

# **Energy Solutions**

**A Plan to Achieve  
Accelerated, Scaled & Cost-Effective  
Greenhouse Gas Emission Reductions  
in the County's Energy Sector by 2015**

## **Sonoma County Community Climate Action Plan**

*Prepared by*  
**Paul Fenn, Robert Freehling, and John Cutler**

**Local Power**

**Local Power, Inc.  
35 Grove St. #118  
San Francisco, CA 94102  
(510) 451-1727**

*For the*  
**Climate Protection Campaign**  
*[www.climateprotectioncampaign.org](http://www.climateprotectioncampaign.org)*

**May 2008**

### **Acknowledgement**

The authors thank Randy Poole, Rusty Klassen and Cordel Stillman of the Sonoma County Water Agency, as well as Steve Heckerath of Renewables.com, for their valuable contributions to this plan.

*This report was prepared as a result of work sponsored and paid for by the Climate Protection Campaign. The opinions, findings, conclusions, and recommendations do not necessarily represent the views of the Campaign. Although this report was done in cooperation with the Campaign, the Campaign has not approved or disapproved this report, nor has the Campaign passed upon the accuracy or adequacy of the information contained herein.*

## **Table of Contents**

<b>Executive Summary: A Climate Solution with Scale and Acceleration .....</b>	<b>1</b>
Community Control of Energy – Cape Light and NOPEC Examples .....	2
Exceeding Sonoma’s GHG Target .....	5
CCA Risks.....	6
Need for Local Action .....	8
Local Authority and Public Financing.....	10
Local Solutions to Global Problems .....	13
<b>I. Introduction.....</b>	<b>14</b>
A. Community Choice Energy .....	14
B. Avoiding the Peak Fossil Fuels Crisis .....	24
<b>II. Rapid Renewable Energy Rollout .....</b>	<b>26</b>
A. Timeline.....	26
B. Financing .....	27
C. Resources .....	28
D. The Vision: Roll-Out Logistics Planning and Procedures for Small Scale Power.....	35
E. Permitting of Large Onshore and Offshore Wind Power Facilities .....	40
<b>III. Portfolio Model Tools and Targets.....</b>	<b>43</b>
<b>IV. Portfolio and Technology Investment Options .....</b>	<b>47</b>
A. Summary.....	47
B. Sonoma County Premier Clean Electric Generation Resources.....	51
1. The Geysers Geothermal Electric Generation .....	51
2. Biofuel/Cogeneration (Heat Recycling) .....	54
3. Wind Power.....	59
4. Energy Storage: Batteries.....	61
5. Energy Storage: Pumped Water Storage .....	62
6. Solar Thermal Concentrator .....	63
7. Solar Photovoltaics.....	65
C. How to Reduce the Burning of Natural Gas .....	67
1. Geothermal Heat .....	68
2. Solar Hot Water.....	70
D. Conservation and Energy Efficiency .....	72
1. Conservation .....	72
2. Energy Efficiency.....	74
<b>V. Governance and Investment Vehicles .....</b>	<b>82</b>
A. Summary.....	82
B. Community Choice Aggregation (CCA) .....	82
C. Joint Powers Authority .....	85
D. Sonoma County Water Agency Role.....	86
E. Steps to Forming and Implementing a Sonoma County CCA.....	87
F. Municipal Revenue and Capital Bonds (H Bonds and H2 Bonds).....	88
G. Application of H Bonds to CCA.....	89
1. Items Financed .....	90
2. Sources of Repayment.....	91
3. Tax Exemption .....	93
H. Financing Reduction of Natural Gas Use: “Opt-In and Opt-Up” .....	97
1. Summary .....	97
2. Large Customers – “Non-Core” Gas Aggregation Program .....	99
3. Small Customers – Core Gas Aggregation Program.....	99
4. Participating Core Transport Agents (CTAs).....	102
<b>VI. Sonoma Clean Energy Plan vs. Remaining with PG&amp;E.....</b>	<b>105</b>
A. Summary.....	105
B. Current Electricity Supply .....	105
C. Sonoma County Profile.....	108
D. The Cost of Delay .....	109

## ***Executive Summary: A Climate Solution with Scale and Acceleration***

This portion of the Community Climate Action Plan describes a new countywide electric power procurement program called Community Choice Aggregation (Community Choice or CCA). Established as a right under California state law, Community Choice allows cities and counties to determine their own electric energy supply. With Community Choice the local government does not go into the business of supplying electricity but contracts with an experienced electric service provider. The local government's role is primarily as a planning and authorizing agency.

The low carbon energy supply portfolio proposed in this report exceeds the GHG reduction targets for the electric utility component of the Community Climate Action Plan, and approaches the 60% to 80% reduction levels that Intergovernmental Panel on Climate Change, the world's scientific authority, states is needed over the next half century. In the Community Climate Action Plan, this significant reduction in the electric sector is achieved within a decade, leaving a surplus reduction that can be applied to other sectors. In addition, the proposed CCA can support other sectors to help them meet their near term goals of 25% reduction in GHG emissions.

Without Community Choice, decision-making regarding energy supply resides primarily with the utility company and state regulatory agencies. Because energy supply for electricity, heating and transportation is the source of over 80% of greenhouse gas (GHG) emissions, if local governments are to address the climate crisis effectively they must address how they obtain and use energy.

Dealing with climate change is rapidly becoming a necessity for local governments. Increasingly, State and federal governments will require that GHG emissions be reduced. An advisory committee to the California Air Resources Board recently singled out local governments as key to achieving reductions in GHG in the energy sector.<sup>1</sup>

---

<sup>1</sup> California Air Resources Board, Economic and Technology Advancement Advisory

Traditional players are not yet moving swiftly enough to reduce GHG emissions to the levels that the law and climate science require. In PG&E’s own planning documents, the only scenario for major GHG reduction—up to 23% below 2007 levels—is if local governments like Sonoma County implement Community Choice.<sup>2</sup>

Community Choice allows local governments to choose where they get their electric power, to develop programs to increase efficiency of energy use, and to reduce demand. A Community Choice program covers not only government agencies, but also the power supply for all businesses and residential customers within their jurisdiction. The program does not require participation, but gives any customer the right to “opt out” and return to their former electric utility company provider if they prefer. This “opt out” system greatly reduces marketing costs as well as startup and planning risks compared to a door-to-door method of gathering customers. Combining all local customers into a single group provides many market advantages such as bargaining power with suppliers and the financial resources to build and finance renewable energy facilities.

### **Community Control of Energy – Cape Light and NOPEC Examples**



Currently, the Cape Light Compact CCA operates one of the most successful energy efficiency programs in the nation, serving 180,000 customers on Cape Cod in Massachusetts. Northeast Ohio Public Energy Council (NOPEC) is a consortium of dozens of local governments in a Community Choice Aggregation that serves 400,000 customers. The

contract between the CCA and its Electric Service Provider guarantees 5% savings on their electric supply. NOPEC also uses its buying clout to purchase natural gas for its participating customers.

---

Committee, Economic and Technology Advancements for California Climate Solutions Draft Report, November 15, 2007.

<sup>2</sup> Pacific Gas and Electric Company, 2006 Long-Term Procurement Plan, Volume I—Amendment, page IV-11 to 12.

Both Ohio and Massachusetts have experimented with open electricity markets, and Community Choice has proved itself as the real success story. In the Cape Light region over 80% of customers have stayed with Community Choice service since it began in 1998, and the remainder has chosen the regular utility company. In the rest of Massachusetts, in places that do not have Community Choice programs, the exact reverse is the case: 80% or more are utility company customers even though they have full power of choice to use another electric provider. In Ohio, the deregulated market is considered a failure and is in the process of being shut down. However, the state government has singled out Community Choice as an exception to the rule and has stated its intention to preserve this market form.



While Community Choice deals primarily with the electric sector, this can be an effective basis for transforming the energy source for other sectors as well. These transformations would reduce GHG emissions while providing local economic development opportunities: conversion to electric transportation, recycling the waste heat from electric generation for use in commercial/agricultural/industrial processes, and conversion of agricultural and municipal waste into fuel for power are all viable paths for a local community to explore.



Many communities today are looking for ways to convert to cleaner energy, increase self-reliance, and address climate concerns. Often they are blocked by inadequate funding mechanism. Significant tax increases are considered unacceptable, and no other revenue exists to fund initiatives that could make a significant difference. Community Choice breaks through these barriers by giving local control over the usually quite substantial revenue stream that is normally held by utility companies. By 2015, the people and businesses of Sonoma County will be paying roughly \$500 million per year to the utility company for their electric bills<sup>3</sup>. Local control through CCA would allow a portion of

---

<sup>3</sup> California Energy Commission data shows that in 2005 Sonoma County consumed 2828 gigawatt-hours, and PG&E's average rate was 13.07 cents/kilowatt-hour, for a countywide bill of about \$370 million. At

this money to be redirected to much cleaner sources of energy than PG&E currently provides.

Community Choice would provide the County with the financial resources and the tools to achieve substantial GHG reductions without a need for new taxes or major risks to participating local governments. An “Electric Service Provider” under contract with a Joint Powers Authority created by Sonoma County governments would perform implementation. Over a dozen Electric Service Providers serve major commercial accounts throughout the state under a stable system called “Direct Access” that survived the energy crisis, and that continues to supply 9% of the electricity sold in California<sup>4</sup>.

Many community leaders express concern that local authorities have less expertise in the energy field than the existing utility company, and are also afraid that a CCA would result in higher rates. Yet experience with CCAs in other states and also with energy programs in California point to the opposite conclusion. The California Public Utilities Commission in 2002 to 2003 compared the performance of energy efficiency programs run by utilities and those run by independent suppliers and local governments. The results showed that the non-utility programs, including the local public programs, out-performed utility company programs.<sup>5</sup> Moreover, electricity rates of investor-owned utilities are generally higher than of local, publicly operated utilities.<sup>6</sup>

---

1.2% per year electricity growth , and 2% per year rate increase, countywide consumption would be 3186 gigawatt-hours at 15.9 cents/kilowatt-hour, totaling \$507 million.

<sup>4</sup> Table 9, Retail Electricity Sales Statistics, State Electricity Profiles 2005, US Department of Energy, p.25.

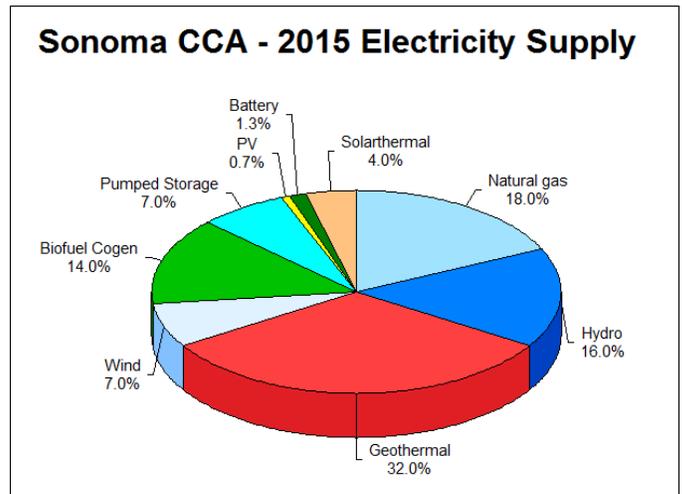
<sup>5</sup> [The Myth of IOU Cost-Effectiveness](http://www.womensenergymatters.org/currentcampaigns/EE/Brief_EE_history.htm#12) (August 8, 2003). Report by SESCO Inc. Can be downloaded from: [http://www.womensenergymatters.org/currentcampaigns/EE/Brief\\_EE\\_history.htm#12](http://www.womensenergymatters.org/currentcampaigns/EE/Brief_EE_history.htm#12)

<sup>6</sup> Op. cit. 4, 2005 rates: 12.69 cent/kwh for investor utilities, 9.65 cent/kwh for public utilities in this state.

### Exceeding Sonoma’s GHG Target

The plan outlined in this report would provide the County with 67% of its power from renewable energy versus 20% if the County stays with PG&E. This plan eliminates the need for energy from coal or nuclear power and reduces reliance on electric generation from natural gas, which has increased in price by about 198% per decade for the last half century. Using the strategy outlined in this report, the County would avoid price shocks due to reliance on natural gas.

A critical tool for price stability is community investment in renewable energy facilities. The source of this investment is low interest municipal bonds that are secured and repaid through the revenue stream from electric customers. This relieves the burden from the tax base and transfers most of the risk associated with ownership of these facilities to the Community Choice energy



system rather than on the local governments themselves. The bonds also lower the cost of renewable energy by dramatically reducing the profits and interest burden on financing. Thus the cost of renewables developed through the CCA competes favorably with those of traditional utilities.



N. California geothermal heat at 10 km depth. Red means 480° F. or more. Map: NREL.

Some speculate that the manufacturing capacity for renewables will be unable to support the infrastructure proposed in this plan, and the cost of renewables will escalate along with demand. Indeed, this has been the case with the wind industry where price increases have correlated to market expansion. But this plan relies little on wind<sup>7</sup> and instead is based on developing a variety of local and regional renewable resources

<sup>7</sup> This plan proposes to develop 150-megawatt wind power plant, a fraction of the annual U.S. construction rate of 2500 megawatts and global construction exceeding 10,000 megawatts.

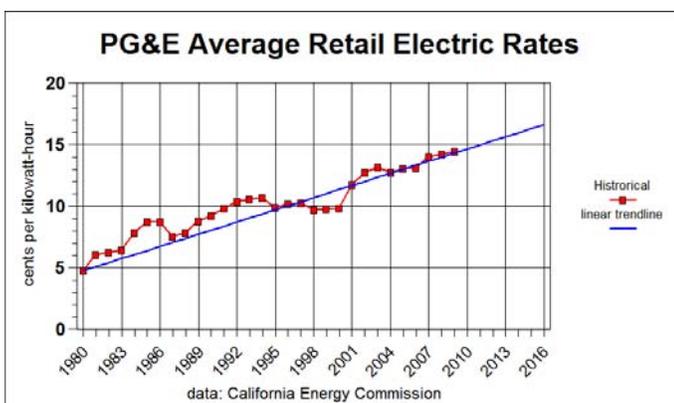
such as geothermal and solar energy, as well as demand response and energy efficiency, solutions that have only partially been tapped to date.

Another concern is that there are not enough renewable resources in Northern California to meet the need. This study details the plentiful renewable resources throughout the northern part of the state. An example is the Geysers geothermal energy facility that currently generates about 800 megawatts of power around the clock. A recent geological assessment found that over 500 megawatts of additional geothermal capacity could be developed in the region of the Geysers.<sup>8</sup> This plan calls for developing 125 megawatts of this resource.

PG&E plans to develop renewable resources in remote places such as Canada for wind farms and the Southern California desert for solar thermal facilities. Accessing these resources depends on adding long distance transmission capacity, an investment of staggering size, complexity and cost. In contrast, this plan relies on what can be accomplished nearby. Importantly, the lower cost financing available through a CCA actually expands the resource base by allowing development in areas that would be considered uneconomic by for-profit developers.

### CCA Risks

Most questions about Community Choice pertain to its future electricity rates vs. those of PG&E. As shown in the chart to the right, PG&E's rates have climbed for many decades and will probably continue to do so. This plan forecasts that Sonoma County can procure greener power at the same or lower rates than available through PG&E.



<sup>8</sup> New Geothermal Site Identification and Qualification (CEC Publication No. P500-04-051, April 2004), [http://www.energy.ca.gov/pier/final\\_project\\_reports/500-04-051.html](http://www.energy.ca.gov/pier/final_project_reports/500-04-051.html)

The largest risk for a CCA is not energy procurement, but the charges on CCAs assessed by state regulators on behalf of the utility companies. California Public Utilities Commission regulations hold that PG&E customers are not allowed to bear unfair “excess costs” due to departure of Community Choice customers. For a limited time, Community Choice customers will be required to pay a surcharge, called an “exit fee,” that covers what the commission considers to be their fair share of utility company costs. This fee covers former financial obligations entered into by the state and the utility company. It is important to realize that these are costs paid both by CCA customers and by customers that remain with PG&E. Each of these charges has an expiration date, and all but one will end in 2012. The remaining charge - paying off state issued energy bonds - is relatively minimal, is paid by all PG&E customers, and does not currently affect the competitiveness of a CCA’s energy supply. However, this may not be the case with new exit fees in the future. Thus, there is a window of opportunity in the next few years for CCAs to form without any real financial handicap.<sup>9</sup>

One concern expressed by PG&E representatives is that in the event the CCA fails, PG&E would be responsible for the costs and energy supplies for returning customers. State regulations require CCAs or their supplier post a bond or demonstrate insurance to cover any incremental costs from return of customers. CCAs in San Francisco and elsewhere have required suppliers to provide this bond to ensure that suppliers manage liability on performance of their service commitments. Any costs associated with a return of customers to PG&E are covered by this bond or insurance.

Among available measures to implement substantial GHG reductions in Sonoma County, Community Choice is by far the lowest risk to public jurisdictions. CCA places a maximum of operational responsibility and risk management on private sector partners and their underwriters, limiting the public agency’s ongoing role to monitoring contract compliance, customer relations, and confidential customer data management.

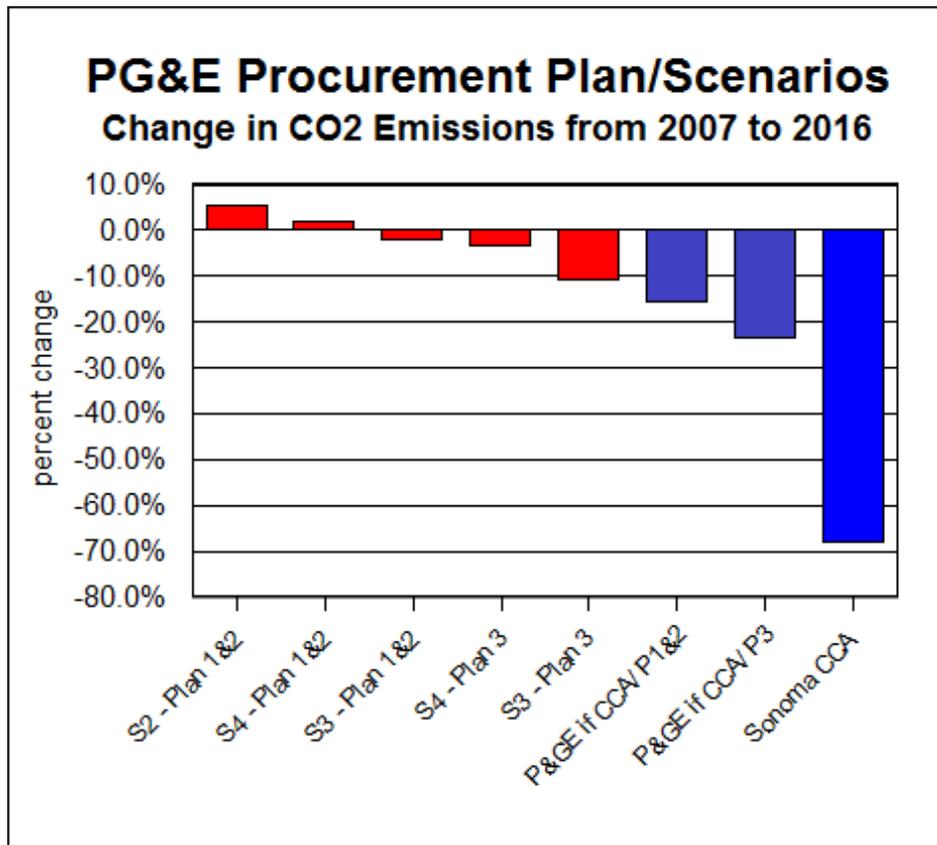
---

<sup>9</sup> California Public Utilities Commission, R.03-10-003, Phase I and II decisions, December 16, 2005 and December 17, 2006.

Any risk inherent in switching to a CCA must be compared to the risk of insufficient action to reduce greenhouse gas emissions. Climate scientists warn that we will pay later for any delay now in reducing emissions.

**Need for Local Action**

The following table shows changes in carbon dioxide emissions due to PG&E’s electricity sources by 2016;<sup>10</sup> the far right bar shows the reduction from the energy supplies proposed by Local Power for a Sonoma County Community Choice Plan.



**PG&E vs. CCA Energy Procurement Scenarios**

The bar on the far right shows over 60% reduction in CO2 in the electric sector from the Sonoma Community Choice Plan, far larger than what is planned by PG&E.

<sup>10</sup> Pacific Gas and Electric Company, 2006 Long-Term Procurement Plan, Volume I—Amendment, page IV-11 to 12.

None of the GHG emission reduction scenarios in PG&E’s Long Term Electric Procurement Plan are low enough to reach the 1990 levels required under California law, or the much more aggressive targets recommended by climate scientists and adopted by Sonoma County local governments.

PG&E has in its current Long Term Electric Procurement Plan three different “plans” that are each tested under four different scenarios, totaling 12 variations. Nine of these result either in reductions of 2% to 10% from 2007 levels *or increases of 2% to 5%*. So, according to PG&E’s own assessment, GHG emissions from their electric supply might go down, but they might also increase. The remaining three variations (seen in the chart above PG&E Procurement Plan/Scenario “if CCA”, P1, P2 & P3) show a larger decrease of 15% to 23%. These variations assume that 10% of PG&E’s customers switch to Community Choice. In other words, Community Choice is currently PG&E’s best (and only) plan for complying with California’s new GHG reduction law.<sup>11</sup>

Meanwhile, PG&E opposes legislation that would increase the state’s renewable energy requirement to 33% of utility power supplies. Instead, the company proposes to meet the state’s GHG reduction targets by relying on its hydroelectric dams, building more nuclear plants, and offsetting its emissions by purchasing carbon credits.<sup>12</sup>

Sonoma County cannot wait for State leadership to reduce emissions. Accusing the Golden State of “loud words, soft actions,” *The Economist*<sup>13</sup> noted that “California is finding it easier to export its policies than to put them into practice at home” and indicated that implementing California’s green laws may prove “an uphill climb.”

Even massive subsidies by the state are proving inadequate. A September 2007 study by SunCentric entitled “The California Solar Initiative – Triumph or Train wreck?” reports

---

<sup>11</sup> For PG&E’s CO2 data table see Appendix, section XII.

<sup>12</sup> Pacific Gas and Electric Company, 2006 Long-Term Procurement Plan, Rebuttal Testimony, p 9-5. PG&E states that the CPUC should not adopt a 33% renewable mandate, but that “Market-based solutions should yield the most cost-effective means to achieving greenhouse gas reductions.” They refer here to potential carbon pollution trading that may be set up under AB 32 as a better option than renewables.

<sup>13</sup> June 21, 2007

that only 14MW of residential solar reservations have been issued under the state's new \$3 billion solar subsidy program. “[The] program has drastically slowed the residential and commercial markets in California and threatens to seriously damage the state's solar industry.” The article concludes “the data does not paint a very optimistic picture about the prospects for solar if we stay on the current track.”

### **Local Authority and Public Financing**

Reducing local emissions in the very short time that exists is unachievable without recourse to municipal bonds. As a means of accelerating the development and uptake of innovative power generation technology and of stimulating growth of a clean new economic sector, CCA finance mechanisms supply a much needed and broadly diverse new capital resource.

Municipal bonds have long been the financing solution to public infrastructure needs like municipal sewer systems, hospitals, and bridges and to historic health crises that required a community response. In the United States, issuers of municipal bonds have included cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and other governmental entities and groups of governments.

Municipal bonds may be general obligations of the issuer (General Obligation Bonds) or secured by specified revenues (Revenue Bonds). The security of these bonds stems from the ability to provide debt service from the CCA's own revenue streams, power sale contracts, as well as the capital flows from the businesses of funding recipients – developers and manufacturers of renewable energy and energy conservation technology.

The risk ("security") of a municipal bond is a measure of how likely the issuer is to make all payments, on time and in full, as promised in the agreement between the issuer and bond holder (the "bond documents"). Different types of bonds carry different securities, based on the promises made in the bond documents:

## Energy Solutions – Sonoma County Community Climate Action Plan

- General obligation bonds promise to repay based on the full faith and credit of the issuer; these bonds are typically considered the most secure type of municipal bond, and therefore carry the lowest interest rate.
- Revenue bonds promise repayment from a specified stream of future income, such as income generated by a water utility from payments by customers.
- Assessment bonds promise repayment based on property tax assessments of properties located within the issuer's boundaries.

The probability of repayment as promised is often determined by an independent reviewer, or "rating agency." The three main rating agencies for municipal bonds in the United States are Standard & Poor's, Moody's, and Fitch. These agencies can be hired by the issuer to assign a bond rating, which is valuable information to potential bondholders that helps sell bonds on the primary market.

CCA provides a major opportunity for the use of bonds because it introduces a major new, non-tax revenue stream for local governments to employ as the basis for financial investment in new infrastructure that is essential for addressing climate change.

In order to minimize risk to taxpayers, this plan rests primarily on the use of revenue bonds, which Local Power has developed for use in the City of San Francisco in the form of "H Bonds." (See Charter Section 9.107.8, Ordinance 86-04, Ordinance 447-07.) Because H bonds promise repayment from CCA power purchase contract revenues – income generated by the CCA program from payments by customers – they represent the lowest-risk financing option available to local governments and taxpayers. Moreover, this Energy Solutions document does not make any use of Assessment Bonds, which rest on property tax increases, though some parties have recommended this course of action.

Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt. The methods and practices of issuing debt are governed by an extensive system of laws and regulations,

which vary by state. Bonds bear interest at either a fixed or variable rate of interest. As part of its CCA & H Bond program, the San Francisco Local Agency Formation Commission retained the nation's largest public sector energy consultant as Bond Counsel to analyze the feasibility, legality and structure of CCA-H Bonds, which has also contributed to the H Bond section of this plan.

The issuer of a municipal bond receives a cash payment at the time of issuance in exchange for a promise to repay the investors who provide the cash payment (the bond holder) over time. Repayment periods can be as short as a few months (although this is rare) to 20, 30, or 40 years, or even longer.

Because of the special tax-exempt status of most municipal bonds, investors usually accept lower interest payments than on other types of borrowing (assuming comparable risk). This makes the issuance of bonds an attractive source of financing to many municipal entities, as the borrowing rate available in the open market is frequently lower than what is available through other borrowing channels.

One of the primary reasons municipal bonds are considered separately from other types of bonds is their special ability to provide tax-exempt income. Interest paid by the issuer to bond holders is often exempt from all federal taxes, as well as state or local taxes depending on the state in which the issuer is located, subject to certain restrictions. Bonds issued for certain purposes are subject to the alternative minimum tax.

The type of project or projects that are funded by a bond affects the taxability of income received on the bonds held by bondholders. Interest earnings on bonds that fund projects that are constructed for the public good are generally exempt from federal income tax, while interest earnings on bonds issued to fund projects partly or wholly benefiting only private parties, sometimes referred to as private activity bonds, may be subject to federal income tax.

The laws governing the taxability of municipal bond income are complex; however, a law firm typically certifies bonds as either tax-exempt (federal and/or state income tax) or taxable before they are offered to the market. Purchasers of municipal bonds should be aware that not all municipal bonds are tax-exempt.

### **Local Solutions to Global Problems**

Local Power's Renewable Portfolio Standard design models have been developed over the past seven years for San Francisco, Sacramento, San Diego County, Los Angeles, and other regions. Using conservative assumptions regarding the future cost of renewable energy technologies, fossil fuels and conventional energy capacity, Local Power develops price-competitive portfolios using the financial advantages that CCAs enjoy with tax-exempt H Bonds and Capital Bonds ("H2 Bonds").

In the past decade, European countries have established complex financial structures called "feed-in tariffs" to finance rapid and extensive development of solar photovoltaics, wind power and other renewable energy technologies. This has driven 10 fold expansions in solar energy and wind power manufacturing over the past decade. Feed-in tariffs began as local municipal solar policies in Germany that grew into regional aggregations, then statewide programs, and finally federal programs. Had the City of Aachen, which started the whole movement in the mid-1990's, waited for someone else to do it first, the German solar revolution would never have happened – nor the European solar wave that now follows. Community Choice represents an American variation on the theme of local initiative in energy policy.

Sonoma local governments have committed to GHG reductions that match commitments made by European nations. Some worry that an actual attempt to achieve the adopted emissions reduction target is too ambitious – that our political leaders should retract their promises and be satisfied with half measures. This would be a terrible mistake. The herein proposed measures are only the beginning of what must be achieved to avert ecological catastrophe. The time for hesitation is over. Clearheaded leadership based on recognition of inconvenient truths is needed.

## ***I. Introduction***

### **A. Community Choice Energy**

Local Power has prepared Energy Solutions as part of Sonoma County’s Community Climate Action Plan. The overall Plan must provide for a 25% across-the-board greenhouse gas reduction by 2015 – now seven years away. This timeline creates an urgency to begin moving forward on a planned and scheduled course of action.

This section of the plan rests in large part upon the implementation of Community Choice Aggregation (CCA) by Sonoma County local governments. This course of action is recommended as the most cost effective and readily achievable means of reaching the emissions reduction target in the time available.

In establishing a CCA the timeline allows a year for local government to develop an Implementation Plan and contract out with an energy service provider, and another year for customer transfer and preparation for the clean energy rollout, which leaves up to four years for on-the-ground implementation. This Energy Plan outlines a course of action to jump-start the full implementation of Sonoma County’s 25% by 2015 GHG reduction commitment.

There are three parties to a Community Choice Program:

**1) The Community Choice Aggregation (CCA).** CCA is a power and right of local governments, established under California State law (AB 177, Migden), to choose the source of electricity supply for the government, residential and business electric customers who currently get their electric supply from one of the big utility companies. The County’s customers combine into a type of “electricity buyers cooperative,” into which all customers are automatically enrolled, administered by local government. Prior to Community Choice law, Sonoma County local governments have always had this right to create franchise agreements that bind all customers to using the exclusive services of a

single energy company. However, they only had one choice of supplier, PG&E<sup>14</sup>. Under CCA everyone is given a choice: Governments can choose from a number of different suppliers, and customers can “opt out” of a CCA arrangement if they prefer to stay with PG&E.

**2) The Electric Service Provider (ESP).** One of the most important features of CCA is that the administering governmental agency does not “*go into the power business,*” but contracts with an experienced and licensed electric service provider (ESP) that knows how to handle the business of buying electricity and assuring a reliable energy supply. About 15 electric service providers are currently licensed in the State of California, and buy and sell nearly 10% of the electricity in the state every day. California’s ESPs have been buying and selling electricity for years, and they serve some of the largest business and government customers in the state under long term supply contracts. CCA allows the rest of us to benefit from the deals that currently are only being taken advantage of by these big business and government customers.

**3) The “Distribution Service” Utility Company.** This is the company that sends out the electric bill, collects payments, takes care of customer service, performs necessary repairs, and operates the transmission and distribution wires. PG&E does this today for the vast majority of Sonoma County, and would continue to do so under a CCA.

This three way arrangement spares local government most of the burden and risk of changing electric supply. The government only needs to create a CCA authority, develop an energy plan, and sign a contract with a supplier. A CCA does not go into the power business. However, the CCA authority can issue bonds to pay for clean energy facilities, such as wind farms, solar panels, geothermal generators, energy efficiency projects, and much more. The low interest rate of government bonds is used to reduce the cost of clean energy facilities, and this cost savings can be significant. In fact, it can lower the cost of renewable energy sources to a level where they can compete with conventional sources of power, especially natural gas electric generation.

---

<sup>14</sup> Except the City of Healdsburg that has a Municipal Utility District.

To see how bonds can reduce the cost of renewable energy, it is important to understand that interest on loans and profits to investors cost ratepayers far more than the actual wind farm, solar energy or geothermal facility. This cost looks very different to a private developer than it does to a CCA, as explained in the following wind farm example.

**Wind Farm built by a Private Developer:** If a private developer were to build a wind farm today for \$100 million, then that \$100 million would have to return interest payments and profit that would cost 10% per year (or more) of the full cost of the \$100 million investment. That would equal \$10 million per year. Over a 20-year period the combined profits and interest in this simplified example would cost \$200 million (i.e., \$10 million per year times 20 years). The private investor needed \$100 million for the wind farm and \$200 million in interest plus profit, a total of \$300 million, effectively paying for the wind farm three times over.

**Wind Farm built by a CCA:** Municipal bonds issued by a local government agency, which a CCA would be, currently carry an interest rate of 5% or less per year. For this wind farm the initial cost of \$100 million would be the same, but the CCA only needs to pay 5% interest on a bond, which equals \$5 million per year. Over a 20-year period the CCA will have paid \$100 million in bond interest (i.e., \$5 million per year times 20 years). The CCA paid \$100 million for the wind farm and \$100 million in bond interest, effectively paying for the wind farm two times over.

In the above example, the CCA's costs are \$100 million less than the private developer's, a savings equivalent to the full initial cost of the wind farm. Nearly all of these savings can be returned to finance greener power at lower prices, a key reason why CCAs can make renewable energy affordable when investor-owned utilities such as PG&E cannot.

Local Power is focusing on Sonoma County's ability to accelerate reductions in GHG through a "Green Power Portfolio" rollout using CCA, H Bonds, Long Term Municipal Capital Bonds ("H2Bonds") and other available public financing of renewable energy, energy efficiency and energy conservation projects. This will primarily involve

transforming the source for electric power to much higher levels of renewable energy and reduced reliance on fossil fuel.

Local Power's proposed energy supply is based on a survey of available renewable resources in Sonoma County and in Northern California within reasonable proximity to the county. These resources can be developed in nearly every case with existing technologies. Where this is not the case, it will be specified in what timeline a particular technology is expected to become available. In no case does success of the plan as a whole rely upon technology that does not yet exist, and the plan has been designed to allow more than one way to achieve GHG reductions and simultaneously to insure that local energy needs are also met.

The CCA will also be able to assist in the following three areas:

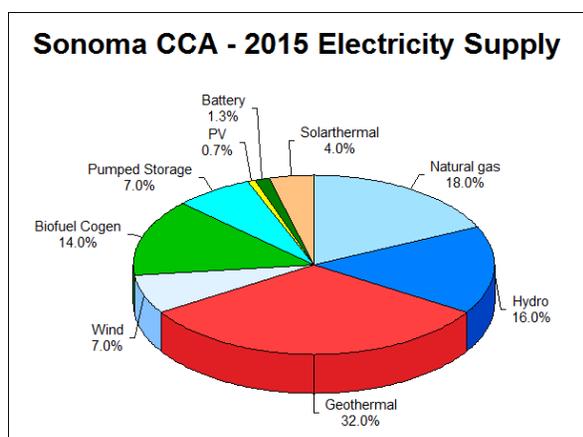
- **Natural Gas:** reducing the current high reliance on natural gas for water and space heating
- **Transportation:** developing energy sector support for increasing use of renewable fuels in the transportation sector, such as offering electricity ratepayers renewable energy products that combine installation of an onsite renewable energy facility with a Plug-In Hybrid automobile and recharging interface. This portion of the plan is still under development, but opportunities to use CCA to reduce emissions in the transportation sector are described in the transportation section of the Community Climate Action Plan.
- **Waste:** separating the organic wastes within the county waste stream can produce biofuel for generating electricity, providing heat, or powering transportation.

The Water, Waste and Transportation portions of the Sonoma County Community Climate Action Plan can be integrated into the Energy Plan rollout so as to provide synergistic opportunities for accelerated GHG reductions across those sectors. For these sectors, Local Power's strategy is to invest in renewable power and fuels infrastructure using the revenue stream from monthly utility bill payments into revolving loan funds, bond repayments, power contracts and fuel contracts. These in turn can supply financial and market support to implement the other sectors of the plan.

This Energy portion of the Community Climate Action Plan will:

1. Begin with a CCA, followed by a multi-year local & grid-connected renewable power facilities rollout
2. Implement energy efficiency and voluntary conservation measures to reduce energy demand at peak hours
3. Offer geothermal and solar heating retrofits to participating electric customers that choose an “Opt-In and Opt Up” natural gas reduction program
4. Invest in renewable fuel and power storage systems
5. Partner with local public agencies
6. Enter into contracts with “Fourth Party” transportation commercialization opportunities to convert public and private sector vehicles, so that they can use and purchase the CCA’s renewable energy and fuels.

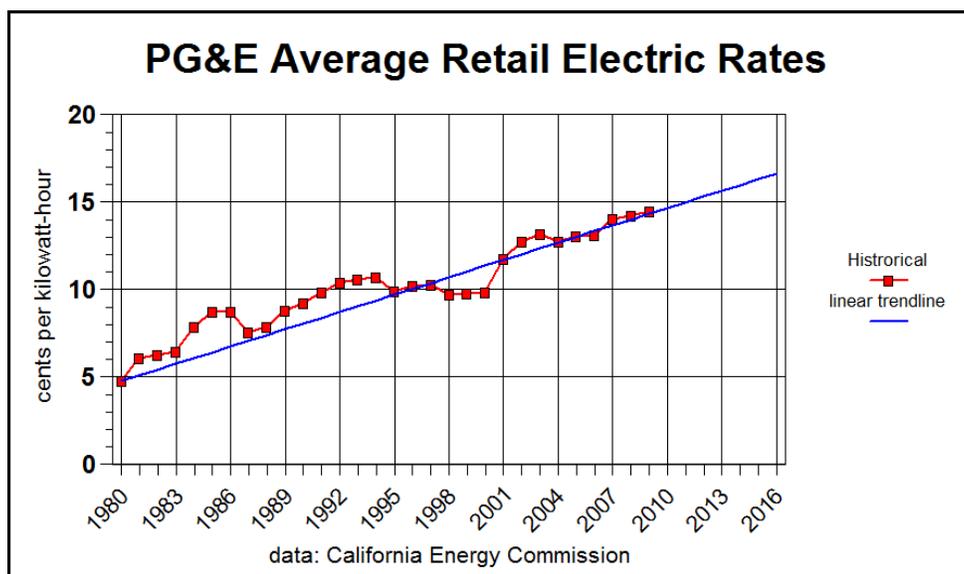
To achieve a 25% GHG reduction in a time of growing energy consumption, Sonoma County will have to invest in multiple large-scale renewable energy technology rollouts over a five-year period, and the County has the opportunity to do so under current law and regulations. This Energy Plan proposes facilities to be sited in specific locations according to available



resources and commercial opportunities. This Energy portion of the Community Climate Action Plan is designed so that implementation of the proposed solutions would *not require* that Sonoma residents and businesses pay higher electricity prices, but instead would pay rates that, over time, *meet or beat PG&E rates* and provide more stable rates than PG&E offers.

Concerns are common regarding the impact on ratepayers as a consequence of moving over to large-scale community-owned renewable energy from PG&E. In addressing this matter it is important to understand the basis for comparison. PG&E rates are not set at

any fixed level, but have consistently increased for decades. PG&E has relied on natural gas and nuclear power to provide the majority of its energy supply. Despite claims that nuclear power will be “too cheap to meter” and clean natural gas “does the big jobs better for less,” PG&E’s rates have steadily increased as shown in the following chart.



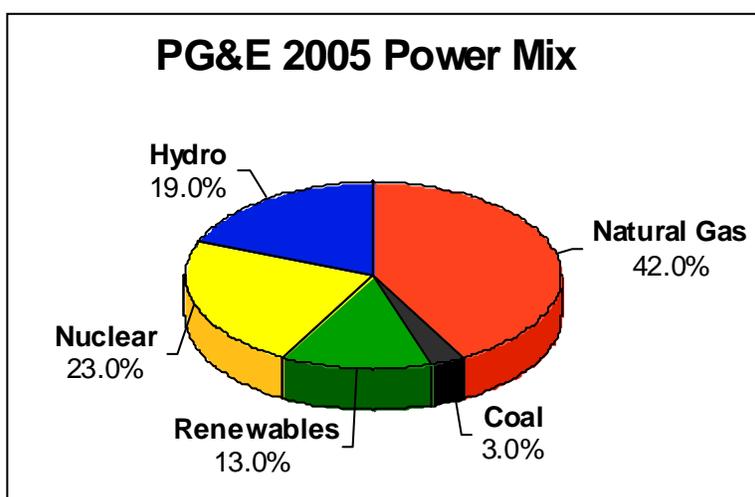
PG&E rates have increased an average of 4% per year since 1980. Requested rate increases for the rest of this decade continue to follow the blue trend line as it approaches its 30<sup>th</sup> year.

PG&E gets 23% of its electricity from nuclear power, making it more dependent on this energy source than other California utility companies. Reliance on nuclear power has accumulated billions of dollars in ratepayer costs, beyond the cost of building and operating the power plant. Two examples:

- The California Public Utilities Commission, the agency that approves the rates that utility company customers will have to pay, has agreed to allow PG&E to pass on to customers over \$800 million in rate increases to repair and upgrade the Diablo Canyon Nuclear Power Plant.<sup>15</sup>
- Another \$20 million per year (approximately) is collected from a surcharge on customers’ bills, and set aside in a special account to cover the decommissioning

and cleanup of the toxic and radioactive nuclear plant when it eventually shuts down. The cumulative amount that had been paid into PG&E’s decommissioning account at the end of 2004 was: \$1.76 billion.<sup>16</sup>

In 2005, 42% of PG&E’s electricity came from natural gas. In 2007 the amount increased to 50% due to low availability of hydroelectric power. On average, natural gas prices have increased 198% per decade for the last half century, a significant cause of the upward pressure on PG&E rates.



Natural gas and coal power plants have impacts beyond rates: they are also major contributors to air pollution and global warming. PG&E’s carbon dioxide emissions in 2005 were reported to be over 20 million metric tons. If in the future liquefied natural gas (LNG) is added into PG&E’s pipeline system,<sup>17</sup> as the utility company is planning, significant GHG emission increases will add to an already serious problem. LNG is

---

<sup>15</sup> PG&E states that it plans to spend “approximately \$1 billion in DCPD through the end of this decades” [http://www.pge.com/education\\_training/about\\_energy/diablo\\_canyon/](http://www.pge.com/education_training/about_energy/diablo_canyon/)

<sup>16</sup> Nuclear Decommissioning Trusts, California Energy Commission, [http://www.energy.ca.gov/2005\\_energypolicy/documents/2005-08-15+16\\_workshop/presentations/panel-3/Robert\\_Kinosian\\_Nuclear\\_Decommissi.pdf](http://www.energy.ca.gov/2005_energypolicy/documents/2005-08-15+16_workshop/presentations/panel-3/Robert_Kinosian_Nuclear_Decommissi.pdf)

<sup>17</sup> Processing and transport of LNG takes a great deal of fossil fuel energy, equivalent to burning 25% (or more) of the natural gas. *LNG Supply Chain Greenhouse Gas Emissions for the Cabrillo Deepwater Port: Natural Gas from Australia to California*, by Richard Heede, Climate Mitigation Services, Report commissioned by Environmental Defense Center, 7 May 2006.

super chilled to minus 260 degrees Fahrenheit and shipped across the ocean in large tanker ships. The cooling and shipping consume large amounts of fossil fuel. A recently released report by Carnegie Mellon shows how even a 10% mix of LNG can cause the greenhouse impact of natural gas to be nearly as bad as coal in some cases.<sup>18</sup>

Renewable energy supplied 13% of PG&E's power in 2005. According to state law, PG&E is required to get 20% of its power from renewables by 2010, but the utility has announced that they will use the legal three-year grace period to meet the 20% target by 2013<sup>19</sup>. PG&E's long-term procurement plans call for between 21% and 26% of its electricity to come from renewables by 2016. A further requirement to obtain 33% of the state's electricity from renewables by 2020 has been in the works for several years; legislation was introduced in 2007 that would require this level of clean energy supply from all utility companies as well as CCAs. PG&E has publicly opposed this target<sup>20</sup>.

The electric supply proposed in this plan aims much higher than either the existing or proposed state clean energy laws require. This higher standard is driven by what is required to achieve the County's GHG reduction target as well as the scientific imperative. To reduce emissions in the electricity sector by at least 25% from a 1990 basis, the proposal in this plan is to achieve up to 66% of the County's electricity supply from renewable resources, such as solar, wind, geothermal, and clean biofuels. The balance of 33% would come primarily from a mix of natural gas cogeneration and hydroelectric power. Future growth in energy demand will be largely offset by aggressive energy efficiency improvements.

The CCA will have a number of strategic elements to protect it against higher energy costs than PG&E. The CCA will:

---

<sup>18</sup> Comparative Life Cycle Carbon Emissions of LNG Versus Coal and Gas for Electricity Generation, P. Jaramillo, W.M. Griffen, H.S. Matthews. Nov. 2006.

<sup>19</sup> PG&E plans to achieve the 20% RPS target in 2012, two years past the 2010 limit. PG&E 2006 Long-Term Procurement Plan, Volume 1, Attachment IVA-Amendment, pp. 9 to 20.

<sup>20</sup> Op. Cit. note 12.

## Energy Solutions – Sonoma County Community Climate Action Plan

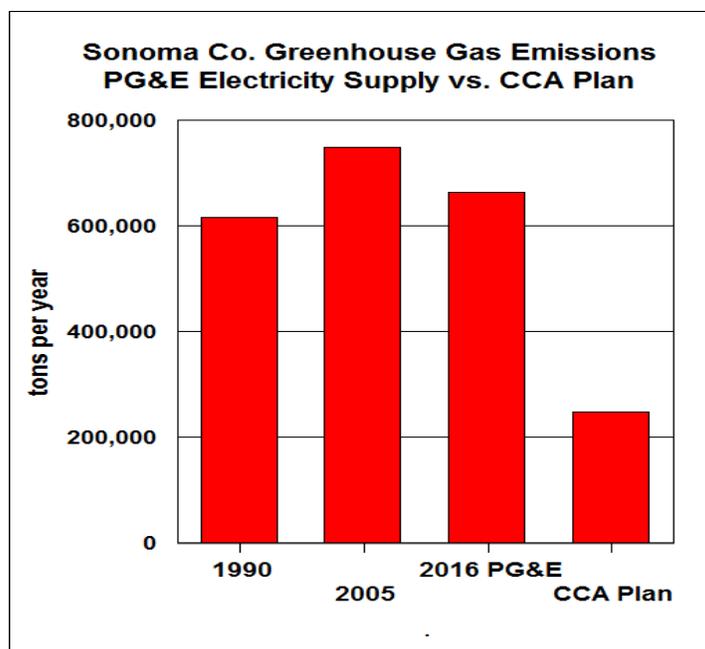
- Use low interest, tax free municipal bonds to finance renewable projects, cutting the cost of these projects to well below the level that PG&E would pay for the same renewable energy
- Have a portion of its portfolio come from natural gas (mostly in the form of cogeneration) sufficient to hedge against downside fuel price risk
- Reduce dependency on natural gas electricity by 50% or more as compared to PG&E, a fuel that has increased an average of 198% in price every decade, and is the primary cause of GHG emissions in Sonoma County’s electric supply
- Use high efficiency cogeneration and other strategies to further reduce natural gas fuel consumption and CO<sub>2</sub> emissions
- Use a diversified energy supply to avoid reliance on any one source
- Have alternate technology options for meeting its needs so it can choose the most cost effective options
- Be able to time deployment of specific projects to take advantage of the decreasing cost of renewable energy technologies
- Have extensive energy efficiency and conservation programs that can cut total energy bills.

The costs associated with developing and/or purchasing renewable energy would not be unique to a CCA; investor-owned utilities like PG&E will be required to meet at least 20% and very likely 33% of their energy needs with renewables in the near future.

While it is possible that PG&E may reduce their carbon emissions over the next decade, this is by no means certain. What is certain is that staying with PG&E will not reduce GHG emissions from electricity consumption to below 1990 levels any earlier than 2020<sup>21</sup>, and thus cannot achieve the County’s goals. In contrast, CCA will allow the County of Sonoma and local city governments as well as the region’s citizens and businesses to achieve the County’s reduction target and to have a say in how electric power is generated.

---

<sup>21</sup> The emission targets mandated by AB 32 are 2000 levels by 2010 and 1990 levels by 2020. These caps will most likely be applied to “upstream” emissions sources, including power plants.



Staying with PG&E electric service means that Sonoma County will fail to meet its GHG targets of 25% reduction below 1990 levels. CCA can achieve much greater reductions than the County's goals require for electricity supply.

With a CCA the County will be able to plan and specify in a contractual agreement with an electric service provider (ESP) how it wants its electricity to be generated in the future. Using this power of CCA, the electric sector could reduce far more than its own share of carbon emissions, and in fact could help to make up for shortfall in other sectors that are more problematic and potentially costly for the County to measure and reduce, such as transportation.

Sonoma County and partnering jurisdictions have the opportunity to invest in renewable energy systems just as it has invested in other public infrastructure. The energy supply proposed here is designed as an investment portfolio using standard sound investment strategies for managing risk. These strategies include diversification of energy supply, insuring a marketable product (clean energy), and hedging risks with real values. This helps to insure that a transition to clean energy is financially prudent.

## **B. Avoiding the Peak Fossil Fuels Crisis**

In addition to achieving GHG reduction targets and controlling electricity rates, there are other reasons for switching to clean renewable energy.

Fossil fuel supplies are finite. Those that remain give our civilization time to make a transition to a more sustainable method for meeting our energy needs. While there are still large quantities of fossil fuels left in the ground, our appetite for consuming these fuels is vast and continues to grow. The cheap and easy sources have mostly been found and used.

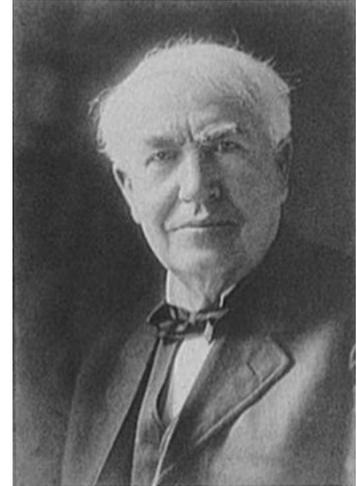
In 1970 the United States was the largest oil producer on earth, rivaling the extraction rates of Saudi Arabia or Russia today.

Since that time our oil production has gone into decline, despite expansion of drilling into the Gulf of Mexico and Alaska.

Today, we are dependent on imported oil for 60% of our needs, a sad fate for what was once the world's largest oil producer. Oil producing and consuming nations should take heed. It may not be possible to keep pace with growing energy demand for much longer.

As if depleting energy resources were not enough reason to act, the environmental, political and economic consequences of fossil fuel dependency are widely recognized as severe. These range from pollution in low income neighborhoods where power plants and factories tend to locate, to international conflict and even wars over dwindling energy supplies. The economic consequence for the United States is ever-higher energy bills, and a cumulative trade debt of trillions of dollars to foreign nations, due mostly to our large imports of energy and automobiles, which we will never be able to repay if we do not change our ways.

It is evident that if we do not end our dependency upon fossil fuels, we will damage the climate of the entire planet for centuries to come. California is joining the growing global movement to mandate limits and reduction targets for carbon dioxide and other



"I'd put my money on the sun and solar energy. What a source of power! I hope we don't have to wait till oil and coal run out before we tackle that."  
*Thomas Edison*

greenhouse gases. While this topic is discussed other sections of the report, there are specific requirements for the electric sector.

- GHG emission limits have been placed on electric generators that will prohibit an increase of coal-derived electricity for California customers whether or not these plants are located in the state.
- State regulators now impose a virtual “greenhouse gas adder” of \$8 to \$25 per ton of CO<sub>2</sub> in making calculations whether to sign new contracts with energy suppliers<sup>22</sup>. While this does not increase the cost of natural gas generated electricity, it does add a margin that makes low carbon electricity sources more likely to be purchased by utility companies, even if they are more expensive.
- A carbon trading system is under development that is likely to add to the real cost of buying electricity from fossil fuel powered plants.



Ice caps protect the earth’s climate by reflecting sunlight back into space. As ice melts, heating of the oceans and atmosphere accelerates. Illustration: NASA.

---

<sup>22</sup> California Public Utilities Commission Decision 04-12-048, [http://docs.cpuc.ca.gov/published/Final\\_decision/43224-07.htm#P929\\_237864](http://docs.cpuc.ca.gov/published/Final_decision/43224-07.htm#P929_237864)

## ***II. Rapid Renewable Energy Rollout***

### **A. Timeline**

The 2015 timeline established by Sonoma County governments should allow a reasonable amount of time for a CCA to move from planning to full implementation. The following table gives an idea of how this would work.

Stage	Begin	Complete	Time
Education and Generate Local Support	2008	Ongoing	Ongoing
Create Implementation Plan, JPA, Ordinances, Approval Process, Continue Education and Local Support Process	June 2008	Dec. 2009	1.5 year
CCA Setup, transfer of Customers, etc.	Jan. 2010	Dec. 2010	1 year
Build-Rollout of Renewables	2011	2015	5 years

The nine-year plan provides an initial three years for creating the framework for a CCA that would start service in 2010. Given that it takes a year after customer transfer to a CCA for an energy company to start construction of physical projects, this translates into a maximum of five years to build a clean energy portfolio. That will reach 2015. If the schedule is adhered to, which we find to be aggressive but feasible, then Sonoma County will have a real chance to reduce GHG emissions in the Electric Sector to much more than 25% below 1990 levels.

A second “Snapshot Scenario” (Section VI-D) highlights the increasing difficulty of meeting targets the longer Sonoma waits. Inevitably, delay means that the rate of carbon reduction will have to be faster and that commitments will be made in the form of investments in the production and consumption of energy. This will raise the cost and difficulty of creating timely change. Given that the electric sector plan will generate a major portion of the GHG reductions, a delay in implementation of the CCA would mean that the 2015 target date for the entire Plan would not be met.

## **B. Financing**

Local Power has provided the financial models for energy and fuel projections, and also worked with the other experts to co-develop financial models for overall integration into a CCA with energy cost projections through the financial life of the Community Climate Action Plan investments. These investments consist of several aspects, and can have different financial structures. The principle investment tool is called an H or H2 Bond financing. These terms derive from Proposition H in San Francisco's 2001 Election.

- H Bonds involve repayment within the term of a contract with an Electric Service Provider (ESP). Since these contracts are typically for 20 years or less, the bonds must be repaid within 20 years or less.
- H Bonds are “Revenue Bonds”, meaning that these bonds would be repaid by the revenue generated through the combined energy bills of participating customers in the CCA.
- H2 Bonds are “Capital Bonds”, meaning their repayment is assured by the actual renewable asset, such as a wind farm generating electricity, and may be repaid over a term that extends beyond the initial service contract between the CCA and the Electric Service Provider.
- H2 Bonds could have a repayment term of 25 to 30 years or even longer. The actual bond structure chosen for each investment will depend on a careful balancing of revenue and risk.

## C. Resources

There are a number of locally and regionally available clean power resources featured in this Energy Element of the Community Climate Action Plan. The significant range of options means that success does not depend on only one resource or technology, and is a key part of the feasibility of the Plan. More detailed descriptions of these resources and how they can be developed by a CCA are presented in later sections of the report. The following is a general discussion of the possible resources available to a Sonoma County CCA

Geothermal: Geothermal power, using the vast natural heat energy stored inside the earth, emits either very little or no GHG, and has great potential for additional development. Geothermal power can be tapped in different ways. For electric generation an underground reservoir of high temperature steam is necessary. The Geysers, a significant portion of which is located within northeastern Sonoma County, is one of the best locations in the state for electric generation. It is also well proven technically, having produced hundreds of megawatts of power for decades, though after 1987 production went into decline due to poor management of the resource. Recently, a water reinjection project has restored steam pressure, and plans are afoot to increase production in the near future. Geothermal electric generation is a base-load resource, meaning that it provides constant power throughout the day, year round. This makes it valuable as a secure, local energy resource.

Geothermal energy can also be used to provide heat for hot water, interior space heating, and industrial processes. This type of resource, which requires a much lower temperature and shallower wells, is pervasive throughout the most inhabited parts of the county, and it could replace much of the local use of natural gas.

Biofuels: With extensive regional agriculture, both in and around Sonoma County, biofuels are an important resource. Wineries, forestry, food and municipal wastes, as well as wastewater treatment, all can create fuel energy for powering electric generation or for

other fuel uses. The US Department of Energy estimates that the county produces 219,000 metric tons of organic wastes each year<sup>23</sup>. Some of these wastes are already collected in centralized facilities where they can be turned into energy. For example, 33,000 metric tons of potential biofuel feedstock is put into landfills. A portion of this energy has in the past been tapped by collecting methane from decomposing organic material, enough to power a 7.5 megawatt electric generator. As this facility has been closed, so a new MRF could be established to perform organic separation and put it into a biodigester. Since landfill waste represented only 15% of the biomass waste in the county, and only a portion of the landfill waste energy was recovered, there is considerable potential for additional development of biomass fuel using existing resources.

This waste resource can also be supplemented by growing energy crops, ideally within the county, but bioresources from nearby counties in northern California could also be tapped.

Wind: Onshore wind generation is possible in certain limited areas of the county. These are primarily along the southwestern coast as well as near the northeastern border in the mountains. These land sites, however, are not sufficient for large-scale commercial wind farms, but may be suitable for smaller generating facilities. Whether these sites can be developed will depend on wind resources at specific locations, public acceptance of wind turbines, and the potential to use the energy at or near the site of the wind turbines. A preliminary examination of wind maps suggests that between 5 and 10 mw of local wind generation capacity might be technically feasible using current technology.

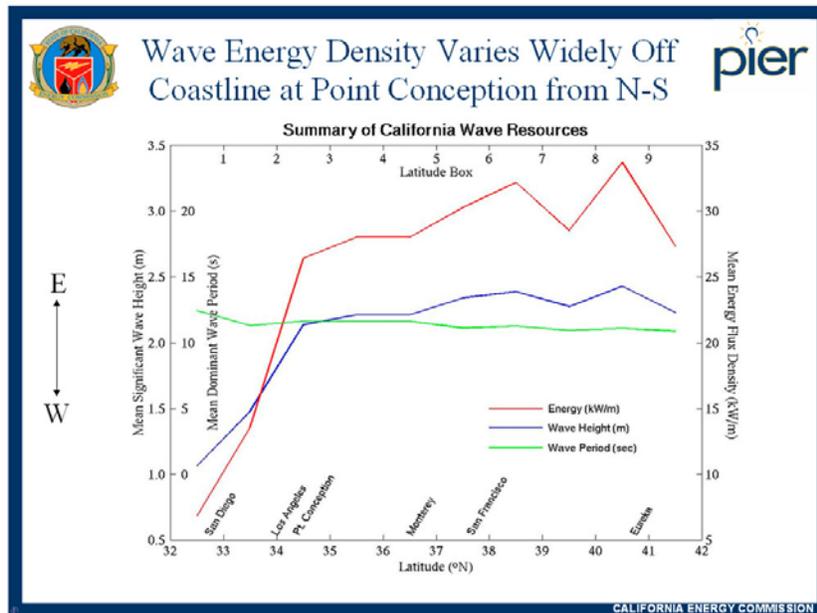
Though Sonoma County has minimal wind resource on land, it does have one of the finest offshore wind power resources in the world. It may be possible to develop a portion of this resource within the 2015 time frame of the Plan; however, the largest resources are located beyond the water depth limit of contemporary technology. This technology

---

<sup>23</sup> National Renewable Energy Laboratory has collected county level data from a number of agencies, including USDA and the US Census Bureau and EPA.

limitation may change over the next decade, and the County should prepare for this eventuality as the resource potential is huge.

Ocean Power: Wave energy resource was surveyed and evaluated but not included in the proposed portfolios. This technology is in the early phases of development, and is quite expensive. However, it should not be ruled out for the future. Government grants or other financing assistance may allow this very low environmental impact technology to be deployed within the term of the plan. Over the longer term, beyond 2015, wave power technology may decrease in cost (and conventional power generation increase in cost) to make this option viable. The offshore wave potential for Sonoma County is good, and thus is very likely to be developed at some time in the future when this becomes economically feasible. The following table shows the various characteristics of waves off the California coast. The most relevant line is the top one showing, to the left side (North) of San Francisco, wave energy rising to over 30 kilowatts per meter of wave front. A 12 to 14 mile long ocean wave conversion plant running at 50% efficiency could, in principle, supply 100% of Sonoma County’s electricity. This is a fraction of the county’s actual coast, which runs for over 40 miles.



Solar Energy: Solar energy, like geothermal energy, can be used in various ways. The solar resource of the county is good, but not optimal for all purposes. Photovoltaics and rooftop solar water heaters are excellent options, and both can be financially supported with tax incentives and generous state rebates.

One form of solar energy technology that is practical and cost effective today in California is using the heat of the sun, concentrated by mirrors onto a tube or other receiver structure, to create steam that powers an electric generator. Solar thermal concentrators are feasible and economic if the solar resource is



adequate. Current technology prices and performance would not optimally favor Sonoma County<sup>24</sup>, though this may change over the next decade. It may be possible to engage the participation of local governments outside of Sonoma County that have adequate insolation (solar resource).

Another technology that has been used for decades is Photovoltaics (PV). PV “solar panels” are easy and relatively quick to install, and, unlike big power plants, can be placed on a customer’s roof or backyard. Solar electric generation in this form can be costly; however, it also creates premium value energy:

- Solar panels produce power at the site where it is consumed; this means energy prices are valued at retail rather than wholesale rates.
- Solar panels produce power in the afternoon, when energy costs spike, sometimes dramatically.
- Solar power systems are owned by the customer, and thus provide some control over energy generation.

---

<sup>24</sup> Resource Map, Concentrating Solar Power Prospects in California, NREL.  
[http://www.nrel.gov/csp/images/1pct\\_csp\\_ca.jpg](http://www.nrel.gov/csp/images/1pct_csp_ca.jpg)

## Energy Solutions – Sonoma County Community Climate Action Plan

- Solar power systems can be bundled with battery backup to allow limited power supply during an emergency.
- Solar power systems require no fuel, very limited maintenance, and panels are warranted to last for decades at manufacturer specifications.
- Solar power systems insure against rising future electric rates.
- Solar energy systems are quiet and emit no pollution or GHG.
- Some types of solar panels can be integrated seamlessly into a building's architecture in the form of shingles, windows or shade structures.

Sonoma County has a good solar resource for using photovoltaics that is above US and global averages<sup>25</sup>. Within Santa Rosa, for example, every square meter of level surface receives 1750 kilowatt-hours of solar energy per year. A residential customer would require 500 square feet of roof space to generate the equivalent of 100% of the electricity consumed by the average Sonoma County household in a year.<sup>26</sup>

Energy Storage: A significant concern regarding use of renewable technologies is that they may not be available at all times when they are needed, and that they cannot always be controlled to meet the specific needs of the power grid in a given moment. As we have seen, this is by no means true of all renewables, and the alleged “defects” of renewable energy can be greatly exaggerated.

A more careful examination reveals that this concept of clean energy resources “not being reliable” or “not putting out much energy”— compared to other conventional energy sources— is really a prejudice. For example, geothermal energy is available all the time and is actually more reliable than a coal, natural gas or nuclear plant. Biofuel powered electric generators can be turned on or off at will and the output regulated. Solar thermal power plants are often built as “dual fuel” meaning that when the sun goes behind a cloud the same plant can be run off of natural gas or some other fuel.

---

<sup>25</sup> National Renewable Energy Laboratory

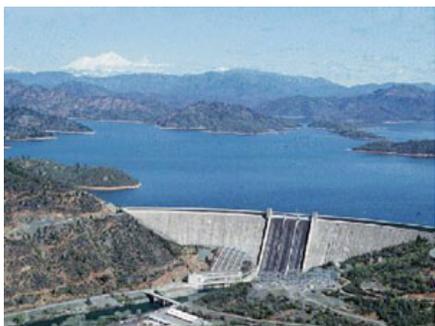
<sup>26</sup> Actual roof area may vary considerably. This figure assumes the 2005 average Sonoma County residential electricity consumption of 6600 kWh per year, and solar panels that operate with 12% efficiency. Solar panels range from 6% to 17% efficient conversion of sunlight into electricity.

Wind and solar power are generally provided as available, meaning that they produce power when the wind blows or the sun shines. In order to make their energy more reliably available when and as needed, and thus more valuable, energy storage can be added. New solar thermal plants can store the heat in an underground storage tank and continue to run until hours after sunset. And electric energy generated by wind plants at night, when demand for power is low, can be used to pump water into a small reservoir on top of a hill. During the day the water runs downhill to power a turbine when demand, and energy prices, are high. The water is recycled, and thus a pumped storage system does not deplete resources or interfere with the flow of existing rivers or streams. The siting of a pumped hydro storage facility may be problematic, but is least costly and least environmentally intrusive when it uses existing bodies of water or reservoirs. This is discussed in more detail in section IV that describes particular projects that might occur locally or regionally.

Other energy storage options are also available. These include the use of long life, industrial quality batteries, biofuels, and hydrogen. All of these energy storage methods can be used for different purposes, of which producing power for the electric grid is only one. These uses can include powering vehicles, and providing fuel for heating or cooking.

Low and Zero Carbon Conventional Energy Supply: While Local Power is projecting that 66% to 75% of Sonoma County’s electric supply can come from renewable resources, a portion of the proposed portfolio are not technically or legally defined renewables in California. However, these other proposed options would still be low or zero carbon emitting, and include conventional hydroelectric power and cogeneration fueled by natural gas.

It is presumed that some access to a small fraction of the state’s hydroelectric resources, or the potential to take advantage of imports from the Pacific Northwest, will be possible under a power purchase contract.



Shasta Dam

The amount of hydroelectricity contemplated by the Sonoma County CCA would only need about 1% or this capacity, or less. Thus, no construction of new conventional hydroelectric dams is assumed or recommended. However, existing hydroelectric facilities can upgrade their electric generation equipment to improve efficiency and power output, and this could be a potential source of new electric generation for the County.

Cogeneration generally uses natural gas fuel, but much more efficiently than normal electric generators. It is essentially a type of “heat recycling” that adds minimally to fuel consumption or emissions compared to regular power plants. Cogeneration also provides an excellent downside price hedge, should natural gas prices remain low for a period of time, or should they be lower than the forecasted prices over the term of the portfolio investment. Cogeneration provides base load (24 hour, year round) service, and thus can contribute a significant amount of the County’s electricity. There is tremendous potential for cogeneration in the greater Bay Area region, easily enough to supply all base load needs for the County if this were necessary. However, to the degree that a portion of base load can be shifted to non-carbon emitting sources such as geothermal energy, this will

California's 386 hydro plants are mostly located in the eastern mountain ranges and have a total capacity of 14,116 MW.

result in higher reductions in GHG emissions. In addition, it may become possible to convert some or all of the natural gas fuel to hydrogen, and, with appropriate technology, greatly reduce the already low GHG emissions from cogeneration plants.

This Energy plan proposes electric generation facilities that can be built within the timeframe of the County’s GHG reduction target. The facilities can be built as coordinated parts of a CCA portfolio with a revolving revenue and loan fund to continue the rollout of renewable resources in a sustainable manner into the future.

The solutions identified in this Energy plan should be considered the lowest hanging fruit for Sonoma County to implement alongside the more incremental, less certain GHG reductions achievable through land use, transportation, agriculture and long-term policies that lack a CCA-type implementation vehicle.

#### **D. The Vision: Roll-Out Logistics Planning and Procedures for Small Scale Power**

While large centralized energy facilities such as pumped storage and wind farms follow a conventional site acquisition process, decentralized energy and capacity roll-outs require a parallel network-based development strategy to fully integrate these technologies into resource and procurement planning. It is the role of the CCA to set up collaboration between property owners and local construction companies and electrical contractors to provide a greening of the local energy, heating and transportation fuel supply. Local Power calls this collaboration a “Rapid Renewable Energy Roll-Out” (RRER). In this plan the RRER applies to:

- installation of conservation measures
- distributed generation facilities
- energy storage
- heating
- transportation energy facilities

**Data System for Site Acquisition.** The key aspects to an RRER are simple – they involve local communication, training, and coordination – at the level where coordination happens best – but includes financing of proposed installations by the local CCA. The key aspects to RRER are:



## Energy Solutions – Sonoma County Community Climate Action Plan

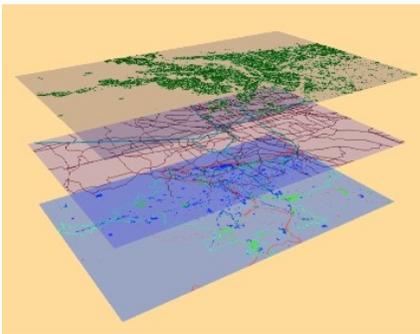
- Phased distribution
- Collaborative network site access
- Dedicated permitting and safety resources

The keys to RRER are based on phased distribution of technology based on estimated site efficiency and site property permission.

“Site Efficiency” is calculated as the resource (hours of sun, amount of wind, estimated geothermal resource, or other site related factor) combined with a property access rating system designed to allocate resources to the most cost-efficient properties:

- Properties with the best output
- With optimal on-site load conditions
- Optimal tariffs
- The best construction efficiencies
- Most cooperative real estate owners

The benefits of this approach mimic the process by which a cellular telephone system is rolled-out: multiple antenna sites are constructed based on knowledge of the property’s physical characteristics - with cellular systems, one determines how radio waves propagate and cover an area, while with solar or wind it is a measurement of the



efficiency at which the chosen technology operates.

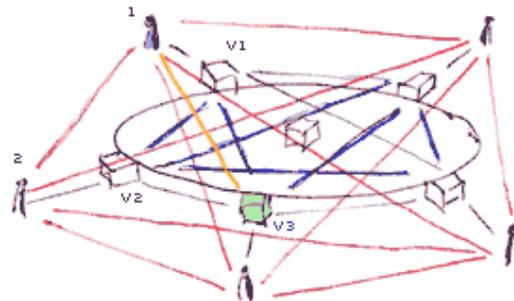
Property characteristics are also important – building and land owners need to allow access for engineering studies, sign necessary property use and building permission documents, and facilitate a certain amount

of future Operations and Maintenance (O&M) activity. Under a RRER, a site acquisition process may be organized to expedite and rationalize this process to streamline rollouts and minimize the impacts of delays. Offering multiple products to consumers also encourages participation and cooperation.

The power of geographic information systems (GIS) can be used to analyze and rank sites. The sites will be designated with an Electricity or Energy Usage rating, which shows the average historical monthly utility bill and energy profile for electricity and gas for a period of time sufficient to design a new system for optimal functioning. The system will allow individual sites to be assigned different values so that solar and wind generators can be placed in locations where the renewable energy output is used to leverage maximum value, such as on-site peak shaving and targeting customers who pay higher electric rates.

**“Opt-Up” for CCA Customers.** It is expected, that with proper structuring, a system of “Opt-Up” can be established for consumers who not only decline to “opt-out” of the overall service, but also wish to become owners of onsite power and efficiency systems. This optional service would offer participating customers ownership, or flexible participation, in local power facilities and additional services from the CCA. Under this system the CCA can harness the power of “PIMBY” (“Put It In My Backyard”) and an information system can be established that allows property owners to upload site information such as photos and electronic files of engineering drawings concerning a structure to allow for centralized or decentralized contractor bidding on certain projects. In this manner a marketing campaign would be enacted to offer residents and businesses to Opt-Up as owners of new local green power facilities, providing first-in-line access to solar and wind distributed electric generation that can be placed on their properties.

Through the Opt-Up program, community members can cooperate in allowing engineers to survey property, access energy installations, and allow for ease of entry in the O&M stage of CCA implementation. As local governments, CCAs frequently communicate with residents and businesses in their jurisdictions, and



these communications provide direct channels for marketing new green products. RRER minimizes the installation cost by aggregating those motivated users prior to the actual roll out commencing. This activity can start almost immediately at lower cost than individual customers could accomplish under any scenario. While the commercial energy supplier manages CCA implementation and service, the CCA can organize logistical and regulatory assistance, as well as effectively communicate program offerings to customers.

The effort would create media attention and let people know that a CCA roll out was coming, creating a virtuous cycle of further positive attention. Owners would want to get in line and contribute to the process by which their properties are made more efficient, self-reliant, and energy secure.

**CCA Zoning and Permitting Coordination.** Health and safety are protected through creation of an expanded Building Permit sub-department dedicated to RRER. This department would include resources that would inspect and rapidly approve building permit plans as well as conduct on-site safety inspections as necessary during the construction and commissioning phase of energy installations. Their RRER final reports would serve to document that conditions of a manufacturer’s warranty were met, all fire and safety codes have been met, and would provide a letter to the property owner (RRER In-Service Letter) describing what has been installed and who to contact in the case of any problems (such as roof penetration or other malfunctions). This function could be provided either by CCA staff or by a consultant.

**Collaborative Network Site Database Access.** This effort would be a centralized outreach approach, where buildings and other sites are identified as optimal and the owners are contacted proactively and made aware of a Site Database or Site “Wiki” where they can upload their site access information and even electronically generate property use documents which can be sent to them, signed and returned such that the CCA begins stockpiling authorized installation sites well in advance of an Electric Service Provider (ESP) being chosen.

**Sonoma County Small-Scale Wind Permitting.**<sup>27</sup> In Sonoma County, the permitting authority for small-scale wind turbines is the Permit and Resource Management Department (PRMD), which has regulations established by ordinance for small wind projects that would apply for approval of onsite wind generation projects.

The PRMD requires a conditional use permit if the small wind energy project is to be developed in a county-designated, urban service area or within a buffer zone located 2,500 feet of urban service areas. A zoning permit is required if the project is located outside urban or buffer zones. It is more complicated and costly to obtain a conditional use permit than a zoning permit. PRMD requires permit applications to include system drawings, an engineering analysis, and a line drawing of electrical components.

Most small wind turbines do not exceed 160 feet height and have negligible environmental impacts, exempting the developer of most small wind turbine projects from having to complete an Environmental Impact Report (EIR) in compliance with the California Environmental Quality Act of 1970 (CEQA). However, projects receiving state or federal incentives may be required to complete an EIR and/or an Environmental Impact Statement (EIS) under the National Environmental Policy Act of 1969 (NEPA).

---

<sup>27</sup> These remarks on wind permitting borrow heavily from an excellent report called “Wind Energy in Sonoma County: Permitting and Incentives,” prepared in July 2007 by Stephanie Collins, Goldman School of Public Policy, University of California, Berkeley, for the Sonoma County Water Agency, July 2007. Collin’s report, which SCWA shared with the Climate Protection Campaign to assist in our research, should be consulted for a greater degree of useful detail on the permitting of onshore and offshore wind facilities in Sonoma County.

## **E. Permitting of Large Onshore and Offshore Wind Power Facilities**

Permitting wind energy facilities can vary widely depending on the size and location of the project. Securing permits for small-scale onshore wind projects located in rural areas is quick and simple compared to securing permits for large-scale offshore wind projects located in federal waters, which can take several years to complete in complex processes involving federal agencies. The specific requirements for each type of feasible project in Sonoma County are outlined below.

**Onshore Wind Farm Permitting.** Large projects, such as onshore wind farms, must be negotiated with the Permit and Resource Management Department. If approved, the project would receive a conditional use permit and will likely require an EIR and/or EIS.

**Offshore Wind Farm Permitting.** Permitting requirements for offshore wind farms depend on the location of the project. If the facility is located on the outer continental shelf, or three nautical miles (approximately 3.3 miles) from the shoreline, federal agencies have the main permitting authority. If the facility is located on submerged lands, or within 3 nautical miles of the shoreline, then state agencies have primary permitting authority.

Though federal agencies have primary permitting authority over facilities proposed for the outer shelf, consultation with state agencies is still required. The California Coastal Commission will review the federal permit for consistency with Section 8 of the California Coastal Act, and may require that the permit be amended if it is not consistent with Section 8. The California State Lands Commission must also issue a lease for power transmission lines that run across state lands. As with projects in state waters, the CPUC, the U.S. Coast Guard, the FAA, and the Fish and Wildlife Service will also participate in the permitting process. In addition, the Army Corps of Engineers will issue a permit under Section 10 of the Rivers and Harbors Act. Generally, a EIS/EIR will fulfill all environmental requirements for a Section 10 permit.

Facilities proposed on submerged lands within state waters must submit to the primary permitting authority of the California Coastal Commission. The Commission issues a coastal development permit if the proposed project is in compliance with Section 3 of the California Coastal Act of 1976. The development permit application requires a thorough evaluation of the environmental effects of the project, and usually an EIR will provide the necessary documentation. The permitting process is expected to range from six weeks to a couple of years.

Though the California Coastal Commission has primary permitting authority, it will not serve as the lead CEQA agency and is not the first agency to be consulted in the offshore permitting process. First, the project developer will need to obtain a lease for the use of state lands from the California State Lands Commission. A joint EIS/EIR will be required in compliance with NEPA and CEQA, respectively, and the State Lands Commission will likely serve as the lead in completing these environmental assessments.

Other agencies will also be involved in the permitting process; though will play a smaller role. An energy facility siting certificate, or a “Certificate of Public Necessity and Convenience” must be obtained from the California Public Utilities Commission. The FAA has regulations in place for projects affecting navigable airspace. Similarly, the US Coast Guard should be consulted to identify possible “hazards of navigation”. The Fish and Wildlife Coordination Act requires consultation of the US Department of Fish and Wildlife. The California Office of Historic Preservation must be consulted if historic resources are affected by the project. Finally, the National Oceanic and Atmospheric Administration may apply the Marine Mammals Protection Act if the project will “harass” marine mammals.

For facilities outside state lands (3.3 miles out), recent changes in federal law have altered the regulatory process for securing permits. While in the past the Army Corps of Engineers was responsible for permitting offshore wind projects, Section 388 of the Energy Policy Act of 2005 (EPACT) established the Department of the Interior (DOI) as the primary permitting authority for alternative energy projects on the outer continental

shelf. The DOI has delegated permitting responsibility to the Minerals Management Service (MMS), which is in the process of issuing a Final Programmatic EIS for its alternative energy program, expected to publish a record of decision in September 2007, and to issue guidelines for the offshore wind energy permitting process. Section 388 requires the MMS to issue leases, easements, or rights-of-way for offshore wind energy development on a competitive basis. If a developer contacts MMS expressing an interest in a lease, the MMS will advertise and hold a lease sale to encourage competitive bidding for the lease. The MMS must charge a fair rate of return for any property interest it grants, must pay out 27 percent of revenues collected to states within 15 miles of the project, and require an environmental review such as a joint EIS/EIR. The MMS will serve as the lead NEPA and CEQA agency.

Though federal agencies have primary permitting authority, consultation with state agencies is required. The California Coastal Commission will review the federal permit for consistency with Section 8 of the California Coastal Act, and may require that the permit be amended if it is not consistent with Section 8. The California State Lands Commission must also issue a lease for power transmission lines that run across state lands. As with projects in state waters, the CPUC, the U.S. Coast Guard, the FAA, and the Fish and Wildlife Service will also participate in the permitting process. In addition, the Army Corps of Engineers will issue a permit under Section 10 of the Rivers and Harbors Act. Generally, an EIS/EIR will fulfill all environmental requirements for a Section 10 permit.

### ***III. Portfolio Model Tools and Targets***

The CCA structure is augmented by financing mechanisms, to enable a Rapid Renewable Energy Rollout of energy facilities. These specific facilities are designed to serve a Sonoma CCA, but may be enhanced by co-development with other public and private sector partners. Based on provisions for inter-agency partnering under AB117 and related statutes, Local Power identifies inter-governmental and regional opportunities to maximize GHG reductions for Sonoma County, and potentially other collaborating local governments in the region, in the shortest possible time frame.

Such partnering is another tool to help make renewable energy affordable. One important way to reduce the cost of renewable electricity is to find optimal sites for the facilities — for example, where there is plenty of wind or sunshine. Sonoma County may not have the best or most easily developed solar or wind resources, but other nearby regions do have these assets. Renewable facilities, such as a wind or solar farm can also benefit from economies of scale. Sometimes the best scale may be larger than would be needed, or than would be prudent, for Sonoma County to develop for itself. Partnership can allow Sonoma County CCA to take a partial share of a larger facility that would provide significant savings to all parties.

The solutions identified in this Energy Solutions plan can also be integrated with the local water and transportation systems and will seek to work synergistically through fuel production, fuel wholesaling and investments in vehicle fleets. In this way, partnership can provide multiple benefits through helping to reduce GHG emissions in other sectors, promoting local economic activity and employment, and providing added value to the CCA's renewable energy facilities.

This Energy Solutions plan uses financial spreadsheet models of these facilities, with estimated investment levels and resulting cost of energy. These are compared to expected costs for comparable conventional energy supply from a new natural gas power plant,

using projected fuel and infrastructure costs from authoritative sources such as the utility companies, the California Energy Commission, and US Department of Energy.

A quantitative model has been used to create the proposed portfolio and evaluate the resulting GHG emissions. In most cases, particularly with renewable energy facilities, the CO<sub>2</sub> emissions are zero. The amount of power provided by each facility is structured into a portfolio mix that is designed to meet the estimated needs for base load (24 hour), intermediate (elevated daytime and early evening demand), and peak energy for the County. The exact level of need for such resources will be determined when the time arrives for a CCA to be implemented. However, the solutions presented here are flexible and scalable to a considerable degree, and—if adjusted accordingly— will be able to meet the foreseeable contingencies for local electricity needs over the next decade. Most importantly, the CCAP portfolio achieves dramatic reduction of GHG emissions compared to PG&E’s supply portfolio. If energy efficiency targets described in another portion of the Community Climate Action Plan can be met, then growth in demand should be minimal or zero and the proposed energy supply should be adequate for decades.

The proposed low carbon energy supply portfolio far exceeds the GHG reduction targets for the electric utility component of the Community Climate Action Plan, and approaches the 60% to 80% reduction levels that IPCC states is needed over the next half century. In the Community Climate Action Plan, this significant reduction in the electric sector is achieved within a decade, leaving a surplus reduction that can be applied to other sectors. In addition, the proposed CCA can support other sectors to help them meet their near term goals of 25% reduction in GHG emissions. Implementation of the Community Climate Action Plan will involve a CCA forming across the municipal and unincorporated areas of Sonoma County, possibly in partnership with other local governments in Northern California. The Plan addresses regional power needs with a combination of local renewable energy, conservation and efficiency measures to reduce carbon pollution caused by electric generation.

While approximately 50% of PG&E’s electric generation is no or low carbon-emitting, only 13% of their supply is renewable according to legal definition. The balance of the 50% is hydroelectric and nuclear power. The design portfolio for the Sonoma CCA excludes nuclear power, though it does include Sonoma County’s “fair share” of hydroelectric power. With the PG&E power supply used as a baseline, the CCA power supply reduces carbon to the extent that its “carbon-free” sources exceed 50%. The CCA plan meets this reduction with a combination of resources, including: energy efficiency, renewables, hydroelectric power, energy storage and cogeneration using natural gas.

The energy efficiency element of the Climate Action Plan has been written up in a separate report. This element takes the efficiency target as input, and assumes a program energy savings of 2% per year relative to projected growth. This would effectively cancel out expected growth in countywide electricity demand, and 2% per year is considered a reasonable target for an aggressive efficiency program by many experts.<sup>28</sup> In a 5-year program rollout, this would mean a 10% cumulative savings. Such savings would likely need to come from a combination of new county efficiency standards as well as the Community Choice program.

State law specifies that hydroelectric power is renewable if it comes from plants that generate less than 30 megawatts of power. The portfolio does not specify whether the CCA supply meets the state definition to qualify as renewable; however this component is an important way to help control energy supply cost as well as additional carbon-free supply to help meet the county’s goals. It is envisioned that the hydroelectric power would come from existing facilities, and thus would not be built by the CCA. The portfolio would, however, involve construction of a “pumped water storage” facility using one or more existing reservoirs, carefully chosen in order to minimize local environmental impacts.

---

<sup>28</sup> See Western Governors’ Association, Clean and Diversified Energy Initiative, Energy Efficiency Task Force Report, 2005.

Cogeneration, or Combined Heat and Power, recycles the waste heat from electric generation, usually for commercial or industrial application. This technology greatly improves energy efficiency and reduces the rate of fuel consumption, and thus carbon emission, for both the electric and the heat application.

It is the combined effect of a variety of technologies —consumer efficiency, renewables, hydroelectric, energy storage and cogeneration— that provides for the large carbon reduction. It also builds in a certain robustness in the planning and implementation process, in assuring that the CCA does not “put all eggs in one basket” but instead relies on a variety of options. This allows for flexibility, to adjust the balance between the options, and to accommodate market risks and energy needs.

Another key element in implementation is timing. Resources deployment can always be adjusted in time to assure financial and practical viability, as energy prices and renewable facility costs change.

Thus, in meeting the targets, the CCA model has a variety of tools:

- Public financing
- Partnership with other agencies
- Operational synergy at energy facilities
- Scalability of clean energy technologies
- A diverse and flexible energy portfolio
- Adjustment in timing of resource deployment

## ***IV. Portfolio and Technology Investment Options***

### **A. Summary**

Local Power has identified, evaluated and financially modeled renewable resource portfolio design strategies using off-the-shelf technologies that are viable and ready for implementation. Developing these resources will involve multi-year commitments of Sonoma County local jurisdictions, and, potentially, neighboring local governments and communities. The revenue generated from the combined energy bills of all participating customers within a CCA structure may be used to finance alternative energy portfolios and accelerate construction of renewable power facilities.

The portfolio consists of a balanced mix of energy resources designed to meet multiple goals, including:

- Achieve combined energy costs similar to or lower than what is anticipated for PG&E electric generation
- Provide a reasonable estimated mix of necessary base load, intermediate and peak load generation
- Provide resource adequacy for peak energy demand
- Insure resource diversity through a range of generation technologies
- Insure that renewable resources can be integrated into the mix, e.g., that wind power is kept below 20% of supply and is backed up with hydroelectricity
- Lower GHG emissions by 50% to 70% for electric generation compared to 2007
- Provide a cash flow from the CCA portfolio for energy efficiency

This chart shows a recommended portfolio for Sonoma County, using the criteria above.

<u>Facility</u>	<u>Net MW</u>	<u>Estimated Cost (in millions)</u>
<b>Geothermal</b>	<b>125</b>	<b>\$ 375</b>
<b>Cogeneration</b>	<b>60</b>	<b>\$ 90</b>
<b>Biofuel Cogen.</b>	<b>60</b>	<b>\$ 180</b>
<b>Solar Thermal</b>	<b>60</b>	<b>\$ 195</b>
<b>Pumped Storage</b>	<b>90</b>	<b>\$ 135</b>
<b>Wind Farm</b>	<b>150</b>	<b>\$ 285</b>
<b>Photovoltaics</b>	<b>16</b>	<b>\$ 128</b>
<b>Battery Storage</b>	<b>18</b>	<b>\$ 45</b>
<b>Total from CCA Facilities</b>	<b>579</b>	<b>\$1433</b>

Nearly all of these assets would have a useful life of 25 to 30 years, and some of them, such as the pumped storage facility, might last for 50 years or more.

This portfolio is based on a general estimate of a countywide CCA’s load profile, and the size of recommended facilities are intended as a schematic illustrations of how to assemble a clean energy supply portfolio. These facilities are entirely capable of being scaled up or down to meet future contingencies, such as growth in demand, customer opt-out, or resource availability. In the case where certain resources might not be available, such as limited access to site development, other options can be scaled up or down to fill in the gaps. For example, should it not be possible for the CCA to secure a geothermal site, an option would be to scale up the cogeneration component. This would still result in very large reductions in GHG emissions, while maintaining a secure energy supply to meet the base load requirements. This shows that particular energy options are flexible, and that needs can be met in a variety of ways.

## Energy Solutions – Sonoma County Community Climate Action Plan

Most of the facilities in the portfolio above are intended to be owned by the CCA, particularly the larger ones. The photovoltaics and batteries might be owned by the CCA participating customers, the CCA itself, or a third party, depending on available tax credits, financing, siting needs or other considerations.

In addition to the CCA owned facilities, it is expected that the CCA would need to contract for certain power supplies, particularly to backup wind generation, to provide load following capacity, and for meeting reserve requirements. Overall, the proposed portfolio, even with these contracted services, would result in a 50% to 70% reduction in GHG emissions compared to the current electricity supply from PG&E.

In total, the estimated cost of the proposed power supply infrastructure is about \$1.4 billion in municipal bonds, excluding the cost of transmission that is expected to be built by PG&E. This is what will be required to finance a CCA portfolio that will give Sonoma residents and businesses rates equal to or less than PG&E's rates – offering a painless transition to vastly lower carbon electricity. This would provide about 80% of the County's electricity for decades into the future. To put this amount in perspective, \$1.4 billion equals a little more than 3 times \$420 million, the amount that County residence, business and government customers pay per year for electricity. By investing in new local renewable power infrastructure Sonoma County will avoid substantial increases in rates based on rising natural gas costs in coming decades.

The repayment of costs for the portfolio would be folded into the general revenue stream that customers pay on their electric bills, and is projected to result in costs similar to PG&E rates in its first decade of operation. However, if natural gas prices continue to escalate as expected, the renewable portfolio will “lock in” costs to a greater degree than a PG&E portfolio that remains far more dependent on natural gas fuel. For this reason, the expected higher natural gas prices will result in lower rates for the CCA participating customers than for those who remain with PG&E.

## Energy Solutions – Sonoma County Community Climate Action Plan

A second key factor in assessing relative effects upon rates is carbon emissions. It is expected that carbon-emitting sources, such as natural gas power plants, will have to pay for this right to emit carbon into the atmosphere. The model projection assumes \$8 per ton cost imposed on all carbon dioxide emissions, a number that is likely to increase as time goes on, and either lower caps on carbon emissions exert more pressure on markets and/or carbon taxes are imposed. If carbon costs go up, the CCA plan is designed to benefit CCA customers significantly, as the spread between the low carbon CCA portfolio and the higher carbon costs of PG&E increases.

### **Sonoma County Annual Share of Carbon Emissions from Electricity Supply**

	PG&E	CCA
Carbon Emissions (tons)	665,000	250,000
Carbon Rate \$8 per ton	\$5,320,000	\$2,000,000
Carbon Rate \$30 per ton	\$19,950,000	\$7,500,000
Carbon Rate \$50 per ton	\$33,250,000	\$12,500,000

At \$8 per ton the difference is \$2 million per year. But if carbon costs escalate to between \$30 and \$50 per ton, the CCA will avoid between \$12 million and \$20 million per year in carbon fees. Protection from increasing carbon assessments is demonstration of how the CCA clean energy portfolio can protect against risks associated with an energy supply more heavily dependent upon fossil fuel.

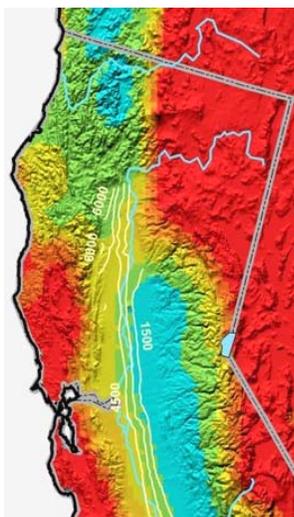
## B. Sonoma County Premier Clean Electric Generation Resources

Sonoma County has an abundance of renewable energy that is only partially tapped. A portion of these resources are quite suitable for generating electricity, though in some cases technology may need further development to fully unlock this potential. There is large additional potential to use geothermal energy for electric generation and heat, as well as offshore wind and ocean power.

The following section is a description of particular resource development projects within Sonoma County and in Northern California that will be utilized in an appropriate portfolio to achieve GHG reduction. It is an example of how a Sonoma County CCA would develop local low and no-carbon electricity generation resources using the municipal revenue bond financing. This portfolio is designed to illustrate how it is possible to meet the local electricity supply needs, and not exceed PG&E's projected energy supply costs over the next decade.

### 1. The Geysers Geothermal Electric Generation

<b>Size:</b>	<b>125 MW</b>
<b>Estimated Cost:</b>	<b>\$375 million</b>
<b>Power Cost:</b>	<b>6.8 cents/kwh</b>



Northern California Geothermal Heat, at 10 km depth. Red means a temperature over 480-degree F. Map: NREL

Looking at an energy map of California, Sonoma County can be seen to sit right on top of a red spot that signifies a high temperature inside the ground. Its source lies deep within the earth; the map to the left shows the temperature at about 30,000-foot depth. The dark red regions represent rock at a searing heat that is in excess of 480 degrees Fahrenheit. This heat, which is a prime quality energy resource, can be found under almost the entire county. While the temperatures grow cooler as they approach the surface, the geothermal heat in the northeastern part of the county

is well over the boiling point of water, sufficient to generate electricity. To date this geothermal resource has been only partly explored or utilized.

Geothermal energy arises due to hot materials from deep in the earth rising to relatively close to the surface. Temperatures of the ground in such areas, that might be useful as an energy resource, can range anywhere from comfortable 90 degrees to a scalding hot 300 degrees Fahrenheit or higher. In order to use this heat, an underground source of water is necessary, which is called a “hydrothermal” resource. The water transfers the heat to the surface. Sonoma County wells between 100 and 1100 feet deep are known to draw up water that is naturally heated, ranging from 90 to 135 degrees F., which is useful for spas and homes. An even higher range of heat, over 300 degrees, is optimal if the intention is to generate electricity.

Geothermal plants are considered the most reliable source of electricity; in fact they are considered the “gold standard” of reliability, earning a rating of over 100% when compared to a gas fired power plant.<sup>29</sup> Geothermal electric generators have several benefits, including long plant lifespan, running 24/7, needing no fuel, having a low profile, and emitting little to no GHG. The main drawback is that they cannot vary their output and thus cannot adjust to the daily and annual increase and decrease in demand for power. A geothermal plant can take care of the low base load requirement, but is nearly useless for meeting peak demand. Though geothermal power can supply the bulk of the county’s electricity, it needs to be supplemented by other energy sources. This should be done in any case because diversity builds resiliency.

Significant development of electric generation from geothermal energy is found in the northeast county, and spilling over into Lake and Napa Counties, at The Geysers. Unfortunately, the manner in which this resource has been developed is not sustainable. Steam from inside the ground has simply been run through the steam turbines and allowed to escape into the atmosphere. This rapidly depleted the resource, rather like a

---

<sup>29</sup>When unconstrained, geothermal can have an effective load carrying capacity (ELCC) of over 100%; California RPS Integration Study: Phase I Summary and Results, NREL, March 2004, p. 12. <http://www.nrel.gov/docs/fy04osti/35947.pdf>

kettle of water left boiling on the stove for hours. This approach was pursued because it was the least costly. However, since 1987 the Geysers electric generation capacity has fallen from 1600 megawatts to 800 megawatts.

To preserve the water in the ground, large pipelines were built to pump water from Clear Lake and wastewater from Santa Rosa. Nearly 19 million gallons of water per day is supplied by these pipes. In addition, about 25% of the steam is recovered. All of this water is injected into the ground through deep wells that recharge the steam pressure. It is expected that this effort will pay off by fully making up for the steam that is lost daily.

Better technology exists today that would allow the energy resource of The Geysers and surrounding area to be used without depletion of the underground steam, or the need to draw from surface water in the surrounding area. This technology keeps the hot steam in a closed loop and re-injects all of it into the ground. A heat exchanger transfers the heat into a secondary loop that powers the turbine. This is somewhat more expensive than the simple geothermal generators that release steam, but it pays back the effort over the long term by preserving the steam resource. This technology provides the added benefit of allowing considerable expansion of the Geysers electric generation without the need to ship more water up the mountains. A CCA could play a critical role in a preservation effort; the CCA's lack of need to maximize profit as well as its lower cost financing can make a closed loop geothermal electric generation process economically viable.

Public financing can help bring down the cost of geothermal electricity sufficiently to make it reasonable to develop this resource in a sustainable manner. In this way, the participation of the county could expand the available resource significantly. It has been estimated that the Geysers regions could support an additional 350 to 550 megawatts of new electric generation.<sup>30</sup> While this is easily sufficient to provide all the electricity needed by Sonoma County for many years to come, the recommended portfolio approach

---

<sup>30</sup> New Geothermal Site Identification and Qualification, GeothermEx Inc. Description of report content is in Geothermal Inventory, New Study Highlights Geothermal Resources Available for Development in California and Nevada, By Jim Lovekin – Manager of Field Operations, GeothermEx, Inc., GRC Bulletin, November/December 2004.

diversifies the investment into a variety of appropriate types of generation. This is important, because geothermal is useful for providing a steady source of “base load” power, but does not vary in output to meet changing demand over the course of the day. For this and other reasons, geothermal energy needs to be supplemented by different sources of power.

## 2. Biofuel/Cogeneration (Heat Recycling)

<b>Size:</b>	<b>60 MW</b>
<b>Estimated Cost:</b>	<b>\$175 million</b>
<b>Power Cost:</b>	<b>7.9 cents/kwh</b>

There is a small but definite potential for using existing biofuels to supply a limited amount of electricity inside the county. Here is a list of the sources for organic fuel.

<b>Sonoma County Local Biomass Resources<sup>31</sup></b>	
	<b>Metric tons</b>
Crop Residues	728
Animal Manure	5,209
Forest Residues	9,297
Primary Mill	110,241
Secondary Mill	6,173
Urban Residues	52,953
Landfill	33,774
Domestic Wastewater	758
<b>Total Tons per Year</b>	<b>219,133</b>

Biofuels are considered low emitters of GHG, because the plant material is made from carbon dioxide in the atmosphere to begin with. The burning of biofuels is thus simply a recycling of atmospheric CO<sub>2</sub> that will be replenished the next year in the form of new plants.

This picture makes a couple of assumptions. First, land use and climate patterns will allow a similar amount of plant material to be grown in future years. Second, the energy required to make the biofuel is minimal or at least minimally carbon-emitting. This is not

---

<sup>31</sup> Data NREL

always the case, as for example in some corn ethanol manufacturing facilities in the Midwest, which use coal to convert the corn into fuel. Better approaches exist to create and consume plant fuels. For example, biofuel conversion can use renewable and/or recycled energy, and crop rotation can be used instead of fossil fuel intensive fertilizers. Both of these greatly reduce carbon emissions as well as other detrimental environmental effects.

Biofuels can take a number of different forms, including ethanol, methanol, carbohydrates, oils, wood-- or even more modern fuels like biodiesel. In addition to the waste materials, which are rather limited, it is also possible to grow energy crops, and the county has sufficient land to make this feasible to some extent. Either public or private lands could potentially be used.

Currently the county has a biofuel facility generating electricity from methane wastes from the Laguna water treatment plant. According to an article from The Press Democrat, a local newspaper,

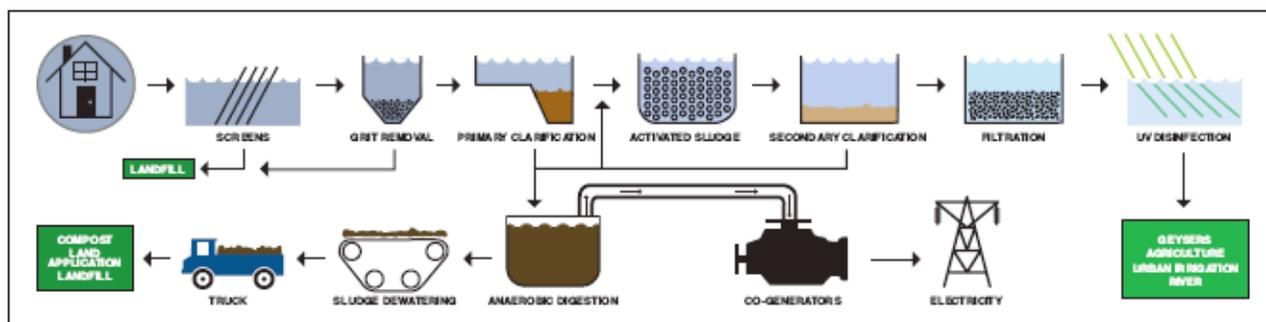
At Santa Rosa's regional sewage treatment plant, sludge is processed to produce enough methane gas to power one of the three engines the plant runs daily, with natural gas making up the difference.

The engines have co-generation units that produce about two megawatts, or about 30 percent of the plant's annual electricity needs. The reduced demand on the power grid equals the annual electricity needs of some 2,000 PG&E residential customers.<sup>32</sup>

---

<sup>32</sup> Green Energy, *How alternative resources have gone from responsible to cost-effective*, by Clark Mason and Michael Coit, The Press Democrat, November 26, 2006.

### Laguna Treatment Plant Recycled Water Treatment Steps<sup>33</sup>



Organic Material from “Wastewater” enters Anaerobic Digester Tank that produces methane and helps power a 2-megawatt co-generator.

A traditional way of cleansing wastewater is to pump air through it, which uses this “aerobic” (i.e., air-breathing) processes to break down impurities. This process consumes lots of energy, without producing any. An Anaerobic Digester, on the other hand, breaks down wastes with bacteria that do not breathe air. This bacterial process creates methane, which some wastewater treatment plants burn in open air, in a process called “flaring”. This completely wastes a valuable fuel, earning the waste treatment plant its name.

Methane is the principle ingredient in natural gas, and the Laguna Plant captures this methane for powering the co-generator unit. A co-generator produces both heat and power, with the heat being used to warm up the water to allow the anaerobic processes to do their work. The Laguna Treatment Plant process chart does not show this heat recycling, an important efficiency component.<sup>34</sup> The Press Democrat article reported that the methane and co-generation saved the city \$500,000 per year in energy costs.

A critical part of making biofuel systems efficient and cost effective is to create what are called “co-products”. The more co-products you can generate, the more efficient and productive the biofuel process. This ability to involve co-processes and generate co-

<sup>33</sup> Source: City of Santa Rosa, <http://ci.santa-rosa.ca.us/ut/pdf/Steps.pdf>

<sup>34</sup> For an excellent presentation of wastewater treatment processes and efficiency improvements, see: Energy Efficient Alternatives for the Fortuna Wastewater Treatment Facility, by Jennifer Fuller. Supported by: The Community Clean Water Institute Fortuna Water Quality Project. <http://www.ccwi.org/issues/Fuller-EnergyEff.pdf>

products is the most complex, but also the most interesting and unique feature of biofuels. The Laguna Plant illustrates this principle well:

- The Anaerobic Digester Process helps to sanitize waste water
- The Digester produces methane used as fuel
- The fuel produces electricity in a cogenerator that powers the treatment plant
- The cogenerator creates waste heat that feeds the Anaerobic Digester
- Finally, the Anaerobic Digester produces compost that can help grow food, which starts the process over again.

Reproducing this type of multiple-element, carefully engineered system is critical to making biofuels into a viable element of the energy system. In this way it is opposite to corn ethanol as an example of biofuel. Corn ethanol does not use a “waste product”, but an essential food product with many negative environmental consequences. It provides a minimal energy and climate benefit due to the high level of petrochemical fertilizers and fossil fuels that are used to grow and process the corn into fuel. The Laguna Plant illustrates the type of thinking that leads to a much more sustainable biofuel economy.

A much larger biofuel facility is at Sonoma County’s central landfill, near Santa Rosa. The landfill collects methane from organic waste and uses it to generate 7.5 megawatts of electricity.

The two waste facilities represent a combined total of 8.25 megawatts running on biofuel, which equals about 2.5% of the average electric demand for the entire county. As can be seen from the table above, the energy resource from solid and water waste is a small fraction, only 15%, of the county’s baseline potential. It is also likely that better organic waste and methane collection methods might be able to supply more methane from the existing processes at the solid and water waste facilities.

Far more biofuel could be developed by going beyond the waste stream to growing actual organic energy crops. These could be used for making ethanol, methanol, biodiesel, methane, or hydrogen. These fuels can in turn be used for generating electricity,

providing heat for buildings or cooking, or as transportation fuels. Most biofuel production requires heat, and a few different opportunities for clean heat sources can be used, including:

- Waste heat from cogeneration
- Geothermal heat
- Solar thermal heat

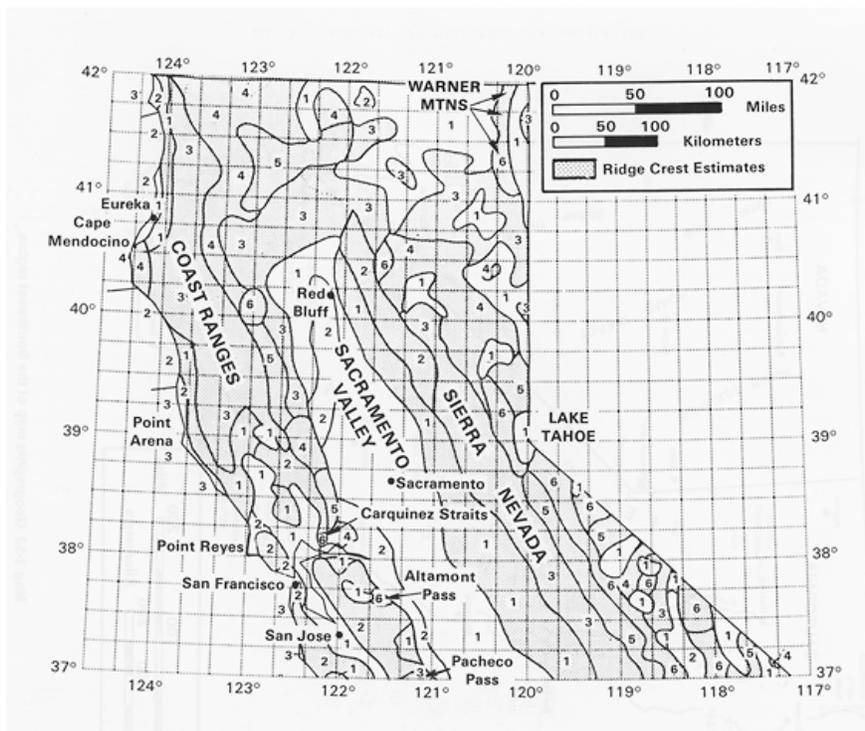
Burning biofuels can emit certain pollutants, mainly particulates. The proposed technology is fluidized bed that would result in much cleaner burning than open combustion, however, more advanced biofuel technologies are in development. One of these is biofuel gasification, which would greatly increase the electric energy yield.<sup>35</sup>

---

<sup>35</sup> IEPR Committee Workshop on the Cost of Electricity Generation. Levelized Cost of Generation Model—Renewable Energy, Clean Coal and Nuclear Inputs, Navigant Consulting, June 12, 2007.

### 3. Wind Power

**Size Range:** 150 MW  
**Estimated Cost:** \$285 million  
**Power Cost:** 6.8 cents/kwh



Mid 1980s Wind Map shows regions of wind resource ranked by Classes from 1 to 6. Class 5 is the likely minimum for commercial development. Some changes have occurred in more modern wind charts, with a downgrading of the Class 5 region to a Class 4, Southwest of Red Bluff along the coastal range. (NREL)

Our analysis of average local wind speeds has led us to determine that onshore wind is not of sufficient strength to provide for efficient generation of electricity in most of Sonoma County. However there are other resources nearby that are large. Solano County has excellent wind resource and several wind facilities have been built there, and there is still significant additional space for more development. And further north, to the West of Red Bluff, is an excellent location for a wind farm from the viewpoint of energy resource and access to an existing transmission corridor. A possible wind site at the Geysers is

being tested by PPM Energy, a private developer, and new generation wind turbines may be able to take advantage of lower levels of wind to make such development feasible.<sup>36</sup>

A far greater resource exists offshore; in fact the winds just a few miles directly off the coast are world class and could potentially supply the equivalent of all of the county's electricity. To use this resource today would require building wind turbines and electric transmission lines within easy view of the coast, which would have limited feasibility even if the community accepted such an intrusion on the shoreline. It may be worthwhile to do a more accurate assessment than has been performed to date in order to determine the exact location of the high quality wind. However, it is likely that the water is too deep for today's offshore wind turbine designs.

Much better would be to place wind turbines far enough offshore that they would be either not visible at all, or only minimally so. Large floating turbines are being designed that may see the light of day over the next decade or so. The offshore wind is much steadier, as well as more powerful, than the onshore wind and thus would make for a superior and more reliable energy supply. The upfront cost of such offshore wind turbines is significantly higher than for their onshore counterparts, but a superior wind regime will make up for most of this added expense.

Wind power is an intermittent source of power and therefore needs support from energy systems that will supplement when wind output is insufficient. These systems are described below in the section on Energy Storage. Today natural gas electric generation is the common backup system, but this emits too much GHG to achieve the necessary reductions targeted by the county. For this reason, natural gas use will be minimized.

---

<sup>36</sup> Green Energy, *How alternative resources have gone from responsible to cost-effective*, by Clark Mason and Michael Coit, The Press Democrat, November 26, 2006.

#### **4. Energy Storage: Batteries**

<b>Size Range:</b>	<b>18 MW</b>
<b>Estimated Cost:</b>	<b>\$45 million</b>
<b>Power Storage Cost:</b>	<b>20.9 cents/kwh</b>

Wind generators only produce energy when the wind blows, which is not necessarily correlated to demand for electricity. One way to enhance the value of wind power is by storing the energy until the time when it is most needed. In California the wind typically picks up at night, when demand and energy prices are low.

A storage system would allow the energy to be deployed during the peak hours of demand during the day, when the need for energy, and prices, are high. Though many ingenious ways have been devised to store energy for electric power, there are not many ways to store large amounts of power economically.

The best-known system of storage is a battery. Batteries are very efficient and highly portable compared to a natural gas, coal or nuclear power plant, they usually do not emit air pollution or GHG (except lead-acid batteries can emit hydrogen sulfide), and most batteries can be placed near or at the site where the energy is needed.

Battery systems have been used reliably for at least 200 years, but most batteries suffer from numerous problems. Among these are: short useful life, inability to be charged and discharged to their full storage capacity, high expense when compared to the energy supplied, performance loss over time, and large volume and weight required to store significant amounts of energy.

New battery technologies, and improvements to old battery technologies, have reduced the drawbacks greatly. Prices for energy storage are cheaper, product life is longer, and performance has improved. One of the most remarkable new battery systems is the Sodium Sulfur Battery. This is the first battery system that can efficiently store megawatt levels of power that is useful at a utility company level. Industrial strength, these batteries can last for 15 years or longer, can take very deep charge cycles, and come in power

packs up to 9 megawatts. These batteries can be charged at night using inexpensive wind, hydroelectric, geothermal or other grid power. The energy can then be released during the peak hours of demand in the day for 6 or more hours. These batteries are expected to come down in price, though they are currently only slightly more expensive than a new natural gas peaking plant, once future lifecycle fuel prices are taken into consideration.

## **5. Energy Storage: Pumped Water Storage**

<b>Size Range:</b>	<b>90 MW</b>
<b>Estimated Cost:</b>	<b>\$137 million</b>
<b>Power Cost:</b>	<b>15.8 cents/kwh (including input power)</b>

Another option for storage is pumping water into a small reservoir at a high elevation at night, and releasing the water through turbine generators into an existing lower reservoir during the day. These facilities recycle water, and thus does not “use up” water like traditional hydroelectric plants. And while hydroelectric power plants churn up images of vast public works projects with potentially serious environmental impacts, pumped storage units are remarkably compact.

To give a comparison is useful. In the central valley near Sacramento, 340 foot high Folsom Dam generates about 198 megawatts of power and creates a 15 mile long artificial lake, called Folsom Lake that occupies up to 10,000 acres.<sup>37</sup> Upstream in the mountains, Sacramento’s public power agency, SMUD, is planning to build a 400-megawatt pumped storage facility that will require an upper reservoir of only 109 acres. Using only 1% as much space as Folsom Lake, this facility will generate up to twice as much power.

Pumped storage benefits from a large difference in elevation between two reservoirs, and also from using an existing lower reservoir with sufficient water. Sonoma County has an ideal site that matches this description at Lake Sonoma, with elevations to the north of the

---

<sup>37</sup> [http://www.parks.ca.gov/default.asp?page\\_id=882](http://www.parks.ca.gov/default.asp?page_id=882)

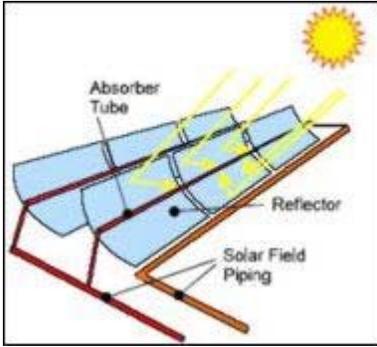
lake below the ridgeline at about 500 feet above the Lake. While it may be possible to build hundreds of megawatts of capacity on this site, Local Power advises building a facility of more modest scale in order to minimize impact on the land; the proposed 120 Megawatt pumped storage upper reservoir should occupy about 60 acres. There is some economy of scale that can be realized for pumped storage units, and a balance will have to be found between optimal energy cost and maintaining a modest footprint on the land.

The proposed portfolio is designed to diversify energy supplies and not get all peak power from only one source. The pumped storage, however, serves an additional critical function— to balance out the wind generation and convert it into a highly reliable energy supply that can be used during the peak hours of the day. Pumped Storage has the remarkable property that it can counterbalance more than its rated capacity in wind power. For example, a 150-megawatt wind farm might fluctuate from a low of 10 to a high of 150 megawatts of output within a single day, representing a swing of 140 megawatts. The pumped storage can take up to 120 megawatts of that swing and convert it into pumped hydro energy, leaving the “wind only” output to move from 10 megawatts to 20 megawatts. The swing in power output is reduced from 140 megawatts to only a difference of 10 megawatts of output, an amount that can easily be assimilated usefully by the grid in other ways.

## **6. Solar Thermal Concentrator**

<b>Size Range:</b>	<b>60 MW</b>
<b>Estimated Cost:</b>	<b>\$190 million</b>
<b>Power Cost:</b>	<b>16.3 cents/kwh</b>

While Sonoma may have to look to neighboring counties to develop a facility, a solar thermal concentrator should be on the top of its list for development. Another important resource, particularly in California, is solar energy. While photovoltaic “solar panels” are quite popular for placing on rooftops, another technology has been developed using mirrors to focus light and collect the heat energy of the sun. Long transparent tubes are placed at the focus of the light and heat up a fluid inside the tubes to a very high



temperature. The fluid in the tubes is circulated to a heat exchanger that is used to turn water into high temperature steam. The steam then powers a conventional steam turbine running an electric generator.

While these facilities are best located where there is the most sun, modern solar thermal plants are highly reliable and— if designed properly— can generate electricity at any time, whether or not the sun is shining. They use two different methods to accomplish this trick. The first is to store the hot fluid in an underground storage tank that stays hot if the sun passes behind a cloud, and even for hours after the sun has set. A second backup is to use natural gas to power the same turbine at night that the sun powers during the day.

Sonoma County is not an ideal location for a solar thermal electric generating plant, since solar energy hitting the ground is neither sufficiently steady nor powerful to be a significant resource. However, a countywide CCA could partner with other CCAs or public power agencies to build a solar facility in a better location. This would have the double benefit that the solar thermal facility could be scaled up considerably compared to what Sonoma County would need only for its own purposes. At larger scale the unit cost is likely to decrease substantially, and thus provide more affordable electric energy costs.

While the cost of solar thermal generation can appear to be high, it provides power during the hours of the day when the demand peaks. At these hours, particularly between noon and 6 pm, the cost of purchasing electric energy can be very expensive. A solar thermal plant provides an excellent hedge against likely future increases in natural gas prices, while the natural gas is only used to generate less than 20% of the plant's electric output. With underground thermal storage systems, the natural gas component can be reduced to below 10%.<sup>38</sup> At an expected cost of 16.6 cents/kwh, solar thermal electricity should be fully competitive with a new natural gas power plant operating under similar demands.

---

<sup>38</sup> Source: Solargenix

An optimal location for a regional solar thermal farm would be to the east side of the Central Valley, and in general to the South, which enjoys much better sunshine than Sonoma County.

## **7. Solar Photovoltaics**

<b>Size Range:</b>	<b>16 MW</b>
<b>Estimated Cost:</b>	<b>\$123 million</b>
<b>Power Cost:</b>	<b>20 to 40 cents/kwh</b>

Photovoltaics are manufactured crystals, usually of highly refined silicon, that convert sunlight directly into electricity. This method of generating electricity is considered relatively expensive compared to the usual methods of coal, nuclear and natural gas power plants. On the other hand, unlike the other methods just mentioned, solar panels can be safely placed on a roof. This confers a number of advantages to the solar panels, the most important being that it can generate power anywhere that it is needed. If batteries or other energy systems are used for backup, then the solar electric system can be completely cut off from the electric grid.

Solar cells have proven to be highly reliable, usually operating for years with very little maintenance, and absolutely no fuel requirement other than sunlight. They emit no pollution, make no noise, and can cut a very low profile.

The prime drawback is that the initial outlay of funds is large for most people, and can run from \$10,000 to over \$30,000 for a home or small business. Over the decades during

which they will produce power, solar electric systems can pay back the initial cost of investment while providing insurance against future rate increases from the utility company. Federal tax credits and state rebates help bring down the cost sufficiently to make the value equation work, particularly for customers faced with the combination of high electric rates and good sun found in California.

To make solar electric generation pay off requires careful planning. Good support program structures can help a great deal. For example, CCA bulk purchasing of hardware, and exercising good quality control, can help lower costs and improve performance. Solar panels produce electricity during the day, at times that match the peak demand for energy use by businesses and industry. They do not match nearly so well the energy use patterns of households, which usually need electricity in the early morning and in the evening. In addition, solar electricity is more expensive for homes than for businesses due to economies of scale as well as the tax benefits and financing options available to businesses.

Owner	Cost of Electricity
Residential (with rebates)	40 to 50 cents/kwh
Government/CCA	30 to 40 cents/kwh
Commercial (with tax credits and rebates)	8 to 15 cents/kwh

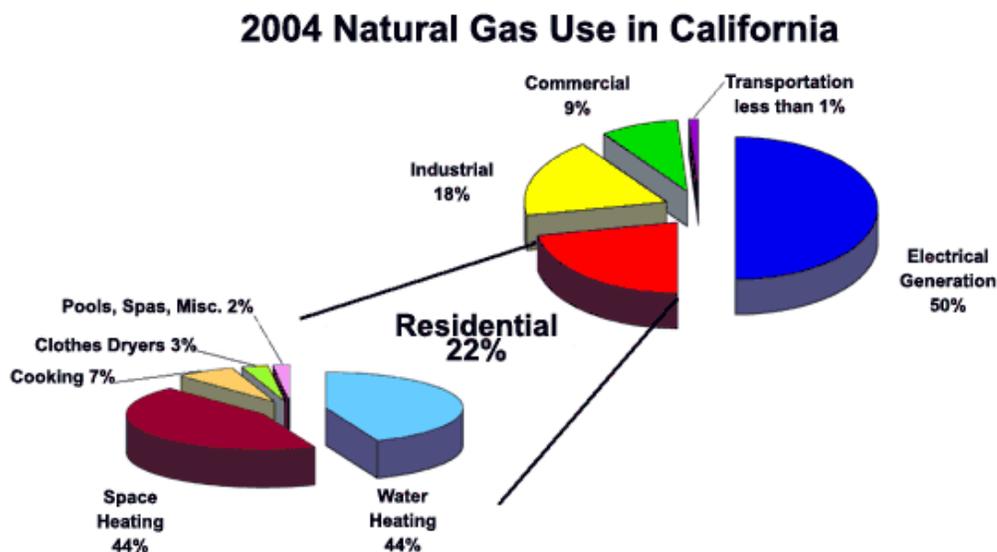
Local Power estimates that a Sonoma County CCA could benefit by the development of 16 megawatts of photovoltaics over the next decade. This would be sufficient to supply 0.7% of the county’s electricity and help to meet peak demand during the day. Additional photovoltaic systems either already have been or could be built in the future, but these would not necessarily be financially supported by the CCA. Currently, a number of solar photovoltaic systems exist or are planned in Sonoma County; here is a sample of larger projects

**Large Photovoltaic Projects in Sonoma County <sup>39</sup>**

Location	Size in kilowatts
Codding Enterprises, Rohnert Park	1,000
Rodney Strong Vineyards, Healdsburg	750
Sonoma County Water Agency, Santa Rosa	522
St. Francis Winery & Vineyards, Santa Rosa	450
Pine Creek Properties, Santa Rosa	200
Ted Stevens Auto Group	130
Santa Rosa Junior College, Santa Rosa	80

**C. How to Reduce the Burning of Natural Gas**

Natural gas combustion accounts for about 17% of GHG emissions within Sonoma County. In California half of natural gas is burned to generate electricity, and most of the rest is used for heating water and indoor air. Thus, water and space heating represent the biggest opportunities for reductions in emissions from natural gas outside of converting the electric system to renewables.



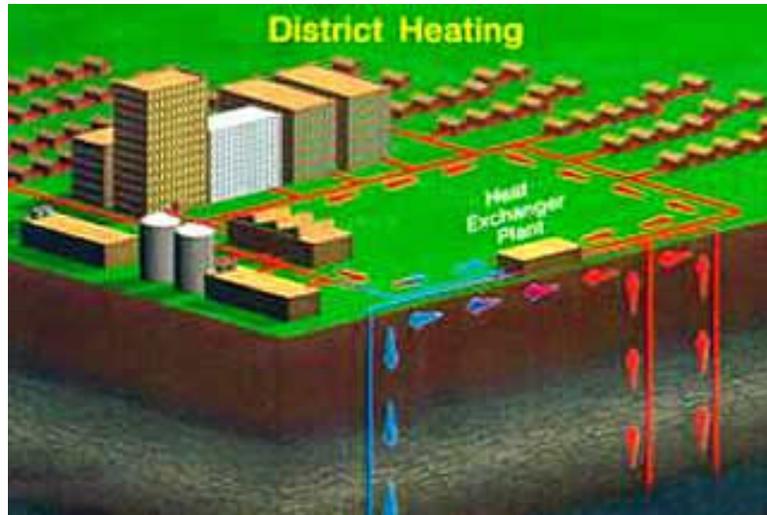
Source: California Energy Commission

<sup>39</sup>PVResources.com, etc..

## **1. Geothermal Heat**

Most areas of the county do not have sufficiently hot water near the surface to use for generating electricity. Water temperatures in wells of 100 to 1100 foot depth can range from 90 to 130 degrees F. These temperatures are ideal for contributing to indoor space heating in the winter, and to hot water year round. Such applications of geothermal energy can be more economical to tap than electric generation for a variety of reasons. Drilling costs for shallow wells, which can cost thousands or tens of thousands of dollars, are orders of magnitude less than the millions of dollars in drilling costs required for geothermal electric generation, which usually requires wells that may be thousands of feet deep. In addition, conversion of geothermal heat to electricity is only about 10% efficient, due to the relatively low temperatures of geothermal steam compared to steam produced by fossil fuel power plants. Direct use of the heat is more efficient than using the heat to produce electricity. Most important, from the viewpoint of sustainability, geothermal sites used for generating electricity last for decades before they need to be retired. Geothermal energy that is used for lower temperature applications like heating buildings and water, however, is expected to last for centuries.

Geothermal wells can be drilled anywhere there is a concentration of population, and the water may be shared around a neighborhood. One of the geothermal spas in Sonoma County shares its hot water with a residence across the street. The water can be pumped hundreds of feet in pipes beneath the ground, and thus one well could potentially serve a number of customers. Several large deep wells in Santa Rosa could be used to feed a local infrastructure for hot water throughout a significant part of the city. This application has examples in other geothermal regions, and is referred to as “Geothermal District Heating.” Such wells are often much deeper than would be economical for a single facility such as a few homes or a spa.



Source: Idaho Energy Division

The best example in the US for geothermal district heating is in Idaho, where there are seven such systems. The largest is in the capitol, Boise, which serves government buildings, businesses, and over 300 homes. Wells around the region can be 3000 feet deep or more, and provide hot water between 101 and 175 degrees. The Idaho Department of Water Resources website states that



“Idaho has the only State Capitol building in the United States that is heated by a geothermal direct use application. The Capitol is part of the Capitol Mall Complex, which heats more than 1.5 million square feet in nine public buildings. The Capitol Mall system had an average annual production of 128 million gallons between 1997 and 2000. The production well is over

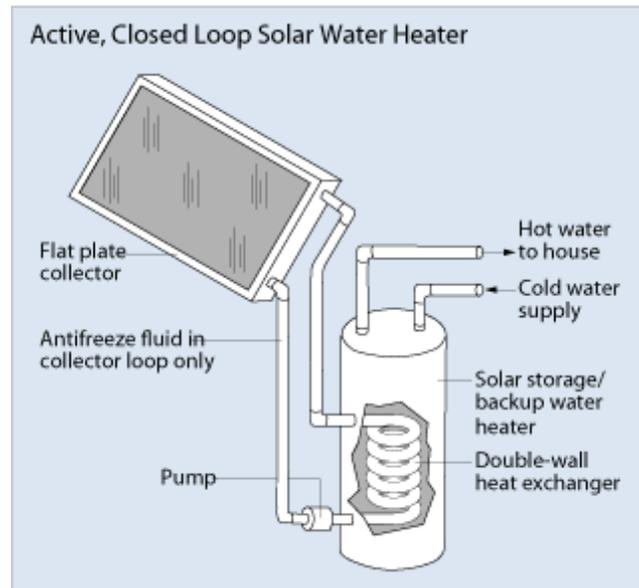
3,000 feet deep and the water temperature is about 155° F. The used geothermal water is re-injected into the aquifer system.”<sup>40</sup>

<sup>40</sup> Idaho Department of Water Resources, Idaho Energy Division.  
[http://www.idwr.state.id.us/energy/alternative\\_fuels/geothermal/detailed\\_district.htm](http://www.idwr.state.id.us/energy/alternative_fuels/geothermal/detailed_district.htm)

Sonoma County has resources similar to Boise’s with a milder climate. Heating needs in the winter are comparatively modest, while hot water needs are likely similar. There would appear to be little reason why the county could not develop this energy resource in the areas where population and geothermal energy are concentrated such as Santa Rosa, Sebastopol, and Sonoma. While the initial cost would be in the millions of dollars, the heat could be sold in the same way natural gas is sold today. Such an arrangement could be greatly facilitated by forming a natural gas consumers’ aggregation, similar in structure to a CCA.

## 2. Solar Hot Water

A well-developed and easily implemented technology is using solar energy to heat water for homes and businesses. One or two panels can be placed on a south-facing roof that collects heat during the day. The heat is transferred to a standard hot water tank that can also be heated by natural gas when the sun is not shining. The added cost to put supplemental solar hot water on a rooftop is about \$3000 to \$6000 per household, an amount that could be significantly reduced if solar hot water heaters were mass-produced. In Israel, for many years, solar hot water has been mandated by building codes to reduce dependency on imported natural gas fuel. The result was that, in the 1990s, solar hot water heaters only cost about \$1000 per unit.



Schematic of a solar hot water system

Solar hot water would not provide energy for the electric system, but could avoid the consumption of natural gas. Rough estimates suggest that solar hot water systems can reduce residential natural gas consumption by 40% or more, and if they were installed on all homes about 5% of all natural gas consumption in the state would be avoided.

Of course, not all homes are ideally suited to solar hot water heaters. There must be adequate local sunshine, which most of Sonoma County has, access to a south facing roof or other suitable support structure, and a location sufficiently free of shading.

Significantly more savings would be possible if solar hot water were also used in non-residential sectors as well. On the other hand, it is likely that large consumers of hot water, and areas with concentration of people or businesses might be better served by the region's geothermal energy to heat the water. Since geothermal heat is available around the clock, and not just during sunny days, it would also result in greater fuel savings than solar hot water.

An optimal program would take advantage of both of these methods for providing hot water, with geothermal heat in the central cities and towns, and solar hot water for outlying populations. These systems would be best implemented with the support of the local governments and perhaps the use of building codes that would mandate solar hot water for new structures, or even more broadly where circumstances are appropriate. To the degree that these technologies are widely deployed, economies of scale will help to reduce the cost for everyone and also fulfill the promise of real reductions in GHG emissions due to direct use of natural gas in homes and businesses.

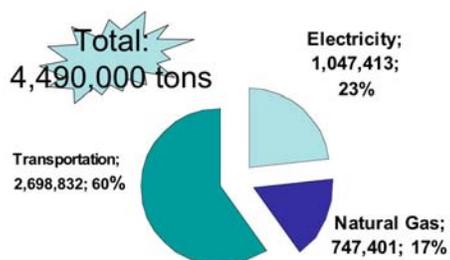
A CCA can provide a suitable financing mechanism that would ease deployment for customers who cannot or would otherwise not want to afford a solar or geothermal hot water system.

## D. Conservation and Energy Efficiency

### 1. Conservation

While conservation on a personal level can have a significant effect in the larger world, conservation does not depend only on remembering to turn off the lights when you go out of the room. Conservation is also capable of being created by design and by public policy choices. This can achieve tremendous savings of energy while, if properly done, not significantly reducing the quality of life or services that people are accustomed to.

**Tons of Carbon Dioxide from Sonoma County Sources - 2005**



Demand Response automates a voluntary conservation process. Demand Response is a built in program of reducing energy consumption at times of peak energy usage. This is usually reserved for power emergencies when the transmission lines and power generating stations are strained to the limit. Demand Response can take different forms. One of these is by special pricing that a customer agrees to if they reduce their energy usage when the electric grid operator requires it.

Special electric meters can be placed in homes and businesses that relay the strained conditions by showing greatly elevated prices of electricity during different hours of the day. Customers do respond to this, as long as the market and electricity usage information is clearly communicated and easily visible.

An alternative to the market-based metering system is to set up contracts with certain customers who agree to curtail loads if called upon by the system operator. Usually this arrangement is reserved for large business and industrial customers who have large energy appetites. The customer is either given a special rate, or, potentially, they can be paid directly in a similar way that electric generators are paid. By curtailing consumption

during these stressed hours the customer is actually avoiding the need to purchase very expensive power. This can range from 16 cents to over a dollar per kilowatt-hour. Part of this savings can be paid out directly to the customer, in effect buying negative kilowatts--or “negawatts.”

The State of California requires that utilities obtain at least 5% of its peak electricity capacity needs from Demand Response.<sup>41</sup> For Sonoma County this would represent about 35 megawatts. With the emergence of mainstream demand technologies like Converge in conjunction with both utility and individual customers, Demand Response represents a very low hanging fruit in Sonoma’s Climate Plan.

Mechanical controls can conserve energy by installing sensors or switches that, for example, turn off the lights when they are not needed. This is, effectively, a machine doing what a person would do if they remembered to turned off the lights. It is a form of automated conservation. As Demand Response may be treated as “virtual capacity” for sale in a wholesale or retail peak power transaction, it is easily monetized and may therefore be financed with H or H2 Bonds in conjunction with CCA revenues, just like solar or wind power.

Other controls can allow a person to intervene into a system that would otherwise not be so convenient. For example, many new appliances have transformers and indicator lights that stay on all the time, even when they are not needed in any way. These small power loads are like energy leaks in the appliances, and are becoming an increasing percentage of electricity consumption. By building in proper switches into the house circuits, some of these power drains could be turned off, where today the only way to do this is often either unplugging the cord or getting down on your hands and knees to turn off the switch on power strips. This could be addressed by better access to control switches. Turning off “parasitic loads” could save up to 5 percent of household electricity.

---

<sup>41</sup> This is capacity in Megawatts, not energy supply. California Public Utilities Commission Decision D.03-06-032.

## 2. Energy Efficiency

Efficiency is defined as the amount of energy output from a machine that represents useful work. It is usually expressed as a percentage. The scientific laws of heat energy, called thermodynamics, tell us that the useful energy output must always be less than the energy input. Thus, there can be no 100% efficient machines. While we can sometimes get surprisingly close to 100% efficiency through good design of the machinery, our present energy systems are all too often discouragingly wasteful. The electrical system is particularly bad--of course, on the flip side, this means that there is enormous opportunity for improvement.

The energy needed to produce light from an ordinary incandescent light bulb requires an electrical generator, and the generator needs fuel. On average, the machines that generate electricity in the US are about 33% efficient. Of the power that leaves the electric generator, nearly 10% gets “lost” in the wires on the way to your house. Thus, 70% of the energy is wasted before you even turn on the switch. The light energy in a light bulb is measured in “lumens”, and a typical light bulb puts out perhaps 10 lumens for each watt of power that it consumes. A fully efficient light bulb would pump out closer to 220 lumens, which means that over 95% of the energy that a normal, off-the-shelf light bulb consumes is wasted.

Of the original energy in the coal, natural gas or nuclear fuel, only about 1.4% emerges as light that is useful to you. Replacing that light source with a compact fluorescent (CF) bulb improves the matter considerably, since a CF pumps out about 60 lumens per watt of power it consumes. As impressive an improvement as this is, yielding up to 6 times as much light for the same amount of energy, it still means that the total “fuel energy--to electric generator--to light bulb” efficiency is only about 8.2%.

A common measure of the efficiency of our energy usage is called “energy intensity”. This refers to how much energy is required to produce one dollar of economic activity. All industrial societies go through a bell shaped curve, where they initially need more and

more energy to produce a dollar of output. Then the curve peaks and, as machinery begins to get more efficient, the economic system as a whole becomes much more energy efficient. This peak in energy waste happened in the US decades ago, and has improved dramatically over time. Even after adjusting for inflation, the amount of energy required to produce a dollar worth of goods or services has dropped in half since 1970.

In other words, today we are getting half of our energy supply from energy efficiency, when compared to how we were using energy in 1970. This gain is dramatic and real, and far exceeds consumption of any fuel.

The California Public Utilities Commission has set targets for the utility companies to offset half of new demand growth for electric power through energy efficiency programs set up by the commission and the utility companies.<sup>42</sup> But this is only a fraction of what is possible. The Western Governors' Association in 2006 established a target of saving 20% of projected electricity demand by 2020. In fact, after researching a number of different efficiency programs, they concluded that such a target could likely be met earlier.

A local program that would combine new building codes with an energy resource plan under CCA can further electric system efficiency targets. The efficiency program can be supported by state program funds, but the CCA can also plan and fund these independently. Most energy efficiency is cost effective without any help, and estimates in the past have suggested that somewhere between 20% and 60% of electricity can be saved with investments in energy efficiency, far less money than it would cost to generate the same electricity.

CCA presents a significant opportunity for energy efficiency development. A Sonoma CCA may declare its intent to apply to become an administrator of all electric energy efficiency funds collected from CCA customers pursuant to PUC 381.1 (a), or otherwise request that the California Public Utilities Commission adopt a Decision allowing CCAs

---

<sup>42</sup> Energy Efficiency targets were adopted by the California Public Utilities Commission in Decision D.04-09-060.

to collect their own Public Goods Charge (PGC) funds at the same minimum levels required of PG&E, exempting the participating CCA customers from paying into the PG&E PGC Fund, As a consequence, any Sonoma municipal agencies that have historically partnered with PG&E in implementing energy efficiency programs in the county, or otherwise in negotiations to continue this partnership, may discuss options for becoming fund administrators and shifting implementation onto the CCA Supplier.

For many years in California, utility companies have been primarily—but not exclusively—responsible for energy efficiency programs. Since the 2000-2001 “Energy Crisis” there has been a renewed emphasis on using energy efficiency as a resource. This has been reflected in greatly increased budgets allocated by the California Public Utilities Commission (CPUC). In 2004, spending was set at about \$400 million per year for customers of the “Big Three” utility companies; by 2008 this budget had been increased to \$800 million. The money comes from two sources: a surcharge on all electric bills is pooled with funds from the utility companies’ own procurement budget. Both of these allocations are mandated by the CPUC, as are the energy savings targets for each utility.

More recently, the CPUC has instituted a program of paying the utility companies a guaranteed profit if they meet certain targets. These are disbursed directly to stockholders, and are called “shareholder incentives.” The idea is to give utilities an incentive to “unsell” their primary product: electricity. While California some years ago “delinked” utility company profits from the volume of electricity sold, they still make money from building power lines and owning power plants. The actual profits from the efficiency programs are an order of magnitude smaller than the customary profits the utilities make by building and operating infrastructure devoted to delivering electricity. This leads to a significant conflict between the two endeavors.

Results of efficiency programs administered by California’s utility companies have been mixed. Reasonably good results have come out of the programs for large commercial and industrial customers, but the outcome of efforts to save energy for residential customers has been poor. Shortfalls in meeting goals have been common, and as a result the CPUC

recently ruled that the utility companies could still get paid even if they did not meet the goals—60% of the target has now been deemed to be sufficient.

PG&E's long-term procurement plan calls for increasing savings in each year for the service area, with program funds paying for reduction in demand for power. By 2016, the end of the current 10-year planning cycle, the utility has projected that it will save between 1487 and 2195 megawatts of power, out of a total demand of 25,142 to 26,515 megawatts in the CAISO Northern Region (NP26). However, there is no real guarantee that these savings will be manifested, and the recent ruling of the CPUC on energy efficiency profit incentives suggests that expectations are already being lowered significantly.

Several programs in the state have been administered or implemented by non-utility entities, and these entities are much less entangled with utility company electric sales. A study by Richard Esteves of SESCO, Inc. in 2003 compared the results of 37 efficiency programs in California. The study was based purely on self-reported energy savings and expenditures by utility companies and independent entities. They showed an average energy savings to cost ratio of 2.00, meaning that the value of savings was double the amount of money that was invested. While this suggests a reasonably good program performance, it masks the serious underlying problems. Results were very uneven: commercial savings rated a high 2.6, residential programs only got a 1.63. However, these results combined the efforts of third parties under contract with the programs implemented by utility company staff.

If the results are separated a stark picture emerges. The third party entities were getting \$3.79 of energy savings for each dollar invested, while programs implemented by utility company staff were only getting 87 cents of energy savings on the dollar. In other words, the utility program was not cost effective and was in fact losing significant amounts of ratepayer money. The independent entities were getting over 4 times the savings per dollar invested in residential energy efficiency. There is little question that removing these programs from utility control is one of the most cost effective investments that can

be made. In Sonoma County, about 43% of electricity is sold to residential customers; thus it is very important to consider how these funds are spent. A Community Choice program would offer the opportunity to save far more energy per ratepayer dollar, particularly in the residential sector.

The light bulb analysis shows that efficiency is by far our greatest energy resource. It has been conservatively estimated that the U.S. wastes more energy than Japan consumes, offering a huge opportunity. The tremendous progress in efficiency to date suggests what is possible.

Many improvements in energy efficiency are already cheaper than coal. This energy efficiency can be treated as commoditized virtual electric power capacity in a structured long-term power supply agreement built on bond-financed public works projects. The financial savings from implementing low-cost energy efficiency can be captured to “fund” higher cost clean energy technologies that offer higher value, an opportunity that is currently blocked by utility tariffs and transactions. With no sunk investment in existing fossil fuel infrastructure, power plants, and transmission lines, CCAs are uniquely positioned to implement a scaled acceleration of demand-side technologies, integrating energy efficiency with photovoltaics, urban wind, fuel cells, demand response, and microgrids.

### ***Statutory Discussion***

AB117 provides an opportunity for CCAs to apply to administer substantial annual recurring revenues paid by ratepayers in their jurisdictions. These funds are currently administered by investor-owned utilities: Sempra, Edison and PG&E.

Electricity customers in Sonoma County currently pay a surcharge, called the Public Goods Charge (PGC) for various public purpose programs including energy efficiency, renewable energy research and development, and low-income energy efficiency programs, among other activities. The PGC is collected from retail electric and gas customers throughout the state. For Sonoma County, the energy efficiency PGC funds

are currently administered by PG&E. However, AB 117 provides that the CPUC should establish a process whereby CCAs and other entities may apply to become administrators of these funds, or require the IOU administrators to direct a proportional amount of energy efficiency resources to CCA service territories. As stated earlier, the CPUC has indicated in its Energy Efficiency proceeding that it may, at a future date, elect to allow CCAs to administer the PGC funds collected from their customers by PG&E, or to collect their own energy efficiency funds from participating ratepayers.

Under a CCA program definition, Sonoma municipalities and county may either apply to the CPUC to administer PGC Energy Efficiency funds collected by PG&E, or establish a separate collection of its own public goods charge funds on PG&E bills commencing upon establishment of CCA service. Customers who opt out of the CCA program will continue to receive energy efficiency services from PG&E.

Based on information received from PG&E regarding the level of electric PGC funds collected within Sonoma County, millions of dollars in annual energy efficiency funds may be available for Sonoma's CCA energy efficiency projects, which over the course of a CCA contract are worth as much as a new power plant.

Administration of funds is not necessarily tied to who actually performs the energy efficiency services. Sonoma's PGC funds could be administered by staff employed by the CCA, and the energy efficiency programs themselves be implemented by the electric supplier and its subcontractors. The efficiency resources can be designed as components of the CCA's "low carbon" portfolio outlined in its CCA Implementation Plan.

PGC funding will be supplemented by additional funds from CCA revenues, H Bonds and other public financing. These several funding sources will finance strategic energy efficiency and conservation activities of the CCA.

Whether or not Sonoma is able access the PGC funds through the CPUC, the CCA supplier may have access to additional funds for energy efficiency activities, such as

CCA revenue bonds. However, the amount and timing of revenue bond issuances dedicated to the implementation of the energy efficiency activities will depend on the response of bidders to the RFP. The Sonoma CCA’s ability to secure the supplemental funding through the PGC will also affect timing. The CCA will seek opportunities to lower the cost and improve performance of its resources. Emphasis will be placed on peak demand reduction that offsets the need for the most expensive power purchases.

### ***Regulatory Discussion***

In D.05-01-055, the CPUC stated its intention to examine the role of CCAs in Section 381 fund disbursement.

“At the same time we recognize that ultimately CCAs are appropriately independent agencies that should have considerable deference to use Section 381 Funds” (D.03-07- 034), and have reserved broader issues about CCAs role and discretion for later determination.”

The CPUC indicated that it would consider the manner in which customer funds could be redirected from the utility company to the CCA, if the CCA wishes to administer them directly:

“Stated another way, we may revisit the question of whether CCA customers should be relieved of their responsibility for energy efficiency PGC and procurement surcharges if the CCA elects to take over these functions. Nothing in this decision prevents us from modifying the process for allocating PGC funds to CCAs in the future”

To ensure that the maximum amount of resources are committed to local energy efficiency programs, along with CCA portfolio integration capabilities regarding energy efficiency investments and local control of ratepayer funds, the Sonoma County Administrator may upon its initiative engage the CPUC to reopen this issue, or seek direction from the Sonoma Board of Supervisors. The county-wide CCA would have the option of administering local energy efficiency funds for all municipalities and the unincorporated areas. If municipalities wish to directly administer energy efficiency

public goods charge funding in their communities, they would have to individually plan a termination of any outstanding PG&E Partnership programs.

***Important Distinctions***

Communities investigating CCA now have full access to all local electric system data. CCAs may also upgrade data capabilities to enable acceleration of demand side technologies as well as renewable distributed generation such as solar photovoltaics, urban wind, and onsite renewable power storage. Effective negotiation with suppliers requires data to map out energy load patterns in Sonoma County, and to determine siting for green power facilities at dozens to thousands of locations.

## ***V. Governance and Investment Vehicles***

### **A. Summary**

This section identifies the process and programs by which Sonoma County could recoup its green investments and raise revenue. This is an analysis of implementing programs that would be needed, including specific econometric estimates of payback periods, gross expenditures, and debt levels for the portfolio options, and other detailed financial projections relative to the included resources. Analysis identifies the amount of capital investment and the time and rate of payback.

### **B. Community Choice Aggregation (CCA)**

Community Choice (CCA) is a key strategy that can give Sonoma County the ability to develop renewable energy facilities on a scale that will reduce the need for fossil fuel electric generation from the Western Regional Power Grid. CCA is technically easier to implement and less risky than a municipalization, but facilitates local control of energy resource planning. Under a CCA, Sonoma would procure power services on behalf of residents and businesses; PG&E will continue to provide distribution, meter-reading and billing services, and would remain the Provider of Last Resort. By leaving physical delivery of power to customers and related operations to PG&E, CCA enables a competitive CCA supplier to focus on power procurement and resource planning: resource adequacy, schedule coordination, new renewable resource development, energy efficiency measures, and a customer call center.

CCA is an established, successful method of procuring competitively priced energy services. Nationally, CCA uses economies of scale to leverage lower prices, cleaner power and better service. Since 1997, CCA Laws have been passed by New Jersey, Ohio, Massachusetts, California, and Rhode Island. All of Cape Cod formed the nation's first CCA in 1997, and has provided electricity service and energy efficiency services at below-market prices since then.

The Cape Light Compact is a regional services organization made up of all 21 towns of Cape Cod and Martha's Vineyard, and Barnstable and Dukes counties. The purpose of the Compact is to represent and protect consumer interests in a restructured utility industry. As authorized by each town, the Compact operates the regional energy efficiency program and works with the combined buying power of the region's 197,000 electric consumers to negotiate for lower cost electricity and other public benefits. The Compact provides:

1. Aggregated power supply
2. Consumer advocacy
3. Energy efficiency programs for low income, residential, commercial and industrial customers
4. Education programs

Cape Light Compact emphasizes a comprehensive approach, undertaken with legal and technical support – as the electric industry continues in its transition to a competitive market.

Forty California municipalities and counties are now evaluating Community Choice, 27 of them are seeking to double or more the state Renewable Portfolio Standard (RPS) targets.<sup>43</sup>

Apart from providing revenue for the repayment of renewable energy investments, CCA offers Sonoma residents, businesses and government agencies transparent, structured rates. “Political rate-setting” may be avoided by requiring prospective suppliers to “meet or beat” PG&E’s current rates, be selected through a competitive bidding process, and commit to a locally-set rate schedule. Sonoma, or a regional CCA, may set a Renewables Portfolio Standard (RPS) for the community and require suppliers to design, build,

---

<sup>43</sup> Braly, Mark; “Public Power ‘Lite’ Looking Very Green,” *Renewable Energy World* (renewableenergyworld.com), February 13, 2008; Ehrlich, David, “Sidestepping the Utilities to Go Green,” *CleanTech.com*, February 19, 2008.

operate and maintain renewable energy and conservation facilities as portfolio components of the service. CCA enables a maximum level of performance risk to be placed on the energy rather than participating local governments' General Funds. With significant revenues secured under a CCA contract, City program costs can be self-funded from a small increment of revenues, placing no burden on General Funds. The single supplier approach developed in San Francisco allows for greater performance accountability, protecting property taxpayers while enhancing ratepayer protection against energy market risk under PG&E services, which can change rates twice per year and directly pass on increasingly volatile fuel costs directly through to ratepayers. While bonding or insurance may be used to insure against risks associated with commodity services, a letter of credit or an additional bond may be used to cover risks conventionally associated with facilities construction. Finally, participation is voluntary. After a CCA signs a contract under specific terms, every customer will receive four notifications comparing the CCA's deal to PG&E'S terms, and be free to opt- out without penalty over a 120-day period.

The repayment of Sonoma energy investment may be made directly through CCA, or indirectly by selling power to another party. Directly, Sonoma County local governments could provide for the power needs of local residents, businesses and public agencies, offering them less volatile and green power at competitive prices, and guaranteeing power sales from a renewable energy facility integrated into the CCA – delivering fixed prices and energy independence to the local economy. Indirectly, Sonoma could build a facility to sell power to other CCAs, municipal utilities or Municipal Utility Districts like Sacramento Municipal Utility District (SMUD), or to the wholesale power market.

With other municipalities in the region considering CCA power may also be shared among CCAs. Either approach would enhance the uniqueness and sustainability of the renewable energy facility development and deliver profits to the city and significant local economic development.

Under Community Choice, local governments can serve as a virtual "electricity buyer's cooperative" for local residents, businesses and government agencies. Unlike ordinary cooperatives, however, the day-to-day management for securing electricity supplies is managed by a qualified and experienced third party, while the local government is placed in the role of strategic planner. While a CCA contracts with existing licensed suppliers called "Electric Service Providers" (ESPs), it may also enter into an agreement with another public entity, such as the Sonoma County Water Agency, either unilaterally through formation of a CCA Joint Powers Agency, to purchase, build, operate, buy and sell power. ESPs are often the optimal vehicle for designing, building, operating and maintaining facilities because they are risk-bearing retail entities, in the business of providing reliable and cost-competitive electricity for large businesses and government agencies. In some cases, however, public agencies like the water agency with experience in the utility business may take on part of the enterprise and risk management role. About 9 percent of California's electricity is currently purchased from Electric Service Providers. This market is based upon contracts that were already in place by 2003, when PG&E entered bankruptcy prior to its \$11 Billion ratepayer bailout.

### **C. Joint Powers Authority**

Under AB117, a municipality or county may partner with other local governments to improve purchasing power, improve the load profile of the CCA, share the use of local renewable resources regionally, and co-invest in power projects, through the formation or joining a Joint Powers Authority. Local Power has identified key local agencies that are optimal as "anchor" partners for a CCA.

If governmental entities in Sonoma County were to desire to form a CCA Joint Powers Authority they could investigate partnering with neighboring local governments that are studying CCA such as the County of Marin. The County of Yolo also has an active CCA discussion underway, with Woodland and SMUD articulating interest in such partnering concepts.

## **D. Sonoma County Water Agency Role**

The Sonoma County Water Agency is the largest energy consumer in Sonoma County.<sup>44</sup> Therefore its participation in a CCA is critical and creates exciting opportunities to co-invest in renewable energy facilities on or near Agency water facilities and rights of way. The Agency is also committed to market carbon-free water in the next 10 to 15 years. Already a solar power developer, the Agency is now completing its third - and largest – of four very large solar installations. A 470-kilowatt installation now powers the agency's administrative building, and another project with peak energy generating capacity of 527 kilowatts has just been completed at the airport wastewater treatment plant in Santa Rosa. The cost for one of the installations was \$7.8 million of which about \$2.8 million was immediately returned in a direct PG&E rebate. The rest of the funding came from existing Sanitation District construction funds.

The Agency is building a major solar photovoltaic system that will allow the Agency, which oversees wastewater purification, to implement tertiary treatment, leaving the water clean enough to be used for irrigation of agricultural lands, city parks, and other landscaping. A water-recycling program is planned for irrigating north county croplands.

The Agency adopted a green energy policy in September 2005. In addition to installing a total of 2,041 kilowatts of peak solar generating capacity in less than two years, the Agency plans to add landfill-based methane energy generation and an all-electric Toyota car to its fleet.

---

<sup>44</sup> Randy Poole, General Manager, Sonoma County Water Agency, 2007.

## **E. Steps to Forming and Implementing a Sonoma County CCA**

The decision to implement a CCA comes at the end of a deliberative process, not the beginning. The process of due diligence includes research, data collection and analysis, defining the desired energy service for the local community, negotiations with energy suppliers, and preparation and adoption of a detailed implementation plan before deciding whether to commit to implementation of a CCA program.

The process includes the following.

1. A single county (including unincorporated areas) or a municipality, or any combination of municipalities and/or counties form or join a CCA Joint Powers Authority (JPA) by ordinance. Forming a CCA gives the CCA legal standing to investigate its options without taking risks or committing to implement. The ordinance should outline the basic goals of the CCA (e.g., achieving GHG reduction targets), and (in the case of a JPA) should invite neighboring municipalities to consider joining the CCA JPA and provide a process for joining and governing the JPA.
2. Once formed, a CCA selects the elected representatives to govern, and hold preparatory meetings to approve a one-year budget and hire a consultant to assist in program definition, technical support and negotiation with prospective energy suppliers.
3. The CCA should organize a series of public hearings and (if possible televised) local community meetings throughout the county to undertake a participatory discussion of the CCA program, and through that engagement to adopt, modify or add to a draft program definition.
4. The CCA should select and direct a consultant to prepare a Draft Implementation Plan, including proposals for issuance of bonds to finance the proposed roll out of renewable resources.

5. The CCA should accept the consultant’s Draft Implementation Plan and authorize the consultant to proceed with the negotiation process through preparation of a Program Basis Report and issuance of a Request for Information, Request for Proposals to prospective bidders.
6. The CCA should receive the consultant’s evaluation of bids and decide whether to approve one of the bids by ordinance.
7. The CCA should approve a contract with the supplier by ordinance, adopt the final Implementation Plan and Statement of Intent by ordinance, and authorize signing of a “Binding Notice of Intent” for submission to the California Public Utilities Commission to begin providing electricity service to customers on a certain date.
8. The program is now operational, with transfer of customers scheduled, followed by issuance of bonds and start of construction.

Forming a CCA involves a process that is opposite to the traditional process of municipalization in which a municipality first takes over wires and power plants, then begins services, then determines what rates will be charged. Under CCA, participating governments secure rate schedule commitments from suppliers before deciding to implement the program.

## **F. Municipal Revenue and Capital Bonds (H Bonds and H2 Bonds)**

First created in San Francisco, H Bonds are generic municipal revenue bonds used to finance renewable energy and energy conservation facilities. Whereas San Francisco’s restrictive charter required voter approval to create a special H Bond Authority, Sonoma County, municipalities or a JPA already have authority to issue H bonds based on a new revenue source – monthly electric bill payments of participating residents, businesses and public agencies, or power sales revenues in the CCA.

## **G. Application of H Bonds to CCA**

H Bonds and CCA are synergistic. Together, they (a) provide the means to develop renewable energy and energy efficiency resources and the market to utilize and pay for those resources, and (b) provide CCA with a secure base of resources with which to serve its customers and, thus, avoid excessive dependence on a volatile energy market.

Whether the bonds qualify for tax-exempt status and other factors affecting their marketability depends on the structure of the transaction being financed. Generally to qualify for tax exemption, the facilities that are financed must be owned by a governmental entity or operated by this or another governmental entity - or by a nongovernmental entity on behalf of the governmental entity pursuant to a contract that meets certain requirements prescribed by the Internal Revenue Service. Even if not tax-exempt, H Bonds could still be issued to finance facilities which make solar and other technologies more affordable to local residents and businesses, albeit at a slightly higher interest cost than government-owned facilities would pay – but could also take advantage of significant federal tax benefits.

H Bonds provide CCAs with considerable flexibility. They can be used to finance renewable energy generating units and other revenue producing elements of CCA. They can be supported by existing assets and enterprises, or by new assets or enterprises such as renewable energy generating units, or revenues from a contract with an Electric Services Provider (“ESP”).

Without CCA, renewable energy and energy efficiency projects financed by H Bonds would have to search for a market for the power output. Given that San Francisco, Oakland, Marin County, Berkeley, Vallejo, Pleasanton, and several other Bay Area cities are now seeking to implement their own CCA programs, this opportunity is also immediate.

Alternately, without resources of the sort authorized by H Bonds, a CCA program could not finance new green power facilities; moreover, without a secure base of resources, a CCA would be extremely dependent on the energy market to serve its customers. The energy crisis of 2000-2001 dramatically demonstrated the danger of over-dependence on a volatile energy market - a lesson reinforced by fossil fuel price fluctuations this year, and PG&E's increasingly volatile electricity rates<sup>45</sup>, reflecting its 42% natural gas fired power plant fleet. The specifics of how H Bonds are used in connection with CCA depend on what types of projects are to be financed. Because a driving factor behind most local government's interest in CCA is to utilize renewable energy and energy conservation, a number of projects that meet the parameters for H Bonds would probably be part of a Sonoma CCA energy plan. Those projects can be financed with H Bonds.

The specific use of H Bonds to most effectively further CCA depends on the particular projects. Three of the threshold questions that must be addressed are (i) what assets or programs would best assist with the implementation of CCA, (ii) what revenue source will secure repayment of the H Bonds, and (iii) whether the H Bonds are tax-exempt or taxable. These items are discussed briefly below. The first two are somewhat related in that if the items financed do not have an independent or sufficient revenue stream to support the bonds to be issued, a separate revenue stream for the H Bonds must be identified. The question of tax exemption will turn generally on the specific facts relating to ownership and use of the financed items.

## **1. Items Financed**

San Francisco's CCA Implementation Plan has determined that the City will require its power supply to be 51% renewable, including energy efficiency, by 2017. The other Bay Area CCA's mentioned previously are seeking a 40 to 50% renewable requirement by the same year – far exceeding the 20% by 2010 required by state law. Were Sonoma to take a similar course, its energy plan would contemplate a number of elements that should fall within H Bond financing.

---

<sup>45</sup> PG&E's business customers saw a 43% increase following the Energy Crisis, and both businesses and residents suffered new rate increases in January 2006.

These include renewable energy generation projects as described earlier, as well as energy efficiency programs. This also includes the developmental costs such as preparation of requests for proposals, environmental studies, permitting, accounting and legal expenses, in addition to hard costs of construction.

## **2. Sources of Repayment**

H Bonds are “revenue bonds” issued by a municipality, county or Joint Powers Authority, which are secured by the revenues derived from fees and charges associated with the operation of an enterprise. Revenue bonds are commonly issued by state or local governmental entities and secured by the revenues of electricity or water enterprises or other revenue producing enterprises such as ports. H Bonds may not be secured by or payable from Sonoma County’s or participating local governments’ general funds. Rather, revenues from an operating enterprise must be the source of security or repayment. H Bonds allow, but do not mandate, the potential use of revenues produced by a facility to be built with proceeds of H Bonds to secure and repay those bonds but revenues from other revenue producing enterprises may be used as security in lieu of or in connection with revenues from an H Bond financed facility. As structured CCA rates are determined based on H Bond paybacks, a baseline is needed to show that a portfolio will be competitive. Local Power uses existing revenues only to “pencil” a portfolio, but additional revenues or investments will cause rates to drop further below PG&E rates.

Under California law, revenue bonds such as H Bonds are excluded from the voter approval requirement of Art. XVI, Section 18 of the California Constitution if they meet the requirements of the so-called “special fund doctrine.” Under this exception, a debt otherwise requiring voter approval is not required if such debt is solely payable from and secured by revenues produced by an appropriate enterprise. No general fund or other tax revenues may be pledged to the repayment of such bonds.

In order to constitute permitted “revenue bonds,” Sonoma will need to identify a dedicated revenue source by which H Bonds are to be secured and repaid, whether revenues of a

new source or an existing source. As noted, Sonoma can structure H Bonds to be secured by the revenues from an existing revenue producing entity. Other financing scenarios, not discussed in that report, also exist and are discussed below.

H Bonds can be secured by revenues from a new enterprise such as the CCA or facility such as a renewable energy source that has not yet commenced producing revenues. This has the advantage of a logical nexus between the bonds' purpose and source of repayment. A disadvantage is the need to borrow additional moneys to pay interest on H Bonds during the construction period until such time as the facilities can produce revenues to pay the bonds.

Such a structure also has “construction” or “completion” risk that may result in a slightly higher interest rate on the bonds. In addition, the revenue production of a new facility to be built is uncertain which may also affect the interest costs that are attainable.

Securing the H Bonds with the revenues of an existing revenue producing entity avoids the disadvantages discussed above. However, such a structure does “tie up” a revenue producing enterprise of the City. A potential “hybrid” structure is to use a combination of the foregoing structures. Under this alternative structure the H Bonds could be issued and secured by both a pledge of revenues from an existing enterprise and from any new enterprise. The pledge on the existing enterprise could be limited to the construction period during which the new facilities are not producing revenues or could be for the life of the H Bonds. By limiting financing to H Bonds, the local government is placing most risk on bond buyers, but a strategy that uses H2 Bonds or capital bonds will take on a greater degree of risk. Finally, Sonoma jurisdictions may decide to invest General Funds directly into construction of the facilities, which would involve an even greater level of risk comparable to building a parking garage or county hospital.

Another possibility would be to secure H Bonds with revenues available from a contract with a California-registered Electric Service Provider (“ESP”) providing CCA services. Such revenues could be structured to constitute revenues of the enterprise(s), which would

be the security for the H Bonds. For example, lease payments received from an ESP would constitute revenues that could be pledged as security.

Ultimately, the projects Sonoma desires to finance with H Bonds will have a strong bearing on the security structure chosen. For example, if a significant portion of the proceeds of H Bonds will be used to acquire or implement non-revenue producing programs, the use of an existing revenue producing enterprise will be required. On the other hand, if a significant portion of the proceeds is used to acquire revenue-producing facilities, such facilities or related activities could serve as the security and source of repayment for the H Bonds.

In any event, a bond rating will be required for H Bonds secured by new or existing enterprises that do not already have a rating. The credit quality analysis conducted by the rating agency will, among other things, focus on the “coverage” provided by the pledged revenues. Generally, the rating agencies prefer pledged revenues that are 125% or more of the scheduled debt service on the bonds.

### **3. Tax Exemption**

A variation of this alternative structure would be to create a single “enterprise” of the combined existing enterprise and the new facilities.

Sonoma has a wide degree of discretion regarding the use of H Bond proceeds for renewable energy and conservation projects. However, the particular programs and users of facilities financed with the proceeds of H Bonds will impact whether the interest on such bonds will be tax-exempt under the provisions of the Internal Revenue Code of 1986, as amended (the “Code”).

In other words, Sonoma could use H Bond financing to provide its residents and businesses with the opportunity to purchase and own solar power with no money down.

In general, the “use” of facilities or items financed with the proceeds of H Bonds by an entity other than a state or local government could result in such bonds constituting “private activity bonds.” In that case, under Section 141 of the Code, the interest is not tax-exempt. Such use is often referred to as “private use”. Private use is present where there is any type of privately held “legal entitlements” with respect to the financed facility. Nongovernmental ownership constitutes private use as does long term contracts regarding the output to be produced by the facility. For example, a long-term contract with a nongovernmental entity in which that entity agrees to purchase the energy output of a facility will generally constitute private use. In addition, contractual arrangements with nongovernmental entities regarding the operations and maintenance of a financed facility will constitute private use, unless such contractual arrangement is consistent with certain contract parameters approved by the Internal Revenue Service and described below.<sup>46</sup>

---

<sup>46</sup> Generally, bonds constitute private activity bonds if they meet either of the following tests:

1. Both the private business use test (“Private Use Test”) and the private security or payment test (“Private Payment Test” and together with the Private Use Test, the “Private Business Tests”); or
2. The private loan financing test (“Private Loan Test”).

A bond issue meets the Private Use Test if more than 10 percent of the proceeds of the issue are to be used for any private business use. A bond issue meets the Private Payment Test if the payment of the Implementation Plan of, or the interest on, more than 10 percent of the proceeds of such issue is (under the terms of such issue or any underlying arrangement) directly or indirectly --

1. Secured by any interest in property used or to be used for a private business use, or payments in respect of such property; or
2. To be derived from payments (whether or not to the issuer) in respect of property, or borrowed money, used or to be used for a private business use.

For purposes of these tests, the term “private business use” means use (directly or indirectly) in a trade or business carried on by any person other than a governmental unit. Use as a member of the general public shall not be taken into account. A bond issue meets the Private Loan Test if the amount of the proceeds of the issue which are to be used (directly or indirectly) to make or finance loans to persons other than governmental units exceeds the lesser of (a) 5 percent of such proceeds, or (b) \$5,000,000.

Last, it should be noted that loans of the proceeds of H Bonds to a nongovernmental person or entity will generally cause the H Bonds to fail to qualify for tax exemption.

Therefore, the facts regarding the ownership and operational structure of the financed facility will determine whether the bonds may be issued as taxable or tax-exempt. If Sonoma and/or local public agencies own and operates the facility, and if the power is delivered to participating customers, then the facility will probably qualify for tax-exempt financing. It will also be possible to qualify for tax-exemption if Sonoma contracts the management of that facility to a private party, provided the management contract requirements of Internal Revenue Service Revenue Procedure 97-13 (discussed below) are satisfied. On the other hand, if an ESP or other nongovernmental entity owns the financed facility or operates it pursuant to an arrangement that does not meet the requirements of Revenue Procedure 97-13. , it will probably not qualify for tax-exempt financing.

H Bond proceeds can be used to fund energy conservation programs. However, to the extent such purpose is accomplished through a loan program wherein residential and business customers can make use of low interest loans in a CCA program to make energy conservation and efficiency improvements the loans of bond proceeds will cause the program to not qualify for tax exempt financing. Grants of bond proceeds could be made to individuals and businesses for conservation and other expenditures so long as an adequate project revenue stream is identified to secure and pay the bonds.

The fact that such H Bonds are not tax-exempt does not in and of itself make such a program nonviable. Taxable rates on such H Bonds could potentially still be substantially less than the rate of interest otherwise available on loans to residential and business customers.

There are a number of ways H Bonds could be used to finance renewable energy facilities. This can be accomplished either in a structure wherein Sonoma (or other local government) undertakes acquisition, construction, ownership and management of the

facilities or through structures wherein an ESP undertakes some or all of the activities. As noted, the tax-exempt status of H Bonds varies depending on the structure.

Structures wherein an ESP takes on one or more of the roles present issues under the Private Business Tests discussed above. Any lease or other similar arrangement with an ESP would likely result in the H Bonds being categorized as taxable “private activity bonds.” Again, such a result would not prohibit the structure but rather would result in a higher cost for these components of the program. While H Bonds do not expose a CCA’s General Funds to substantial risk, a direct investment in renewables or use of H2 Bonds (capital bonds) would incur a greater degree of risk.

An alternative involving an ESP would be to utilize the management contract provisions under IRS Revenue Procedure 97-13 (“Rev Proc 97-13”). Rev Proc 97-13 describes safe harbor contractual arrangements that may be made with nongovernmental entities to provide management, operations or other services with respect to a tax-exempt bond financed facility.

Pursuant and subject to the requirements of Rev Proc 97-13, Sonoma could engage an ESP to manage and operate renewable energy facilities financed with H Bonds without the ESP’s involvement being in violation of the Private Business Tests discussed above. As discussed below, Rev Proc 97-13 would permit a contract between Sonoma and an ESP for managing and operating a renewable energy facility financed and owned by Sonoma for as long as 20 years. Rev Proc 97-13 defines “management contract” as “a management, service or incentive payment contract between a governmental person and a service provider under which the service provider provides services involving all, a portion of, or any function of, a facility.”

Rev Proc 97-13 focuses generally on the term of the contract and the manner and amount of compensation paid to the service provider. Generally, the more fixed in periodic amount the compensation paid to the service provider, the longer the permitted term of contract. Contracts pursuant to which the service provider’s compensation is 80% fixed

may be as long as 20 years in the case of service contracts relating to “public utility property”. On the other hand, contracts pursuant to which the service provider’s compensation is 50% fixed may not have a term in excess of five years. A variety of methods of paying an ESP an annual fee with additional compensation in each year based on a variable component to allow a contract to be as long as twenty years. In addition, the ESP may be paid a one-time incentive award during the term of the contract, equal to a single, stated dollar amount, under which compensation automatically increases when a gross revenue or expense target, but not both, is reached. Further, a contract that satisfies the requirements of Rev Proc 97-13 may be renewed at the expiration of its term.

A variety of the foregoing structures involving H Bonds could be used in tandem. For example, Sonoma could enter into an energy supply contract with an ESP, which would not directly require the use of H Bonds. Sonoma could then issue H Bonds to construct renewable energy facilities to be owned by the County. Sonoma could then enter into a management contract with an ESP as permitted under Rev Proc 97-13 to manage and operate the facilities. Such a structure would allow for the H Bonds to be tax-exempt.

## **H. Financing Reduction of Natural Gas Use: “Opt-In and Opt-Up”**

### **1. Summary**

Local Power recommends that a Sonoma CCA establish a special natural gas aggregation program to replace natural gas water and building heating systems with geothermal district heat, solar thermal heat and geothermal ground well water heating systems. The program could focus on large customers or small customers depending on the availability of suppliers.

As discussed above, solar thermal and geothermal heating and water heating technologies are low hanging fruit for achieving significant GHG reductions in Sonoma County. According to the countywide GHG inventory conducted by the Climate Protection Campaign in 2005, natural gas combustion accounts for 17% of all GHG emissions in the County. Sonoma’s ubiquitous geothermal and solar resource provides a clear means for

reducing natural gas consumption in Sonoma County. As with CCA, the key to achieving a sustainable and scalable roll out of these technologies is giving ratepayers the choice to reinvest their monthly natural gas bill revenues into solar and geothermal heating and water heating technologies.

In the early 1990's, California began deregulating natural gas by allowing non-core gas customers (large industrial users and power plants) to buy natural gas in an open market with the objective of allowing them to get lower prices. Deregulation in the natural gas market has also been extended to residential and small commercial customers (core customers) who can now also purchase natural gas directly from competitive suppliers. Under this gas rate option, customers purchase their gas commodity from a competitive supplier, known as a Core Transport Agent (CTA). The local gas utility, such as PG&E, still owns and maintains the lines that deliver gas to the customer. Currently there are numerous CTAs offering core gas aggregation services to various commercial and residential customer groups (residential, small commercial, schools, municipalities, public agencies, etc.).

While Massachusetts and Ohio CCA laws allowed for Opt-Out natural gas aggregation by CCAs, California's legislature did not alter existing gas aggregation laws that provide for an Opt-In Approach requiring each customer to individually sign up for gas service. As with electric deregulation, most suppliers have focused on serving large commercial, industrial and government customers, considering small customers too little to warrant high marketing and customer acquisition costs.

The market has worked well for large customers. All non-core customers have the ability to select natural gas service from a Gas Service Provider (GSP) instead of the utility. The utility still provides these customers with the transportation of the gas across its distribution system to the customer's meter.

However, CCAs with a better marketing channel have the ability to serve small customers as well. "Core" customers can take advantage of purchasing gas from a GSP

through the core aggregation program provided by all California utilities. Customers must be part of a group that uses a minimum of 120,000 therms of gas per year. The individual core aggregation group must make a minimum one-year-commitment to purchase their gas supply as part of the group.

## **2. Large Customers – “Non-Core” Gas Aggregation Program**

Noncore customers are large commercial customers with annual monthly average usage equal to or in excess 20,800 therms that have not elected core service.

Whereas core customers are served according to a “cold-year, peak-day” criterion based on human needs, large non-core customers choose to use the gas distribution system on an as-available basis for industrial and commercial purposes in return for significantly lower rates. In return, if the utility pipeline system is being fully utilized by core customers or some other event arises which may jeopardize service to core customers, noncore customers agree to discontinue their use of natural gas.

Noncore gas customers have automatic meter reading (AMR) installed that allows PG&E to record their usage on an hourly basis. Noncore gas customers agree to charges being imposed on them if they do not comply with a gas curtailment request. Due to the lower reliability of service provided to noncore customers the average gas transportation rate charged to noncore customers is lower than the average transportation rate charged to core customers.

## **3. Small Customers – Core Gas Aggregation Program**

Small customers are more challenging to serve under the current rules, but this may be surmounted through a full use of the CCA marketing, product design, and customer interface. The State of California allows residential and small business customers to purchase natural gas from marketers through a “core aggregation transportation program” offered by the local distribution companies (LDCs). This program has not been very successful, but could potentially be made successful through a CCA-based marketing

effort to Opt-Out electrical customers, offering not cheaper gas commodity but instead a solar thermal/geothermal green replacement program.

**Overview.** California has had a customer choice program for all residential and small commercial customers (referred to as core customers) since 1995 through its core aggregation transportation program (CAT). The program allows core customers to purchase gas from marketers who have met minimum aggregation levels of 120,000 therms per year. The group that satisfies at least 120,000 therms per year can be made up of any combination of core customers and does not need to be linked by geography or corporate structure. Customers must sign a 1-year agreement to purchase natural gas from the non-LDC supplier. According to the most recent Energy Information Administration data, 31,967 residential customers in California are purchasing gas from marketers, representing about 0.3 percent of deliveries to residential consumers statewide in 2005.<sup>47</sup>

CCA could enhance performance by eliminating marketing costs and changing the choice criterion. Pacific Gas and Electric Company had approximately 6,400 residential customers or 0.2 percent of its residential market participating. Although legislation was passed in October 1999 that required LDCs to provide bundled service and be the only providers of billing and metering services, it exempted existing core aggregation programs and included the provision that consumers can choose to purchase gas from another supplier. As of December 2006, only one marketer was participating as an energy service supplier for residential customers. The main reason for the low interest from marketers in serving the residential market include high marketing costs and the difficulty in offering competitive rates to core customers – problems that could be solved with a CCA-based, green-oriented rather than discount-oriented marketing program.

**Details.** Eligible California customers are free to choose a natural gas supplier other than the investor-owned utility by signing up for “Core Gas Aggregation Service,” winning potential savings from established sign-up procedures, billing, cancellation procedures,

---

<sup>47</sup> United States Energy Information Service (eis.gov).

and clearly defined roles of competitive supplier and utilities.

**“Core Gas Aggregation Service (CGAS).”** Under this gas rate option, customers purchase their gas commodity from a competitive supplier, known as a Core Transport Agent (CTA) and continue to use PG&E for gas transportation. The investor-owned utility still owns and maintains the lines that deliver the gas to homes and businesses under this service. Suppliers can often provide customers with price protection, alternative billing methods and cost savings.

Choice of a CTA does not change a customer’s other gas services. Much as in CCA, the investor-owned utility remains responsible for the safe and reliable delivery of natural gas to that customer’s home or business, and remains responsible for safety issues regarding gas service.

Residential and small commercial customers currently being billed for gas on any core gas rate schedule are eligible to participate in CGAS. To participate, a residential and small commercial customer must be part of a group that together uses a total of at least 120,000 therms of gas per year. Customers are linked by their designation of a common supplier who manages the gas supply and delivery for all customers within the group. Each customer within the group is required to make a minimum one-year commitment to core gas aggregation service and to purchase natural gas from the supplier instead of from the investor-owned utility.

Suppliers may contact customers with information about buying natural gas from them. The suppliers may use advertising, direct mail, personal contact or other means to promote their services. A list of suppliers appears below.

As with CCA, PG&E suffers no profit loss from CGAS. PG&E does not make a profit on the sale of natural gas to its retail customers due to the way natural gas utilities are regulated. PG&E makes its profit from delivering gas through its system as well as from other sources, but not from the sale of gas itself.

CGAS suppliers are responsible for ensuring that gas is delivered daily to PG&E's transportation system, balancing gas supply with gas use and meeting the gas reliability needs of its customers. PG&E is authorized by the California Public Utilities Commission to assess penalties and collect costs from a supplier if that supplier fails to provide for the gas needs of its customers. As part of PG&E's service, PG&E will serve as a back-up supplier in the event your supplier fails to arrange for an adequate supply of natural gas.

Choosing CGAS supply does not change the physical supply of a customer's natural gas. The quality of the natural gas provided to CGAS customers is the same high quality gas you would otherwise receive.

#### **4. Participating Core Transport Agents (CTAs)<sup>48</sup>**

**This CTA serves all customer groups, including single-family residential customers.** [Commerce Energy](#) Customer Service Department (877) 226-5368. Commerce Energy does not currently offer service in PG&E's service territory, but could be engaged in discussions of the idea.

The following CTAs serve all customer groups, except single-family residential customers:

[Aaxiom Energy Marketing, Inc](#)

Angela Olaveson  
Director, Gas Services  
(208) 522-8241  
[sales@aaxiominc.com](mailto:sales@aaxiominc.com)

[Accent Energy California, LLC](#)

Malcolm Reinhardt  
Sales Manager  
(415) 453-3341  
[malcolm@ae2.com](mailto:malcolm@ae2.com)

---

<sup>48</sup> Revised May 23, 2007 (Some CTAs may not appear on this list by their own request.), PG&E Web Site, August 7, 2007, [http://www.pge.com/customer\\_service/customer\\_choice/gas/aggregate\\_contacts/](http://www.pge.com/customer_service/customer_choice/gas/aggregate_contacts/)

[American Gas Management](#)

Customer Service Department  
(800) 500-9155  
[info@americangm.com](mailto:info@americangm.com)

[BP Energy Company](#)

Robert Turner  
Origination Manager  
(949) 251-8696 x110  
[robert.turner3@BP.com](mailto:robert.turner3@BP.com)

[Commercial Energy](#)

Curry Stypula  
Vice-President, General Manager California  
(510) 567-2700  
[curry.stypula@commercialenergy.net](mailto:curry.stypula@commercialenergy.net)

[Coral Energy Resources, L.P.](#)

Rand Havens  
Customer Service  
(510) 382-9084  
[rand.havens@shell.com](mailto:rand.havens@shell.com)

[IKUN, LLC](#)

Angela Olaveson  
Director, Gas Services  
(208) 522-8241  
[aolaveson@ikunenergy.com](mailto:aolaveson@ikunenergy.com)

[Redwood Energy Marketing, LLC](#)

Duane Hughes  
(877) 259-5311  
[duane@rdwd.com](mailto:duane@rdwd.com)

[Sempra Energy Solutions, LLC](#)

Deanna Stuart  
Sales Manager  
(818) 356-1035  
[dstuart@semprasolutions.com](mailto:dstuart@semprasolutions.com)

[Spark Energy Gas, LP](#)

Michael Nguyen  
Operations Manager  
(713) 977-5640  
[mnguyen@sparkenergy.com](mailto:mnguyen@sparkenergy.com)

## Energy Solutions – Sonoma County Community Climate Action Plan

### Tiger Natural Gas, Inc.

Tracy Phillips

Vice President

(918) 491-6998

[tphillips@tigernaturalgas.com](mailto:tphillips@tigernaturalgas.com)

CTAs serving schools, colleges, cities, counties, special districts and public agencies:

### Association of Bay Area Governments (ABAG)

Jerry Lahr

(510) 464-7908

### State Of California DGS

Becki Rowland-Mosley

(916) 375-5984

## **VI. Sonoma Clean Energy Plan vs. Remaining with PG&E**

### **A. Summary**

This section compares a CCA with PG&E including climate impacts, energy security, and price competitiveness with PG&E’s conventional power prices.

### **B. Current Electricity Supply**

Apart from direct access and City of Healdsburg customers, the major part of Sonoma County’s electricity comes from the regional utility company, Pacific Gas and Electric (PG&E). While PG&E generates some of the electricity it sells to customers, the utility purchases much of the power from other vendors that operate as wholesale generator companies. From whatever source the electricity is derived, PG&E passes the cost on to its many customers, adding a markup for a variety of items including use of the electric wires that are all owned by PG&E.

By the time a customer flicks on the wall switch, the source of that electricity and its associated carbon dioxide emissions has already been determined. Unless local governments use CCA for their electric supply, individual customers have little say in how the electricity is generated. Thus the environmental impact and GHG emissions of that electrical generation is left principally in the hands of the utility company, supervised by the state regulators who oversee its operations, and who approve power plants and contract purchases of electricity.

In 2007 46% of PG&E’s electricity is generated by fossil fuel with nearly all CO<sub>2</sub> emissions coming from natural gas:

Natural Gas	43%
Coal	3%
Nuclear	23%
Hydroelectric	19%
Renewables	12%

For reference, the United States gets nearly half of its electricity from coal, with most of the balance provided by nuclear and hydroelectric power. About 17% of the nation's electricity comes from natural gas. California comes close to reversing the roles of natural gas and coal, with natural gas supplying 42% and coal about 16% of electricity.

Coal emits much more GHG per unit of energy than natural gas, and represents about 30% of the GHG emissions in the US. However, generating electricity from natural gas is not a good option either.

During the late 1990s, in the waning years of the Clinton Administration, the president ordered the Environmental Protection Agency to team up with the Department of Energy to take an inventory of carbon dioxide emissions from power plants in the US. They found that U.S. natural gas power plants were emitting nearly 60% of the carbon dioxide as coal plants per kilowatt-hour of electricity generated. Further they found that natural gas was compounding rather than lessening the GHG problem.

Natural gas itself is a very potent GHG. The most recent estimates by participating scientists of the Intergovernmental Panel on Climate Change (IPCC) state that methane, the principle ingredient of natural gas, is 23 times more powerful in warming the planet than an equal amount of carbon dioxide. This means that between 1 ½ and 2 ½ percent of fuel that leaks from pipes, natural gas wells, and at the point where it is burned, is a serious problem. This effect from “leakage” of natural gas was not accounted for in the Clinton Administration inventory, and must be added to natural gas side of the equation. Taking methane leakage into account pushes natural gas electric generation up to about 70% of coal in global warming effect.<sup>49</sup>

In recent years imports of natural gas from overseas in the form of super cooled liquefied natural gas (LNG) have increased. LNG requires its own accounting because of the

---

<sup>49</sup> While there is some methane emitted from coal mines, it is minute compared to the emissions from natural gas. Also, there is a major, and remarkably successful, government program to reduce these coal mine methane emissions.

enormous amount of energy it takes to super-chill the gas to minus 260 degrees F., and then ship it across the ocean. According to a new study by Carnegie-Mellon, the extra processing and energy required can push LNG-powered electric generation to virtually the same GHG level as coal.

Very serious efforts to bring LNG into the California market exist, particularly for electricity generation. Should these efforts succeed, California's natural gas supply will have a significantly worse impact on global climate change. This threat underscores the importance of reducing our reliance on natural gas.

According to PG&E projections, energy demand is expected to increase up to 1.5 percent per year for the foreseeable future, even after taking into account existing energy efficiency program savings. This will make it very difficult to achieve climate protection goals without a major restructuring of PG&E's energy supply.

In 2002 California passed a law requiring utility companies to get 20% of their electricity from renewables sources by 2017. This was accelerated to 2010 by state regulators. With only three years left until the deadline, PG&E states that they are working hard to achieve the new targets. However, the company gets virtually the same percentage from renewables today as in 2002-- about 12%. In addition, they are working to get new imported LNG supplies that they plan to bring in through Oregon to circumvent California's resistance along the coast.<sup>50</sup>

PG&E Long Term Procurement Plan models four scenarios for their future electric energy business, and three plans for meeting those scenarios. Most of the Plans under most scenarios achieve little GHG reductions. Four of the twelve scenario/plans *actually result in increasing GHG* by 2016. Scenario 1 achieves the greatest reductions; however, it assumes that 10% of PG&E customers switched to a CCA. It appears that CCA is currently PG&E's most powerful tool for reducing GHG.

---

<sup>50</sup> *Collision Course, How Imported Liquefied Natural Gas will Undermine Clean Energy in California*, by Rory Cox and Robert Freehling, Pacific Environment, Feb. 2008.

PG&E CO2 Emissions<sup>51</sup>  
 Million metric tons

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Current Emissions 2007	20.1	19.8	19.8	19.8
Basic Plan 2016	17	20.9	19.4	20.2
Enhanced Reliability 2016	17	20.9	19.4	20.2
Preferred Plan 2016	15	17.9	17.7	19.1

Under no current scenario or plan will PG&E be able to reduce GHG emissions to the levels contemplated by Sonoma County. Indeed, the current plans are not likely to meet the much more modest goals of AB 32, to return to 1990 levels.

### C. Sonoma County Profile

Electricity was the source of between 18% and 22% of California’s GHG emissions in 2004.<sup>52</sup> California’s Community Choice law creates a unique opportunity for a dramatic reduction of emissions from this sector by allowing local government to choose, finance and build the sources of electric power for all of the residential, business, agricultural and government customers in Sonoma County. No other available policy tool can match this ability to eliminate most if not all of the GHG emissions for an entire form of energy supply in a short to mid-term timeframe.

According to the California Energy Commission, Sonoma County consumed 2,828 million kilowatt-hours of electricity in 2005.<sup>53</sup> The good news is that, in spite of a nearly 10% increase in the number of customers; *electricity consumption had decreased by 5.5% since 2000*. This represented a corresponding decrease in average load, with the

<sup>51</sup> PG&E 2006 Long-Term Procurement Plan, Volume 1-Amendment. p. VI-12.

<sup>52</sup> Analysis based purely upon kilowatt-hours generated and the natural gas necessary to do this would tend toward the lower figure. ICLEI uses a higher emission rate per kilowatt-hour, and this could in part be accounted by natural gas power plants burning fuel as “spinning reserve” and as they are ramped up and down. Also, thermal plants often operate at less than the rated efficiency levels.

<sup>53</sup> California Electricity Consumption by County-2005, California Energy Commission.  
[http://www.energy.ca.gov/electricity/electricity\\_by\\_county\\_2005.html](http://www.energy.ca.gov/electricity/electricity_by_county_2005.html)

county shedding 19 megawatts since the year 2000 when it reached 342 megawatt. This happened at a time when state energy consumption grew significantly, and appears to show that Sonoma County can grow significantly while reducing energy consumption.

While Local Power has data on electric energy consumption, we do not currently have direct information about the amount of generating capacity required to meet this need. Provisionally, we have modeled a similar demand profile to nearby coastal counties, and estimate a base load of about 225 megawatts and a peak demand of about 625 megawatts. This estimate will be revised if more information is obtained from PG&E.

#### **D. The Cost of Delay**

Nearly any delay beyond the schedule proposed in this report will make it highly unlikely that the County will achieve its 2015 deadline. Only about 18 months are scheduled to form a Joint Powers Authority, develop an implementation plan, and secure approval of local governments. Then a supplier must be found and customers transferred to the CCA from their current service. These are all very achievable goals but they still take time to implement.

Delays will compound the challenge. This may be described as a “pain curve” meaning the consumer and taxpayer cost impacts of avoiding GHG reductions will grow progressively severe.

Growth: Continuing population growth, increasing energy demand, new building construction will all make it more difficult each year to reach the promised target. Since 1990 carbon emissions in the electric sector have grown significantly, and this is currently the biggest challenge in reaching the target: namely, having to undo 17 years of increasing CO2 emissions.

**Increasing Energy Costs:** Higher natural gas prices and imposed carbon costs will increase the cost of fossil fuel and electricity for all consumers that elect to remain with PG&E. This may be the single most significant cost and greatest risk to Sonoma County

energy consumers. Remaining with PG&E will insure that all customers are committed to whatever rate increases the utility company needs to obtain its energy supply.

Historically, PG&E rates have increased 4% per year since 1980. An examination of PG&E's own projected energy costs show that the lowest cost energy for all PG&E customers only occurs if CCAs actually form. In other words, PG&E is on record stating in its own numbers that failure to form CCAs will result in higher energy costs for its own customers. In addition, there are likely to be serious economic costs for all carbon emitting activities in the future arising out of carbon taxes or from the increasing cost to purchase allowances under carbon "cap and trade" markets. Economists are talking about charges ranging from \$30 to potentially over \$100 per ton of carbon dioxide emitted. This will add substantially to the cost of natural gas, electricity and transportation fuels.

**Exit Fees:** As PG&E signs contracts for new energy supplies, whether clean or not, all customers are required to fulfill the financial terms of the contract. Currently PG&E is trying to secure 2300 megawatts of new natural gas power plant construction on long-term contracts. In addition, PG&E is trying to procure significant increases in their renewable energy supply. State laws and the rules of the electric system mandate that some of these cost be covered by all customers, whether they remain with PG&E or whether they leave and enter a CCA. Departing customers will have to pay for these contracts whether or not they receive the benefit of the electricity. Many past contracts are due to expire over the next few years, leaving a "window of opportunity" for CCAs to leave with relatively small cost burdens; burdens that are of quite limited duration. If CCAs wait, the costs of leaving PG&E may increase.

**Accumulation of GHG emissions:** If CCAs delay implementation, years of CO<sub>2</sub> emissions will occur without any effective plan to deal with them. Carbon dioxide is a cumulative gas that resides in the atmosphere for centuries. The longer we wait to address the climate problem, the more Draconian and economically shocking will be the necessary reductions.

In conclusion, addressing the increasingly serious problem of climate change requires prompt action at a scale that renders the best policy choice. Acting quickly is both important and achievable. All too much of our nation's intellectual and political energy is spent talking when action on a massive scale is needed immediately. Some may argue that acting quickly is a predicate for not acting carefully, that proper solutions to climate and energy problems will best come from distant sources in due time. A better argument focuses on what is available and what can be achieved by the people of Sonoma County right here, right now – using Sonoma's local energy assets as detailed in this report. Policy creativity and the courage to tackle energy issues at the local level are what will bring great benefits to the County, both in the short and long term.