliance (formerly Solar Sonoma County), online permitting will save an estimated $800,000 annually by eliminating paper and enabling building departments to track and archive permits electronically. In addition, online permitting will mean fewer driving trips for solar contractors and building inspectors, reducing vehicle emissions.[25] Solar Action Alliance is already working to make online permitting a reality and the County of Sonoma should support this effort.

The **City of San Francisco** now offers online permitting.[26]

C. Require solar on new developments (county-wide)

In May 2013, Sebastopol became the second city in California to require solar power systems on new homes and commercial buildings. Lancaster was the first to make solar power mandatory on new housing developments. Sebastopol's ordinance will require new residential and commercial buildings, and major additions and remodeling to include a photovoltaic energy-generation system. The system will have to provide 2 watts of power per square foot of insulated building area or offset 75 percent of the building's annual electric load. In situations where solar power is impractical, such as shaded areas, new buildings may use other energy alternatives or pay a fee.[27]

Recommendation 1.3 Integrate local renewable energy development, energy efficiency, demand response, intelligent grid management, and financing

24 http://bestpractices.energycenter.org/best-practice/base-solar-permit-fees-cost-recovery
25 http://www.solarsonomacounty.org/Resources/Solar-Permits.aspx
26 http://sfenvironment.org/sites/default/files/fliers/files/sfe_re_sf_solar_pv_permitting_guide.pdf
27 http://www.pressdemocrat.com/article/20130507/articles/130509624

Background

An assessment of Sonoma County's energy needs, the available renewable energy supply, and approaches to integrate demand and supply was begun in 2009 with the "Renewable Energy Secure Sonoma County" (RESCO) project. [28] The purpose of the RESCO project was to develop and demonstrate a model for a local, cost-effective renewable energy portfolio that would help Sonoma County meet its GHG reduction goals. The study indicated that Sonoma County must use smart and micro grid technologies for demand response and energy efficiency in combination with renewable energy power generation at optimum locations to minimize fossil fuel use and its associated costs – both fiscal and ecological. Financing is a key component of this approach and is discussed in further detail in the financing section.

Strategies to Consider:

A. Create net-zero energy districts
B. Pursue smart grid modernization
C. Consider a pilot program for energy storage
D. Use geographically-based energy strategies
E. Explore waste to energy opportunities

A. Create net-zero energy districts

Several cities within Sonoma County have downtown areas that may lend themselves to the creation of a net-zero energy district that would be extremely energy efficient and draw its remaining electricity needs from a diverse set of local renewable resources, such as wind, solar PV, and biomass. Such a district would first reduce energy demand and manage peak load, and then invest in renewable energy and adopt smart grid technologies.

"FortZED" is an effort to transform the downtown area of **Fort Collins**, Colorado, into a net-zero energy district through energy conservation, energy efficiency, renewable energy, and other smart grid technologies.[29] Phase I of the project was mainly research-oriented. Phase II of the project was slated for completion in 2013, and aimed to demonstrate the operation of a micro-grid and the use of advanced cyber security safeguards to protect the micro-grid.[30]

Details about FortZED follow.

> Definitions of a net-zero energy district vary, but in the case of Fort Collins, UniverCity Connections envisioned a downtown district that becomes super energy-efficient and draws its remaining electricity needs from a diverse set of local renewable resources, such as wind, solar PV, and biomass. The FortZED

28 http://www.sonomaresco.org/
29 http://www.rmi.org/summer_2013_esj_whats_old_is_new_main
30 http://fortzed.com/what-is-fortzed/energy-technology

plan includes four strategic elements: 1) reduce energy demand, 2) invest in renewable energy, 3) manage peak load, and 4) adopt smart grid technologies.[31]

The downtown area of Fort Collins represents 10–15 percent of the total electric demand in Fort Collins. The district covers two and a half square miles and serves about 6,000 customers, plus the main campus of Colorado State University. Fort Collins currently gets two-thirds of its electricity from coal-fired power plants, and five percent from renewables. Fort Collins electricity prices are 40 percent below the national average with triple the reliability as well as savings from energy efficiency.[32]

The initial team that incubated the FortZED idea formed a steering committee with participants from the city government, the city's municipal utility, and the Colorado Clean Energy Cluster, an organization made up of local cleantech companies dedicated to growing the cleantech industry across the state. The committee identified two large grants to kick-start efforts in FortZED. The first grant, from the State of Colorado, helped the city and its partners leverage $778,000 from the state to generate another $2 million in local matching funds that resulted in efficiency improvements to four large public buildings and the installation of a 54-kilowatt solar PV array on another building. The second grant put FortZED on the fast track to meeting its long-term aspirations. The committee, working closely with the municipal utility, landed $6.3 million from the U.S. Department of Energy (DOE) and $5 million from local matches. As part of a series of DOE projects called Renewable and Distributed Systems Integration (RDSI), Fort Collins Utilities set out to use the funding to build the connective infrastructure that allows electric demand and supply sources in the downtown area to communicate with one another and the utility. Using this new system to activate and manage solar PV, diesel generators, gas turbines, thermal storage, and load shedding from various demands, the utility demonstrated 20 percent drops in its peak electricity demand.[33]

The first phase of the RDSI project, completed in 2011 with reporting extending into 2012, created the technology and communications infrastructure that will allow the downtown area to effectively integrate more sources of distributed electricity generation like solar PV. To carry out the project, the City and the utility established key public-private partnerships with local technology providers and major customers. [34]

In 2010, the committee worked with several community members and The Atmosphere Conservancy nonprofit to create the FortZED Community Energy Challenge. The Challenge is a grassroots effort to attract community members to take a pledge to reduce energy use in their homes; the Challenge has registered more than 2,100 community members to-date.[35]

In November 2012, RMI's e-Lab hosted a two-day charrette in Fort Collins to help the City's leaders identify new opportunities to accelerate FortZED and the City's move toward a clean energy future. The charrette resulted in two project ideas that are moving forward. In one, e-Lab is working directly with Fort Collins Utilities to explore changes in the utility's customer offerings that could induce high levels of adoption of energy efficiency measures and solar PV. The potential changes being explored include innovative tariff designs, on-bill repayment of energy-related investments, and incentives that reflect the value of distributed energy resources. Together, e-Lab and Fort Collins Utilities are developing a small customer energy services company (ESCO) structure that could deliver integrated packages of energy efficiency services, solar PV, and other options for the customer. In the second and complementary project,

31 http://www.rmi.org/summer_2013_esj_whats_old_is_new_main
32 Ibid
33 Ibid
34 Ibid
35 Ibid

RMI is developing a detailed, Fort Collins-level Reinventing Fire vision to show the way forward to dramatically accelerate citywide goals to transition from fossil fuels to efficiency and renewables.[36]

In **Marin County** in 2009, a field test of a smart grid demonstration project involving five buildings at the Marin County Civic Center successfully coordinated and optimized large-scale renewables on the electric grid.[37]

In **Silicon Valley**, Joint Venture's "Smart Energy Enterprise Development Zone" (SEEDZ) initiative aims to build the smart energy network of the future by uniting local energy customers, solution providers, municipalities, institutions, and utility interests. The initiative aspires to high power reliability, quality, affordability and sustainability. The SEEDZ zone spans north Sunnyvale, north Mountain View, and Moffett Field. Between now and 2020, SEEDZ collaborators envision building out the country's highest-performance two-way power network, supporting and rewarding active energy management and clean distributed generation on a sustainable economic scale.[38]

B. *Pursue smart grid modernization*

Micro-grids are modern, small-scale versions of the centralized electricity system, typically utilizing cleaner, decentralized generation. They achieve specific local goals, such as reliability, carbon emission reduction, diversification of energy sources, and cost reduction established by the community being served. Like the bulk power grid, smart micro-grids generate, distribute, and regulate the flow of electricity to consumers, but do so locally. Micro-grids, adopted early by critical needs operations such as hospitals and military operations, bring resilience and security to load serving energy systems.[39] Sonoma County should pursue smart grid modernization with an initial focus on critical needs facilities.

In **Marin County** in 2009, distributed intelligent agent software provider Infotility, Inc. kicked off the field test phase of a Smart Grid demonstration project to optimize large-scale renewable energy in a community setting. The project involved five municipal buildings on the Marin County Civic Center Campus. The project was jointly funded by DOE's Office of Electricity Delivery and Energy Reliability's (EDER) Smart Grid Research and Development Program, Pacific Northwest National Laboratory (PPNL), and the Marin County Office of Sustainability. It was a demonstration of Infotility's Renewables Integration software, Smart Community Energy Manager software and Smart Facility Energy Manager software. During the field test, the software applications coordinated and optimized large-scale renewables such as wind and solar on the electric grid. The goal was to enable utilities and communities to manage their distributed renewable energy supplies such as wind and solar as conventional assets for the electric grid, and to ensure that those resources are a foundation and reliable element of their energy portfolios. Marin County's Marin Energy Authority (MEA) submitted a $30 million ARRA funding request to DOE to support a larger regional demonstration incorporating Infotility's software in 1,000 commercial buildings and 5,000 homes in three Marin communities. Infotility's industry partners and the community were expected to contribute an additional $60 million in matching funds. Infotility's GridAgents software has specific applications for Smart Grid-based energy networks used for integration of renewables and distributed energy resources, micro-grid management, intelligent load control, and smart charging applications coordination.[40]

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36 Ibid
37 http://www.smartgridnews.com/artman/publish/Delivery_Microgrids_News/Marin-County-Microgrid-Demonstration-Kicks-Off-1346.html. Pacific Control Systems acquired Infotility in 2012.
38 http://www.jointventure.org/index.php?option=com_content&view=article&id=809&Itemid=622
39 http://galvinpower.org/microgrids
40 http://www.smartgridnews.com/artman/publish/Delivery_Microgrids_News/Marin-County-Microgrid-Demonstration-Kicks-Off-1346.html. Pacific Control Systems acquired Infotility in 2012. Project update: http://energy.gov/sites/prod/files/SG%202010%20Peer%20Review%20-%20Marin%20County%20Renewables,%20David%20Cohen,%20Infotility.pdf

A U.S. Army base in **Fort Bragg**, North Carolina elected to build one of the world's largest micro-grids in order to enhance power reliability while reducing costs. With guidance from Honeywell, Fort Bragg integrated a variety of distributed generation technologies that work in conjunction with the military base's utility infrastructure. Covering more than 100 square miles, Fort Bragg owns its own electric distribution network and is able to monitor various generations from a central energy management center. The various generation technologies are fully integrated with the post's distribution network, information technology and communications infrastructure.[41]

In **Chicago**, Perfect Power at Illinois Institute of Technology (IIT) partnered with the Galvin Electricity Initiative and the United States Department of Energy (DOE) to develop a Perfect Power System — a smart micro-grid for the IIT main campus. In collaboration with S&C Electric, Endurant Energy and ComEd, the university is building an electricity system of interconnected smart micro-grids in a loop configuration with a redundant electricity supply. Construction on this system is under way. It is estimated that the system will pay for itself as it is built over the next five years.[42]

The following is a list of projects across the country that are pursuing micro-grid development:[43]

Ansonia (Ansonia, CT)
Borrego Springs (Borrego Springs, CA)
Colonias (La Presa, TX)
Drexel University (Philadelphia, PA)
Fort Bliss (Fort Bliss, TX)
Fort Bragg (Fort Bragg, NC)
Howard University (Washington, D.C.)
Los Alamos (Los Alamos County, NM)
Marin County (San Rafael, CA)
Naperville (Naperville, IL)
New Mexico Green Grid Initiative (NM)
Pecan Street Project, Inc. (Austin, TX)
Perfect Power at the Illinois Institute of Technology (Chicago, IL)
Perfect Power at Mesa del Sol (Albuquerque, NM)
Sacramento Municipal Utility District (Sacramento, CA)
Santa Rita Jail (Santa Rita, CA)
Stamford Energy Improvement District (Stamford, CT)
Twentynine Palms (Twentynine Palms, CA)
University of California, San Diego (San Diego, CA)

C. Consider a pilot program for energy storage

Assembly Bill 2514 requires CCAs to deploy energy storage equivalent to 1 percent of their peak load by 2020. For Sonoma Clean Power that will probably translate to about 5 or 6 MW of energy storage capacity. Sonoma Clean Power could partner with a technology company and financiers to launch a pilot program to comply with this law. Energy Storage is critically important for the purpose of achieving intermittent renewable penetration into the power mix beyond 33 percent.

41 http://www.galvinpower.org/resources/microgrid-hub/smart-microgrids-faq/examples
42 http://www.galvinpower.org/resources/microgrid-hub/smart-microgrids-faq/examples
43 http://galvinpower.org/resources/microgrid-hub/microgrid-projects

In April 2013 the **German government** began a new program to finance the introduction of battery storage into homes and small business, which it says is absolutely essential if the "energiewende," the German expression for its energy transition, is to successfully move to the next phase and beyond 40 percent renewable penetration. Although KfW, the government-owned development bank, is looking for investors who are willing to take a loss on their investment, the energy storage financing program has generated a higher than expected response. Already 1,900 homes and small businesses have expressed interest in loans and grants (provided by the Environment Ministry) to install new solar systems and a battery storage system in their home. Around €32 million in loans has already been allocated and €5 million in grants, about 10 percent of the sums allocated in the initial phase of the program.[44]

D. Use geographically-based energy strategies

The local jurisdictions of Sonoma County could support neighbor organized buying groups to accelerate the adoption of solar power. The jurisdictions could develop a roadmap that neighborhood groups can use to create local renewable energy co-ops and neighborhood renewable energy supplies.

A **Los Angeles** cooperative called Open Neighborhoods recently announced a residential PV cooperative solar buy for $4.78 per Watt, almost identical to the SolarBuzz price for industrial scale (500 kW) installations.[45]

In the **City of Portland**, Solarize Portland is a solar panel volume-purchasing program being led by Portland area neighborhood associations. The program helps neighbors decide who to hire, what to budget, and where to start. Interested neighbors come together to choose a contractor, purchase and install solar as a community, and save significant costs as a result of bulk purchasing of solar electric panels. By choosing only one or two contractors, and conducting their own sales and marketing campaign, the project can hand-deliver the contractors warm leads in a small geographic area in a constricted period of time. Job grouping, a constricted time period, and community-led sales can contribute to a savings of an additional 15-20 percent. This, coupled with Oregon's already attractive tax credits and cash incentives, can bring the cost of solar electricity down by 90 percent.[46]

In the **Washington D.C. area**, Mt. Pleasant Solar Co-op is a member of DC Solar United Neighborhoods (DC SUN), a coalition of neighborhood solar co-ops working to make solar accessible and affordable for everyone in DC. They are also a member of the Community Power Network (CPN), a network of grassroots, local, state-wide and national organizations working to build and promote locally based renewable energy projects and policies.[47] The co-op successfully negotiated prices on 50 to 100 residential solar PV installations down to $5.50 per Watt (or lower).[48]

The Capitol Hill Energy Co-op in **Washington, D.C.** followed the Mt. Pleasant model and completed more than 40 installations in 2010. Now, more than 10 other co-ops have sprouted up in all wards within D.C. DC SUN brings these cooperatives together under one umbrella to advocate for better solar incentives and improved customer service from Pepco, to create jobs in D.C., and to spread the word about the benefits of going solar.[49]

The **City of Vancouver's** Neighborhood Energy Strategy was adopted by Council in October 2012. It provides the road map for neighborhood energy development in the city, including key guidelines for the development of neighborhood energy supplies. Neighborhood energy systems use low-carbon sources of energy, such as waste heat from the sewers, to heat and power homes while creating only a fraction of the carbon pollution produced by natural

44 http://www.cleantechfinance.net/2013/germany-finances-major-push-home-battery-storage-solar/
45 http://www.ilsr.org/distributed-small-scale-solar-competes-large-scale-pv/
46 http://www.portlandoregon.gov/bps/article/405686
47 http://www.mtpleasantsolarcoop.org/
48 http://www.ilsr.org/distributed-small-scale-solar-competes-large-scale-pv/
49 https://sites.google.com/site/dcsolarunitedneighborhoods/

gas systems. The City is currently working to identify utility partners for the development of two new neighborhood energy systems—one for the downtown core and one along the Cambie corridor. The development of neighborhood energy systems in Vancouver is projected to reduce 120,000 tons of carbon dioxide equivalent by 2020.[50]

E. Explore waste to energy opportunities

Crop manure, crop residues, and the 120,000 tons per year organic fraction of municipal solid waste that is landfilled in Sonoma County can be harnessed to produce power. The County should encourage biomass energy conversion from dairy farms, and should consider biogas production from municipal solid waste using anaerobic digestion.

More detail on the operation of an anaerobic digester:

> Republic Services could operate a Materials Recovery Facility at the Sonoma County Landfill that separates the organic materials out of the MSW stream. Republic would also work with the County haulers to operate a food waste collection program that is included with the organics. This organic waste could be used to feed an anaerobic digester built by Sonoma Clean Power (in partnership with Clean Energy Renewable Fuels) at the landfill site. The digester would produce biogas, which would be refined into pipeline quality biomethane. The clean, carbon neutral biomethane would then be shipped via natural gas pipeline to Sonoma Clean Power combined heat and power generation systems built and operated (in partnership with local CHP developer). These systems, built onsite, would provide 100 percent carbon-free heat and power to Memorial Hospital, the Santa Rosa Mall, and several other large commercial customers. The heat and power produced by these systems would also be used by thousands of residential customers in the adjacent areas. The landfill gas generation system currently in operation at the landfill would continue to be operated, but would provide heat for the digester to increase its efficiency, as well as to provide power for the MRF and digester. This system would reduce GHG emissions by: a) diverting organics from the landfill and preventing release of the methane that would otherwise be produced with nearly 100 percent efficiency (v. landfill capture systems that are usually only 75 percent efficient); b) creating 100 percent carbon free electricity that can serve both commercial and residential customers (displacing dirtier grid electricity); and c) displacing natural gas used for heating — both hot water and building heat.[51]

The **City of San José** has recently started processing all of the City's commercial organic waste using the first commercial scale dry fermentation anaerobic digestion and in-vessel composting facility in the U.S.[52]

In **Junction City** outside of Portland, a $4 million Green Lane Energy biogas facility will be built by the end of October 2013. The plant will compost organic waste such as food scraps, straw, manure and other materials to generate methane gas that will be collected and burned to power a turbine and produce electricity. The system will anaerobically ferment organic material to create methane-rich biogas — biogas that will be recovered to turn a turbine. Waste will be trucked to a receiving building, where it will be separated, ground down, and processed into a mixture for fermenting. The processing machine will remove packaging such as milk or yogurt cartons that might contaminate the waste. The waste will go into a homogenization tank, where it will sit for several days to ferment. It will then be channeled into a large 1.2 million gallon digester that is constantly stirred. Then the material will go into a domelike structure where the methane will be extracted. That gas is transferred into a biogas scrubber to remove impurities such as hydrogen sulfide and moisture. Once the gas is scrubbed, it is burned in a 16-cylinder, 2,000-horsepower engine. Much of the technology that's being used in the process is imported from companies in

50 Page 13 of Vancouver's CAP update: http://vancouver.ca/files/cov/greenest-city-2020-action-plan-2012-2013-implementation-update.pdf
51 Email from Dave Erickson, California Public Utility Commission, August 28, 2013
52 http://www.sanjoseca.gov/index.aspx?NID=1555

Sweden, Switzerland, and Germany, including the digestion tank agitator, the waste intake sorter, and engine, respectively. Some of the equipment, including the intake sorter, has never before been used in the United States.[53]

In **Weld County**, Colorado a project located near LaSalle will use a complete mix anaerobic digester system to produce up to 4,700 MMBtu of biogas daily, making it one of the largest anaerobic digester facilities in the United States. The anaerobic digestion system converts organic feedstock and dairy cow manure into raw biogas. The raw biogas is then processed into pipeline quality RNG. After being conditioned to pipeline grade, the RNG is supplied to Sacramento Municipal Utility District (SMUD) through a 20-year Gas Purchase Agreement (GPA).[54]

Recommendation 1.4 Continue to support current successful programs

Background

Sonoma County is already a leader in pursuing programs that can finance renewable energy projects. Sonoma County must stay the course with these programs and look for ways to expand them.

Strategies to Consider:

A. Continue to support Property Assessed Clean Energy
B. Continue to pursue Pay As You Save®

A. Continue to support Property Assessed Clean Energy

Sonoma County's Property Assessed Clean Energy (PACE) Program is widely regarded as the most successful in the nation, particularly in the residential sector. To date, it has funded nearly $65M in energy efficiency and renewable energy projects.[55] Sonoma Clean Power can work synergistically with the Sonoma County PACE program to help customers finance projects. Ygrene, a company that offers unlimited private financing for its energy districts, allowing property owners to finance projects without finding their own loans in a difficult market, is using Sonoma County's PACE program as a model for their own financing projects in Sacramento and Miami.

C. Continue to pursue Pay As You Save®

Windsor Efficiency PAYS® provides water and energy saving upgrades for Windsor residential properties that provide immediate utility bill savings, new water/energy saving appliances, and drought-resistant landscaping — with no upfront cost or debt.[56] The program could be expanded to include renewable energy technologies such as solar hot water heaters. Other jurisdictions in Sonoma County should also consider offering Pay As You Save® programs to their residents.

53 http://www.registerguard.com/rg/news/local/30336803-75/waste-biogas-energy-plant-lane.html.csphttp://www.registerguard.com/rg/news/local/30336803-75/waste-biogas-energy-plant-lane.html.csp
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56 http://www.townofwindsor.com/index.aspx?nid=819