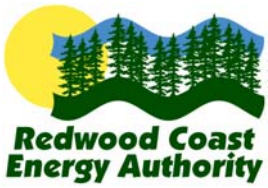
Humboldt County Energy Report

Draft

June 2004



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Chapter 1: Background and Introduction

The Redwood Coast Energy Authority (RCEA) was formed in 2003 as a Joint Powers Association, representing seven municipalities (the Cities of Arcata, Blue Lake, Eureka, Ferndale, Fortuna, Trinidad and Rio Dell) and Humboldt County. RCEA's purpose is to develop and implement sustainable energy initiatives that reduce energy demand, increase energy efficiency, and advance the use of clean, efficient and renewable resources available in the region.

This draft Energy Report was developed as a current snapshot of electricity and natural gas supply and demand[1], provide a current situation analysis, and highlight the growing importance energy efficiency in accomplishing long-term energy resource adequacy. The Report will establish a framework and the information upon which the region can develop a preferred energy supply strategies with the goal of achieving a reliable, affordable and sustainable energy future for Humboldt County. The Report is not complete in its current form, but merely a starting point for engaging in discussions and a more collaborative process for developing local energy strategies, plans and programs.

Since being formed in 2003, the RCEA Board has been considering the potential programs and strategies it can pursue to best serve its mission. Currently, the RCEA program efforts are primarily focused on energy conservation. To a large extent, these programs are limited by the objectives of its funding sponsors.[2]

In order to best understand the need and importance of energy conservation, one must fully understand the broader issues of supply and demand that motivate and drive the need for these programs. Current government state energy planning efforts place the highest priority on conservation, local clean generation and renewables to meeting the State's resource needs through an Integrated Resource Planning (IRP)[3] process. A local energy plan could be a valuable contribution to this process.

The need for energy conservation and other alternative strategies like renewables, is driven by the growing imbalance between supply and demand and the industry's increasing dependence on natural gas. Additional motivation for such planning comes from the growing costs of electricity and natural gas. These costs have significant impacts on the local economy. This Report will enable the region to address how it can best utilize energy programs to reduce the drain of energy dollars from the region.

Research for this Report included a comprehensive review of all available data sources on regional electricity and natural gas supply and consumption, and some economic indicators

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[1] This study addresses electricity and natural gas only. For the purpose of this study, the use of the term "energy" refers only to electric and natural gas use in Humboldt County. Transportation energy is not addressed as part of this Report.

[2] The RCEA has received funding from the California Public Utilities Commission (CPUC) for an energy efficiency information and education program, as well as Department of Energy Million Solar Roofs Program funding for addressing market barriers for the accelerated deployment of solar systems throughout the County.

[3] Integrated Resource Planning is a public planning process and framework within which the costs and benefits of both demand- and supply-side resources are evaluated to develop the least-total-cost mix of energy resource options. In many cases, IRP includes a means for considering environmental damages caused by electricity supply/transmission and identifying cost-effective energy efficiency and renewable energy alternatives.

that drive energy use, such as housing. In addition, a review of previous energy planning efforts was conducted as well as interviews with several key stakeholders in regional energy issues.

Why a Regional Energy Plan?

The current emphasis on statewide energy planning does not necessarily mean that local energy planning is not necessary. The importance of local planning is essential and well understood for issues like transportation, land use, waste management, water supply and housing, but less understood for energy. In today's environment of constrained electricity and natural gas resources, the need for local energy planning is even greater than ever before. The drivers of energy use, supply and the potential for unique strategies and innovative programs are unique to Humboldt County. For example, Humboldt County is one of the few winter electricity load peaking planning regions in the state of California[4]. In addition, Humboldt County has a tremendous amount of renewable energy capacity and potential[5]. This potential could be utilized to a greater extent to assist PG&E and the State of California achieve its aggressive Renewable Portfolio Standard[6] goals.

The Benefits to local government engaging in energy planning are significant, including the potential to:

- Improve the quality of life for their citizens;
- Retain energy dollars in the local economy;
- More effectively incorporate the concerns of local citizens in energy decisions;
- Improve local air quality; and
- Identify the areas where the local County can best assist the State to meet or exceed its policy goals.

The RCEA is well positioned to provide the leadership for such planning. A Regional Energy Plan could become the basis for the organization to build on its current successes to access additional funding for regional energy programs. In addition, a Regional Energy Plan could provide the necessary focus on energy issues that are often lacking in County general Plans. Humboldt County is currently updating its General Plan, so now is an appropriate time for the RCEA to engage in a formal energy planning process. An overview of the issues that can be considered in General Plans is outlined in Appendix A.

Humboldt County has a long history of local energy planning. A Study was completed in April 1981 by the Humboldt County Energy Advisory Committee (HCEAC) entitled A Report on Energy Use in Humboldt County and the Identification of Major Areas of Policy Recommendations. This report was done during a time when utility costs were estimated to be rising at 17 percent per year. This report estimated that in 1980, $151 million was spent on energy (including all forms), and of this, $135 million left the local economy. At that time,

[4] Typically, electricity demand peaks occur during the summer months due to high air-conditioning loads.

[5] Humboldt County's idle renewable capacity (power plants that are fully operational but shut down due to economic or other regulatory constraints) exceeds the total capacity of many California counties that are much larger.

[6] California's Renewable Portfolio Standard (RPS) [Senate Bill 1078. Chapters 516, Statutes of 2002, Sher] was enacted in response to growing concerns about over dependence on natural gas. The RPS requires all retail suppliers of electricity in the state, including IOUs supply at least 20 percent of their sales from renewable energy resources by 2017. Current legislation is considering accelerating the RPS to achieve 20 percent by 2010.

transportation fuels accounted for 61 percent of the total energy use (on a Btu basis), representing $91 million dollars, or approximately two-thirds of energy costs. The report recommended that the two major actions would be necessary to decrease the amount of dollars leaving the county - conserving energy and alternative energy development.

In 1983, as a result of "Project Independence," the County published The Humboldt County Plan To Accelerate The Economic Development of Local Energy Resources. That plan was motivated by the slowing economy and its impact on the local timber industry – the primary economic driver for the region. The study assessed the near-term development of renewable resources, quantified the comparative and cumulative economic impacts of small-scale renewable energy projects, and suggested actions to speed the development of these projects. Some of the conclusions of this report included:

- The County should place a high priority on achieving energy management, conservation, and alternative energy goals, policies and action plans in General Plans.
- The County should develop an incentive program for cost-effective improvements to facilities. As part of this program, savings would accrue to an energy management fund for future improvements and/or for a self-supporting energy management program.
- The County should use the Humboldt County Energy Advisory Committee to develop the idea of the self-supporting energy management program with initial funding from revenue sharing projects.
- An estimated 250 to 375 megawatts of energy resource development existed in Humboldt County.
- Over 560 permanent jobs could be created by pursuing these energy resources.
- County or other revenues generated by this development could reach $2 million annually.
- Local resource development could help stabilize the region from energy supply interruptions.

In 1981, the City of Arcata also pursued the Arcata Municipal Solar & Conservation Utility. The purpose of this entity was to overcome the major barriers to the widespread implementation of conservation and solar programs in the Humboldt and Arcata area, including: 1) high initial capital costs and low capital availability, 2) lack of risk assurances for consumers to reduce and/or eliminate risk for new and innovative technology, and 3) the lack of credible data for area-specific decision making and cost benefit analysis.

It is interesting to note that many of the challenges that the region faced in 1980, it still faces today. Although electricity rates did not grow at 17 percent per year, as a result of the energy crisis of 2000-2001, PG&E and the State of California rates are nearly twice that of the average in the US[7].

[7] PG&E's system average rate is 13.8 cents/kWh (Source: CPUC). The average rate for all utilities in the U.S. is 7.2 cents/kWh (Source: DOE).

Since 1980, electricity costs in Humboldt County have grown over 200 percent from $36.9 million to an estimated $120 million. Natural gas costs have increased 83 percent from $19.7 million to approximately 36 million[8].

In addition, there still remains a significant potential for energy efficiency, local self-generation and addition renewable energy resources to be developed in Humboldt County. According to recent data, there are at least 10-14 megawatts of potential local renewable generation capacity that might be readily brought on-line to improve the supply-demand imbalance in this area. There are also several areas within Humboldt County that have promising potential for major wind projects to assist PG&E and the State to achieve its Renewable Portfolio goals. In additional, there are tremendous opportunities to better focus energy efficiency programs that are available to consumers of the region.

Organization of the Report

Chapter 2 provides an overview of both electricity and natural gas demand, including discussion of contributions by respective sectors (including residential, commercial and industry) and various drivers to demand.

Chapter 3 provides and overview of the regulatory environment surrounding electricity and natural gas industry. Included are discussions of the current regulatory trends and issues that could impact Humboldt County's ability to achieve a more sustainable energy future.

Chapter 4 addresses utility-scale electricity supply issues, including the generation and transmission infrastructure.

Chapter 5 addresses natural gas supply issues.

Chapter 6 addresses energy efficiency resources.

Chapter 7 addresses distributed generation and renewables resources.

Chapter 8 consists of recommendations for additional study and issues for consideration by the RCEA.

[8] 1980 data source Arcata Municipal Solar & Conservation Utility Final Report. Current data derived from CEC consumption figures for 2003, and PG&E tariff data.

Chapter 2: Electricity and Natural Gas Demand

Total Historical Electricity Consumption and Demand

Humboldt County's electricity consumption for 2003 was approximately 939.8 million kilowatt-hours (kWh)[9], which represents approximately 0.26 percent of the total California consumption. For the past decade, electricity consumption has grown an average of 0.6 percent. While consumption saw over a 7 percent decrease during the energy crisis of 2001, like much of the State, much of that savings was behavior-driven as evidenced by a subsequent increase in consumption of over 5 percent in 2003.

Electricity peak demand is estimated to be about 146 megawatts for 2004. Peak demand is estimated to increase on average by 1.3 percent per year[10], slightly less than the average of 1.5 percent for all of PG&E service territory. To put this electricity demand into perspective, it is only about 12 percent more than the total output of the PG&E generating units at the Humboldt Bay Power Plant and is approximately 54 percent of the total in-County generation capacity.

Electricity Consumption By Sector

Residential Sector

Humboldt County's residential sector uses approximately 35 percent of the total electricity consumption for the County. This compares to an average of 30 percent residential electric consumption for the State of California.

The 2003 costs for electricity for the residential sector for Humboldt County are approximately $41.8 million.

The primary end-uses for the residential sector include: lighting, refrigerators and freezers, laundry, heating and ventilation, pools and spas, water heating, cooking and miscellaneous plug loads (e.g. televisions, computers, etc.)

Commercial Sector (except Timber and Agriculture)

Humboldt County's commercial sector (excluding timber and agricultural industries) uses a total of 16 percent of the total electricity consumption for the region. This compares to an average of 35 percent commercial electric consumption for the State of California. The 2003 costs for electricity for this sector was approximately $29.7 million.

The primary end-uses for the commercial sector include: lighting, plug loads (e.g. computers, office equipment), heating and ventilation, refrigeration and exterior lighting.

Industrial Sector (primarily Timber)

Humboldt County's industrial sector (primarily timber) uses a total of 47 percent of the total electricity consumption for the region. This compares to an average of 22 percent industrial electric consumption for the State of California. The 2003 costs for electricity for this sector was approximately $44 million.

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[9] Electricity consumption does not include consumption offset by small distributed generation systems, like rooftop solar and off-grid hydro. It does include consumption of larger customers that have larger generation systems, like Fairhaven Power Company (Eel River Sawmills, Inc.) and Pacific Lumber Company.

[10] PG&E Transmission Study.

Agricultural Sector

Humboldt County's agricultural sector uses a total of approximately 2 percent of the total electricity consumption for the region. This compares to an average of 7 percent agricultural electric consumption for the State of California. The costs for electricity for this sector was approximately $4.1 million.

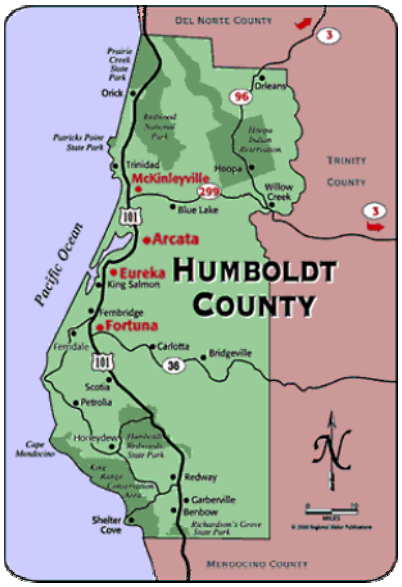
Per Capita Electricity Consumption

The per capita electricity consumption of Humboldt County was approximately 7.3 MWh, compared to a statewide average of about 7.1 MWh. It is difficult to draw conclusions from this statistic without further detailed analysis. It is likely that the average residential demand is much lower than that of the average of the state due to the milder climate and lack of air-conditioning loads. On the other hand, the relative contribution of the energy intense timber sector in Humboldt County is much larger than that of the rest of the state.

Electricity Demand Drivers

Long-term electricity use trends are driven by many factors, the most significant being economic, population, commercial building and new housing.

Geographic



Humboldt County is bounded on the north by Del Norte County (served by PacifiCorp); on the east by Siskiyou (served by PacifiCorp) and Trinity counties (served by Trinity County Public Utility District); on the south by Mendocino County and on the west by the Pacific Ocean. The County encompasses 2.3 million acres, 80 percent of which is forestlands, protected redwoods and recreation areas.

Climate

Climate plays the most significant role in driving energy demand. Humboldt County is a region with moderate temperatures and considerable precipitation. While the average summer temperature of some areas of Northern California is as high as 111°F, Humboldt County's average summer temperature is 79.8°F. Temperatures along the coast varies only 10 degrees from summer to winter, although a greater range is found over inland areas. Temperatures of 32 degrees or lower are experienced nearly every winter throughout the area, and colder temperatures are common in the interior. Humboldt County differs from many parts of the state. Like the Pacific Northwest, Humboldt County has a winter electricity peak demand, rather than a summer peak demand like most of the state.

In most years, rainfall is experienced each month of the year, although amounts are negligible from June through August. Seasonal totals average more than 40 inches in the driest area, and exceed 100 inches in the zones of heavy precipitation. Precipitation does not play a major role in consumption, but contributes significantly to the availability of renewable hydro resources that will be discussed later in this Report.

Population

The 2000 population of Humboldt County was 126,518 and the 2002 estimated population was 127,159. This population growth rate of 0.5 percent trails the State of California growth rate of 3.7 percent[11]. The primary growth areas of the County are around the unincorporated communities of McKinleyville and Garberville, and the cities of Arcata and Fortuna.

Table 1 details County population projections over the next two decades, including estimates for several of the incorporated areas.

Table 1: County Population Forecasted Changes

Location	1998 Population	2010 Population	2020 Population
Eureka	27,750	28,870	29,830
Arcata	16,330	18,180	20,000
Fortuna	10,140	12,560	15,000
Humboldt County	124,000	131,600	140,000
Unincorporated	67,400	67,800	68,140

Housing trends

Housing is a primary driver of load growth. Humboldt County had 54,434 households in 2002 and is projected to add about 5,500 households by 2025[12]. The County has a slightly higher home ownership rate than the state average (57.6 percent versus 56.9 percent), which may suggest that the non-ownership barrier to implementing energy efficiency should not be as significant as other regions.

The County has a much lower percentage of housing units in multi-unit structures (18.1 percent versus 31.4 percent for the State of California). This would tend to increase the energy consumption per household, as multi-unit housing tends to be more energy efficient.

Economy

In many parts of the state, economic factors are a secondary driver of energy consumption. This is not the case in Humboldt County. With such a large percentage of electricity consumption being contributed by industry, economic factors are likely to be most significant.

In addition to the production of commercial and industrial sectors, personal income drives residential demand through the increased demand for electrical appliances such as computers, printers, additional televisions, or refrigerators.

Commercial demand is driven in a large measure by number of businesses and square footage of commercial building space. Other factors influencing commercial energy use are vacancy rates, taxable sales, and population.

Industrial energy use is driven by employment and the output of manufacturing plants as measured in value of shipments.

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[11] Source: U.S Census Bureau. http://quickfacts.census.gov/qfd/states/06/06023.html.

[12] Technical Background Study for the 2003 Humboldt County Housing Element. Chapter 2, page 10. http://www.co.humboldt.ca.us/planning/housing%20element/pdf/2003tbs2.pdf.

During the past 25 years, Humboldt County has experienced a gradual transition from the timber industry to more service-related industries. For example, in 1976 employment in the goods producing sectors, (mining, construction, and manufacturing), was 28 percent of total employment in the County, (EDD 1998). In 1999 employment in the goods producing sectors was 18 percent of total employment, (EDD April 1999). Over the same period, employment in the service producing sectors, (transportation, utilities, trade, finance, other services, and government), went from 74 percent of total employment to 84 percent of total employment. In other words, while employment in goods producing sectors fell 10 percent as a percentage of total employment from 1976 to 1999, employment in services producing sectors increased 10 percent.

The employment decline in the goods producing sectors was due to declining employment in lumber/paper products manufacturing. In 1976 County employment in lumber/paper products manufacturing was 7,325, while in 1999 it was 3,900. Employment in lumber/paper products manufacturing went from 18 percent of total employment in 1976 to 8 percent of total employment in 1999. Employment in other goods producing sectors, (mining, construction, other durable manufacturing, and non-durable manufacturing), taken together, as a percentage of total employment, remained constant from 1976 to 1999. Experts have characterized the transition as becoming a more "resource extractive" economy, toward becoming a more sustainable resource-based economy[13].

Table 2 shows the business patterns for the County 's business patterns

2000 County Business Patterns for Humboldt, CA Source: Bureau of Census			
NAICS/ Industry	Total Establishments	Number with 10 employees or less	Percent > 10 Employees
11 Forestry, fishing, hunting, and agriculture sup	113	100	88%
22 Utilities	7	6	86%
23 Construction	415	393	95%
31-33 Manufacturing	186	138	74%
42 Wholesale trade	109	95	87%
44-45 Retail trade	661	575	87%
51 Information	59	48	81%
52 Finance & insurance	148	136	92%
53 Real estate & rental & leasing	140	138	99%
54 Professional, scientific & technical services	246	235	96%
55 Management of companies & enterprises	13	8	62%
56 Admin, support, waste mgt, remediation servi	125	111	89%
61 Educational services	35	32	91%
62 Health care and social assistance	418	369	88%
71 Arts, entertainment & recreation	52	43	83%
72 Accommodation & food services	347	281	81%
81 Other services (except public administration)	323	316	98%
95 Auxiliaries (exc corporate, subsidiary & region	3	3	100%
99 Unclassified establishments	53	53	100%
Total	3538	3151	89%

[13] Dan Ihara PhD, Executive Director of the Center for Environmental Economic Development.

Electricity Consumption Forecasts

According to the CEC, overall statewide electricity growth during the next decade is expected to start out at approximately 2.2 percent and level off to an average of 1.4 percent. In general, Humboldt County's electricity growth has lagged the rest of the state significantly in the last decade. More analysis of economic indicators would be necessary to determine whether this trend would continue.

Electricity Prices

California's electricity consumers currently face considerably higher rates than consumers in other Western states. Residential, commercial, and industrial consumers pay as much as 53, 110 and 117 percent more in electricity rates in California than similar consumers in other Western states, however, PG&E rates are expected to decrease somewhat starting in 2004 through 2008 due to its emerging from Chapter 11 proceedings. PG&E rates for 2003 are shown in Table 3.

Table 3: PG&E Electricity Rates by Sector[14]

Sector	**2003-2004 Electricity Rates (Nominal cents/kWh)**
Residential	12.9
Commercial	17.0
Industrial	12.4
Agricultural	19.7

Natural Gas Consumption

Direct natural gas end-use consumption (excluding natural gas used in electricity production) in 2003 totaled 48 million therms (MTh). Natural gas consumption has actually decreased by an average of 0.9 percent per year for the last ten years, compared to an average increase of about 1.0 percent per year for the State of California. This decrease is likely to be primarily due to the shifting economic basis of the region as previously discussed.

Natural Gas Consumption By Sector

Residential

Humboldt County's residential sector accounts for the largest share of primary natural gas consumption[15], using 43 percent of the total natural gas consumption. This compares to an average of 21 percent gas consumption for the State of California. The 2003 costs for natural gas for the residential sector for Humboldt County are approximately $15.3 million.

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[14] Source: CALIFORNIA INVESTOR-OWNED UTILITIES RETAIL ELECTRICITY PRICE OUTLOOK 2003 – 2013, JULY 2003. CEC Publication No. 100-03-003.

[15] Direct natural gas consumption is for typical end uses, and excludes natural gas consumption of power plants like the Humboldt Bay Power Plant.

The most significant residential natural gas end-uses are space heating and hot water heating, each of which comprises about 40 percent of all residential gas use. About 85 percent of California homes use natural gas for heating.

According to recent studies, the Statewide potential for reducing electricity and natural gas consumption exceeds 10 percent. This means that Humboldt County could be saving over $1.5 million per year in residential energy costs alone.

Commercial (except Timber)

Humboldt County's commercial sector (excluding timber and agricultural industries) contribute a total of 26.5 percent of the total natural gas consumption for the region. The costs for natural gas for this sector is approximately $9.4 million.

According to recent studies, the Statewide potential for reducing natural gas consumption in this sector is between 18 and 22 percent. If Humboldt County could achieve this level of savings, they would save over $1.9 million per year in commercial natural gas costs alone, keeping these resources in the local community.

The commercial sector has more diversity in its end-uses than the residential sector. The most significant direct commercial natural gas end-uses are heating (35-40 percent) and hot water heating (10 percent). Restaurants account for the largest share of commercial building usage (22 percent), followed by miscellaneous buildings (e.g., auto repair shops, libraries, theaters), offices, hospitals, and hotels.

Industrial (primarily Timber)

Humboldt County's industrial sector (primarily timber) contributes a total of 30.5 percent of the total natural gas consumption for the region. The costs for natural gas for this sector are approximately $10.8 million. The primary uses in this sector are fuel for heating processes and as a fuel source for combined, heat and power electrical generation.

Chapter 3: Regulatory Environment

One of the primary lessons learned from the recent energy crisis is the need for comprehensive, integrated, long-term energy planning. During the recent energy crisis of 2000-2001, many agencies stopped energy planning efforts, trusting that markets would entice suppliers to produce sufficient energy to meet growing demand. It is common knowledge now that electricity is unlike many commodities - for all practical purposes, it must be produced at the instant that it is used, making a market-driven supply/demand model extremely risky and expensive. A resurgence in energy planning at the state and local level has identified energy efficiency as the primary means to achieve resource adequacy in the coming years.

Current State and Utility Planning Efforts

Currently, the State of California is undergoing a process of shoring up its energy planning efforts. The California Public Utilities Commission, in collaboration with the California Energy Commission and the California Power Authority recently adopted a statewide Energy Action Plan (EAP)[16]. In addition, the California Energy Commission adopted the Integrated Energy Policy Report[17], which lays the groundwork for achieving the broader goals outlined in the EAP. These plans lay out broad policy objectives of the State, including:

- Meeting 100 percent of demand growth with energy efficiency, demand response, and renewable resources.
- Ensuring reliable, affordable, and high quality power supply for all who need it in all regions of the state by building sufficient new generation.
- Accelerating the state's goal for renewable resource generation.
- Upgrading and expanding the electricity transmission and distribution infrastructure and reducing the time before needed facilities are brought on line.
- Promoting distributed generation, and
- Ensuring a reliable supply of reasonably-priced natural gas.

The Energy Action Plan recognizes that energy efficiency programs are among the most important tools available to California in meeting these goals.

In addition, the investor-owned utilities, including PG&E, are once again required to develop long-term integrated resource plans. PG&E filed its draft Long-Term Resource Plan[18] in April 2004 and it is expected to be updated in July 2004. Lastly, PG&E files an annual Transmission Plan with the California System Operator (CA-ISO). Planning for transmission generally considers the most adverse conditions, such as low levels of hydroelectric power from the Pacific Northwest, higher than anticipated levels of generation outages inside the state, and the forced or economic retirement of older generation capacity.

[16] See http://www.cpuc.ca.gov/static/industry/electric/energy+action+plan/
[17] http://www.energy.ca.gov/energypolicy/
[18] CPUC Proceeding R. 01-10-024 Order Instituting Rulemaking to Establish Policies and Cost Recovery Mechanisms for Generation Procurement and Renewable Resource Development filed April 15, 2004.

Chapter 4: Electricity Supply

Electric supply to the Humboldt area is provided by both local generation and transmission imports. Local generation consists of larger, utility-owned generations plants; smaller, privately owner cogeneration plants that are located at industrial and commercial facilities; and small electric generation located at homes and businesses. Many of the smaller generation systems are off-grid (small-scale, distributed generation and renewables will be discussed in Chapter 7).

Utility and Other Large-Scale Generation

Humboldt County has a mix of local electricity generation that totals over 265 megawatts (MW) of capacity. This represents over 181 percent of the estimated 2004 total peak demand of 146 MW, making Humboldt County a net exporter of electricity generation outside the County.

Local generation includes the Pacific Gas & Electric (PG&E) Humboldt Bay Power Plant (HBPP) located at the eastern shore of south Humboldt Bay at King Salmon. The HBPP consists of three power generating units. Units 1 and 2, constructed in 1956 and 1958, respectively, are fossil-fueled (oil and natural gas) and have a gross generating capacity of 53 megawatts (MW) each. The HBPP also includes two diesel-powered turbine Mobile Electric Power Plants (MEPPs), with a capacity of 15 MW each run that run intermittently. The long-term availability of the PG&E thermal units is a concern due to their age and dependability. The MEPPs are limited in the total number of hours of operation per year due to emission limits. The capacity factor[19] of the plants from 2001 through 2003 was only about 35 percent (normally, base load power plants operate at capacity factors in excess of 80 percent).

Unit 3, constructed in 1963, was a boiling water, nuclear-fueled reactor with a gross generating capacity of 65 MW that was in operation by PG&E from August 1963 to July 1976. It was closed because the economics of a required seismic retrofit could not be justified following a moderate earthquake from a previously unknown fault just off the coast. It was permanently shut down July 2, 1976, and retired in 1985. The plant was then placed in SAFSTOR (with spent nuclear fuel rods stored in water pools on site) until anticipated full decommissioning in 2015.

Figure 4: Humboldt County relative to the PG&E Service Territory (Humboldt County shown in dark purple at the upper left hand of the figure).

Electricity Transmission

The second means to provide electricity supply to the region is through high-voltage transmission interconnection to broader energy markets. The transmission grid provides for a number of functions. These functions include:

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[19] Capacity factor is the ratio of the net electricity generated, for the period of time considered, to the energy that could have been generated at continuous full-power operation during the same period.

- Support wholesale market transactions and help stabilize electric prices,
- Improve system reliability,
- Improve system stability and reliability,
- Provide additional voltage support.
- The disadvantages of new transmission are:
- New transmission can be very costly,
- Siting issues for new transmission lines are often complex due to the large number of parties that are affected by such projects (e.g. visual impacts, potential impacts on property values, concerns for the impacts of electric and magnetic fields (EMF))[20].
- This capital cost is taxed for 30 or more years.

In the recent past, Humboldt County has been identified by the CA-ISO as a region of concern due to congestion of the transmission system, as well as the potential for stability, voltage collapse, and thermal overload issues. These problems are further compounded by the reduced level of availability of the area generation due to age, generator maintenance outages, and potential shortages or limitations of fuel (i.e. natural gas, oil, wood chip fuels).[21]

Pursuant to California ISO (Cal-ISO) regulations, PG&E prepares and submits an annual electric transmission expansion plan. This Report identifies the electric transmission facilities within the PG&E territory that are projected to not meet the Cal-ISO Grid Planning Criteria during the next 5-years. The latest filing of this plan was September 23, 2003.

According to the recent PG&E Study, the Humboldt transmission system covers about 3,000 square miles, and is located at the northwest corner of PG&E's service territory (see Figure 4). The Humboldt electric transmission system is comprised of 60 and 115 kV transmission facilities.

The Humboldt area is connected to the bulk PG&E transmission system by four transmission circuits, each ranging from 31 to 115 miles. Transmission import occurs primarily through the two 115 kV circuits from the Cottonwood Substation. A one-line diagram of the transmission system for Humboldt County is shown in Figure 5.

The power import capability of the Humboldt transmission system is a function of the load within Humboldt and the amount of internal generation. Previous longer-term studies (10-years) have demonstrated that the existing system's import capability can adequately serve the projected load growth up to 10 years and beyond.

Under winter peak conditions, an overlapping outage of the Humboldt-Arcata-Janes Creek 60 kV line with Fairhaven PP unit offline could create low voltages within the Humboldt 60 kV system. The Cal-ISO has identified that about 4 MW of "Required-Must-Run (RMR) generation is required for year 2004[22].

By Oct 2004, PG&E is scheduled to construct a new 60 kV line section between Humboldt Substation and Arcata Junction. This project will eliminate the need for RMR contracts in Humboldt County.

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[20] For more information on EMF see http://www.niehs.nih.gov/oc/factsheets/emf/emf.htm.

[21] California ISO 2003 Summer Assessment April 11, 2003.

[22] RMR generation is contracted with the CA-ISO to be available during peak periods.

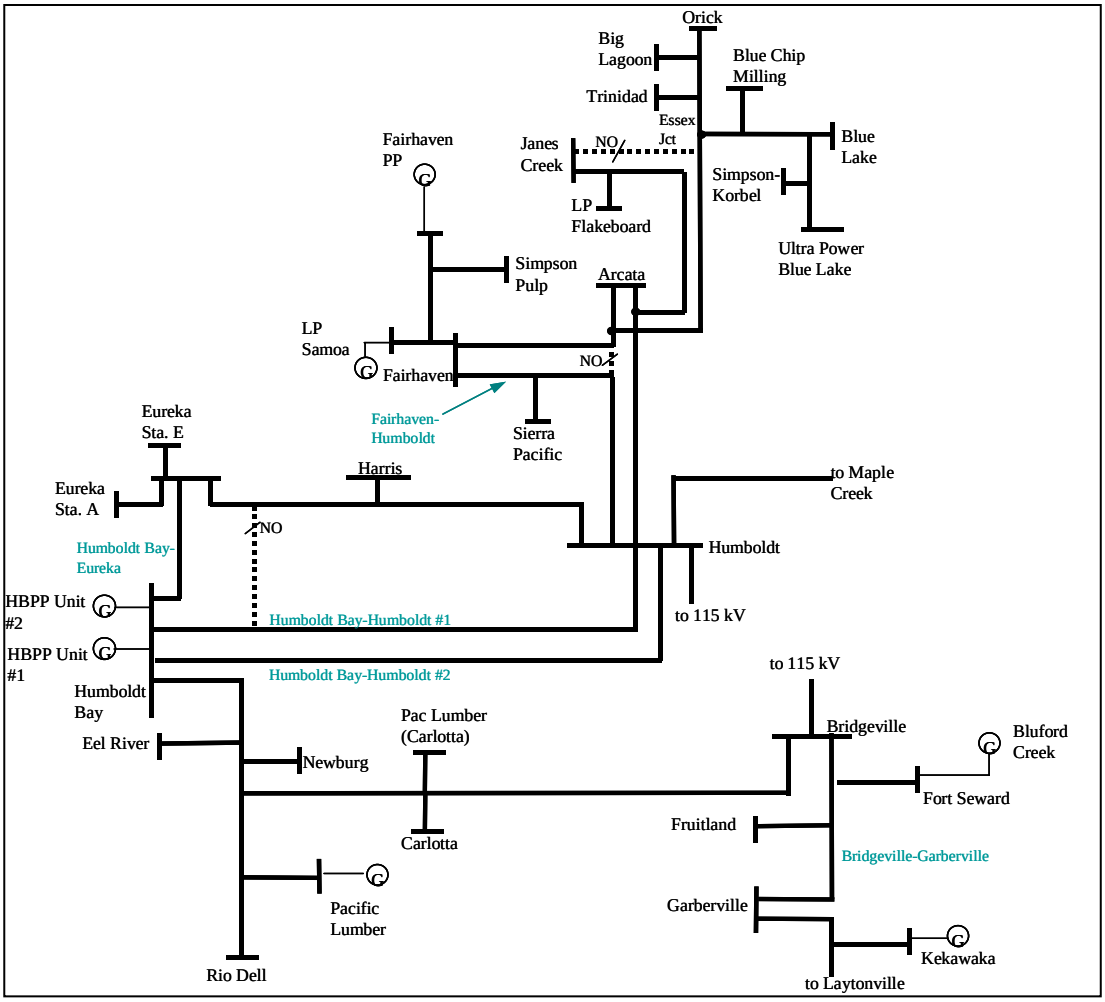


Figure 5: Diagram of the PG&E Transmission system in Humboldt County.

Chapter 5: Natural Gas

This chapter examines issues regarding the supply of natural gas for Humboldt County. The western United States, and especially California, are undergoing a tremendous increase in demand for natural gas as several thousand megawatts of new natural gas-fired electric generating capacity are being constructed.

PG&E is the local distribution company (LDC) for natural gas in Humboldt County. PG&E imports a majority of its natural gas supply from Canada as shown in Figures 6 and 7.

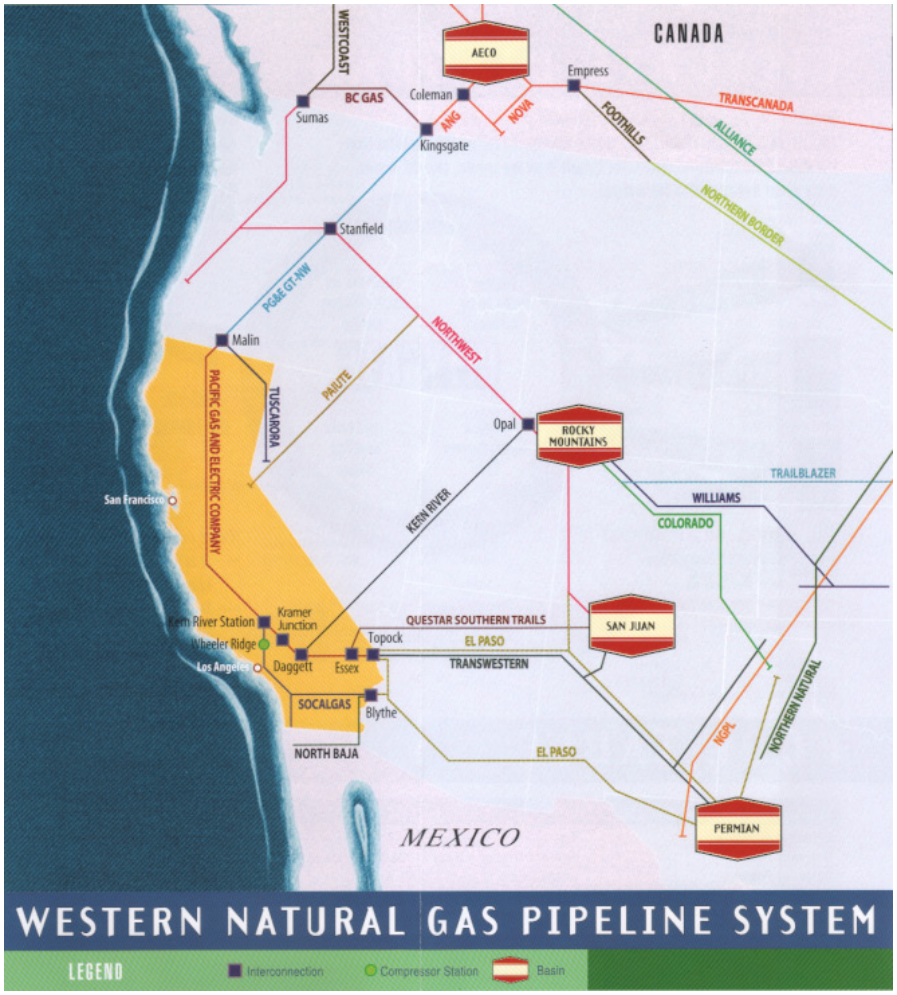


Figure 6: Diagram of the natural gas pipelines interconnecting PG&E to Canadian natural gas supply basins.

Figure 7: Diagram of the natural gas pipelines within California that supplies Humboldt County.

Natural Gas Resources in Humboldt County[23]

There are natural gas deposits present in Humboldt County. Active gas wells are concentrated in the Tompkin Hills Gas Field. Of the County's 39 gas wells, 31 are currently producing and 8 are considered shut in, meaning they cannot produce gas at their current depths and are sealed off in order to maintain the pressure on remaining deposits.3 In 2000, net gas production was 1,337,796 million cubic feet (mcf); this represents a 31 percent decrease in gas production since 1992, when net production was 1,927,787 mcf. Also in

[23] http://www.co.humboldt.ca.us/planning/gp/meetings/natl_res/nr_report.asp

1992, 34 gas wells were in production and 5 were shut in.4 Humboldt County contains three inactive oil wells and has not produced oil in at least the past ten years.

FOREXCO, Inc. of Greensboro, NC, recently secured a 20-year lease (through 2022) to engage in the exploration of natural gas in Humboldt County on the east and west side of the Eel River near Alton to determine potential natural gas reserves. As part of this lease, they have the rights to the exploration and operation of up to five previously developed well sites that have the potential for up to five wells per site. FOREXCO has proposed to construct a natural gas collection and transportation system that would cross the Eel River and interconnect with the existing gas sales delivery point at the Pacific Gas and Electric Company's (PG&E) natural gas meter station in Alton. The pipeline will be designed to operate at a maximum allowable operation pressure of 1,360 pounds per square inch (psi). The design of the project allows for greater capacity for possible future development of natural gas reserves west of the Eel River.

LNG (Liquefied Natural Gas)

As natural gas prices soared in the last 4 years, many companies began pursuing plans to built facilities to import LNG. Calpine Energy was recently turned away from performing a feasibility study for the potential construction of an LNG facility on the Samoa peninsula.

Natural Gas Prices

Natural gas prices have climbed steadily in the last 5 years and have been extremely volatile as can be seen in Figure 8.

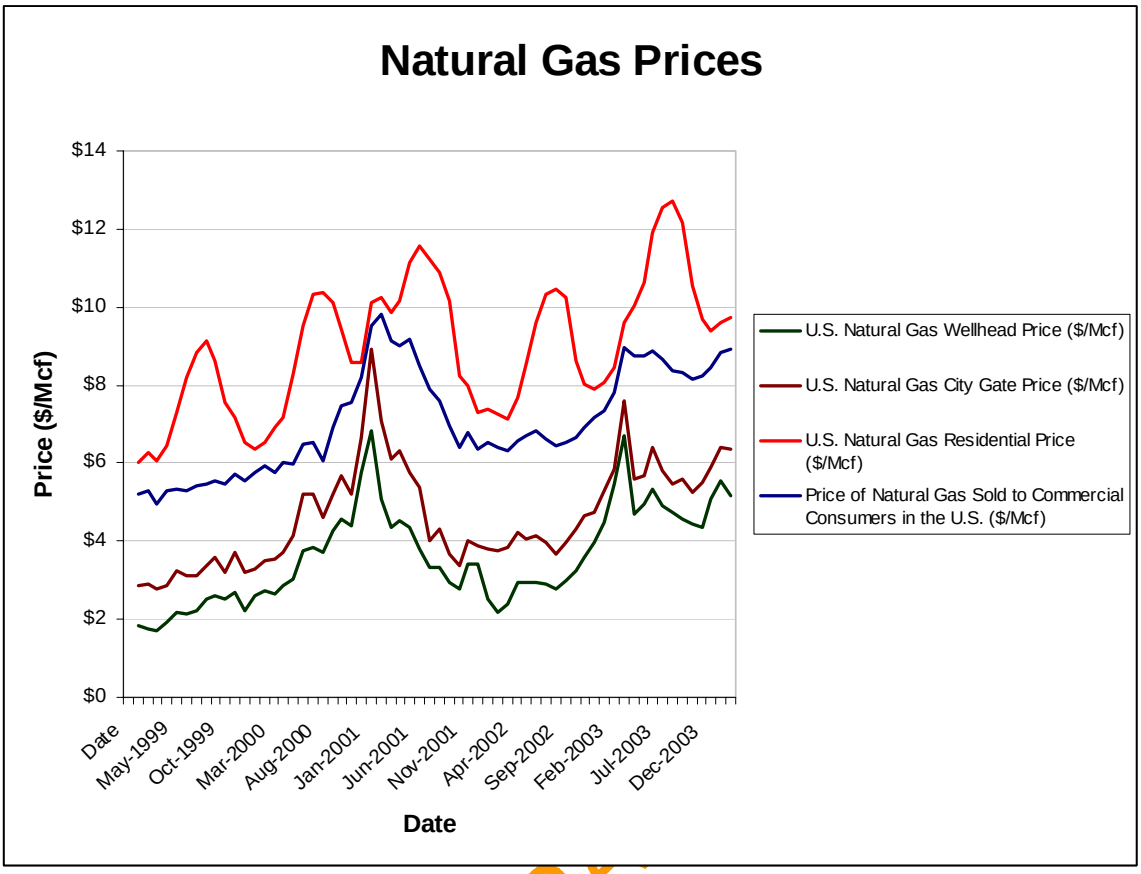


Figure 8: Natural Gas Prices from 1999 to Present (Source: DOE EIA).

Chapter 6: Demand Side Management/ Energy Efficiency

Demand side management has long been recognized as the best means to provide for energy resources. The adage that "the cheapest kilowatt-hour is the one that is not used" is more true today than ever. Based on recent studies, estimates of potential savings for energy efficiency range from 35 to 100 gegawatt-hours, or $20 to 43 million between 2002 and 2011 for Humboldt County[24].

Public-Good Energy Efficiency Programs

PG&E and other third parties, like the RCEA, are currently funded to offer a broad range of energy efficiency programs that provide information, education and incentives to encourage the purchase of energy efficient equipment and support practices for the design and construction of energy efficient buildings and homes. These programs are funded by a surcharge on electricity and natural gas rates. In 2000, the State of California enacted two bills—AB995 and SB1194—extending the systems benefits charge on electric distribution service to support energy efficiency programs with approximately $250 million in statewide funding for energy efficiency programs through 2012. It is estimated that about $1M of these funds are collected from customers in Humboldt County each year.

Energy efficiency programs are categorized in several ways, including by sector, by technology or strategy and statewide versus local. Statewide programs are those that are those that are offered by the utilities throughout the entire state. They are generally applicable to any region in a like manner. Examples of statewide programs include rebates for high efficiency appliances. An example of a local program is the Redwood Coast Energy Authority information and education program.

Humboldt County, by virtue of its remote, rural geographic location, is defined as "hard-to-reach" by the CPUC. This designation generally presumes that customers do not have easy access to program information or generally do not participate in energy efficiency programs due to their being distant from the urban centers.

Codes and Standards

California's building (Title 24) and appliance standards and are the most cost-effective means of achieving energy efficiency in the state. Since 1975, the annual peak savings have been significant. Title 34 codes are enforced by local government jurisdictions and there are opportunities for local agencies to create programs to promote exceeding Title 24 minimum standards. There are also incentive programs to help offset the costs of builders of residential and commercial buildings to improve their efficiency.

This Chapter will be the primary focus of the RCEA in the coming months, as its program is focused primarily on energy efficiency. Through this program, the RCEA will seek to determine:

- How much cost-effective demand reduction and energy efficiency exists in Humboldt County?
- What sectors should be addressed and how?
- What barriers to tradition energy efficiency programs exist that are unique to Humboldt County due to its rural nature, geography, climate, etc.?

[24] Estimates are based on a proportionate share of estimated statewide savings potential.

Definitions

Demand-Side Management (DSM)

DSM includes energy efficiency, conservation, and load management. These measures are also collectively referred to as "demand response" strategies because they focus on influencing customer demands for gas and electricity. The primary difference between these measures is that efficiency and conservation are means of reducing overall energy use, whereas load management is a way of shifting energy use in response to the needs of the electric system.

Energy efficiency refers to the permanent installation of energy efficient technologies or the elimination of energy losses in existing systems. Examples include high efficiency motors that use less energy, building insulation, or new ways of sealing ducts to prevent air leakage. The purpose of pursuing energy efficiency is to deliver the same level of service with less energy.

Energy conservation refers to behavioral changes in how one uses any energy-consuming appliance, such as turning off lights when leaving a room, or running the dishwasher only when full. The behavioral change may last for a short duration or may be incorporated into a habit or lifestyle.

Load management refers to strategies employed by electricity distribution companies to manage their overall system load by "shaving peaks" and or "filling valleys" on a daily or seasonal basis. Load management makes sense because it is more expensive to purchase energy to meet limited term energy peaks than it is for the utility to sponsor program or tariffs that encourage customers to either shift or reduce their energy usage during these peak periods. There are three principal types of load management programs being operated in California today: air conditioner and pool pump cycling programs, time-of-use rates, and curtailable rate programs. In the last two years, the energy agencies in California have been working to expand the effectiveness of time-of-use pricing by adding a more dynamic element. "Dynamic pricing" uses price signals to induce customers to cut back their energy use during periods of peak demand and high energy costs. With dynamic pricing in place, electricity prices charged to customers can be adjusted on short notice (typically an hour or day ahead) to reflect changes in the cost of purchasing and delivering electricity. These measures help to make the energy system more flexible by making the overall system demand level more responsive to changes in supply.

Potential Impacts of Energy Efficiency on the Local Economy

In is widely recognized that investment in energy efficiency can have a positive effect on the local economy. These benefits accrue through the following:

1. Increased spending on energy efficiency in the local economy,
2. Reduced spending on power purchased from outside other region,
3. The possibility if increased regional spending on energy efficiency creating jobs.

Additional long-term benefits accrue to the region through lowered overhead or operating costs for participants (resulting from the continued energy savings of energy efficiency improvements over the 10 to 20-year life of the efficiency measure) and, therefore, increased

disposable income. These energy dollars are more likely to remain in the local economy, creating an economic multiplier.[25]

[25] The American Council for an Energy-Efficient Economy, Energy Efficiency and Job Creation: The Employment and Income Benefits from Investing in Energy Conserving Technologies.

Chapter 7: Distributed Generation and Renewables

Distributed generation is defined as electricity that is generated on or near the point of use. Humboldt County has over 132 MW of non-utility, distributed generation (DG), or 81 percent of peak demand, most of which is fueled by renewable energy resources[26]. This includes larger, industrial cogeneration systems (10 to 25 megawatts each) to smaller solar systems that are on homes and businesses (a few kilowatts each). About 42 MW of this generation is currently idle for due to lack of fuel or other economic reasons. This does not count the significant number of solar and hydro systems that are "off-grid," particularly in the southern portion of the County[27].

The use of distributed generation in Humboldt County is expected to continue to grow for a number of reasons, including significant financial incentives for clean DG, the competitiveness of self-generation and renewable generation to utility rates and the independent nature of Humboldt County that is fueling a desire to become as energy independent as possible. The Gas Research Institute (GRI) estimates that DG for systems of 25 MW and under will grow an average of 4 percent per year from through 2015.[28] The Department of Energy (DOE) projects that utility DG resources will represent about 5 percent of total capacity or 19.1 GW of capacity added by 2020. DOE also estimates that DG in buildings will grow from 8 billion kWh in 2000 to 27 billion kWh in 2020 for all fuel uses.

Of all non-PG&E-owned generators in Humboldt County larger than 1 MW, about 61 percent of the output is sold to PG&E under power purchase agreements with PG&E, the remainder offsets the consumption of the host customer. Table 1 shows the non-utility owned power plants within Humboldt County along with their capacities, total output sold to PG&E, and total output that serves onsite use.

Table 1: Non-utility Generation in Humboldt County

Plant Name	Capacity (MW)	Sale For Resale (MWh)	Onsite Use (MWh)
Fairhaven Power Co	15	102,757	0
Humboldt Pulp Mill	28	0	0
Samoa Pulp Mill	20	2,828	133,426
The Pacific Lumber Co	32.5	156,978	36,649
Ultrapower 3 Blue Lake	13.8	0	0

[26] The only non-renewable powered system identified is one 350 kilowatt natural gas-fuel cogeneration located at Humboldt State University. An additional 750 kW system is being installed in 2004.

[27] David Katz, founder of Alternative Energy Engineering in Redway, estimates that there are about 5,000 people off the grid in Southern Humboldt County (Source: North Coast Journal Weekly. http://www.northcoastjournal.com/022201/cover0222.html).

[28] http://www.industrialcenter.org/consortia/distribgen.htm. A wide variety of ranges in estimates are reported depending on the definition of technologies and markets. According to Resource Dynamics, there is a base of about 50 GW of smaller reciprocating engines. It is reported that less than 100 MW of capacity each year is sold by microturbines, fuel cells and other DG renewables. It is estimated that as much as 72 GW of DG may be added by 2010. See: http://www.distributed-generation.com/market_forecasts.htm#Potential%20DG%20Market%20Size.

The Ultrapower Plant in Blue Lake has been shut down since 2000 when its contract with PG&E was cancelled. The owners of the plant are currently considering several options, including restarting the plant in its current configuration (biomass-fueled), dismantling the plant and moving it to another location outside the County, or expending the plant to provide an additional 20 MW of capacity. Permit applications are pending for the expansion which is their preferred option. The expanded plant would be fueled by either ultra low-sulphur diesel or renewable biofuel. While the expansion and startup plans are supported by PG&E and the CA-ISO, there is some reported lack of support by staff of the CPUC[29].

DG provides several benefits to electric utilities and ratepayers by avoiding or reducing the cost of transmission and distribution system improvements, avoiding congestion problems, adding voltage support, providing more efficient use of natural gas (through CHP), reducing peaking and base load generation development requirements, and provide additional generation without the capital cost being passed on to consumers. The individual customer could benefit from increased reliability, reduced peak demand and the ability to choose its own power supply in the absence of direct access. One of the most attractive benefits to consumers is that distributed generation of less than 1 MW can return excess power to the grid at retail rates under the "net metering" provision.[30]

Broader regional benefits from DG include: power supply diversity, increased in-region power supply, a hedge against higher cost grid-based power supply options as future prices are expected to continue to climb, and energy security through enhanced "control" of supply and economic development.

Increased use of DG technologies in the region also has some potential disadvantages including the potential need for gas and T&D infrastructure upgrades, potential increased complexity of coordination of DG units for grid planning and the potential of an increased reliance on natural gas while gas prices are on the rise.

Several economic, regulatory and institutional barriers exist that will influence the rate at which DG is used throughout Humboldt County. In the past, the most significant barrier to widespread deployment of DG is the high up-front capital cost of many technologies. With the proliferation of DG throughout the state, prices have been coming down to some extent. While some DG technologies are very cost effective (e.g., CHP), others currently still depend on government incentives (e.g. PV, wind, geothermal and some biogas DG). Many barriers to these technologies have also been mitigated since the energy crisis of 2000. There has been significant emphasis by regulatory bodies to improve tariffs, mitigate exit fees and standby charges and streamlining permitting processes. For example, the CPUC has provided for an exemption for 3,000 MW of distributed generation over the next 10 years from the Cost Responsibility Surcharge or "exit fee" imposed on customers who leave the grid.

Humboldt State University is currently installing its second distributed generation unit- a combined heat and power (CHP) system. The first is a 350 kW natural gas fueled, reciprocating engine. The heat output is used to heat dormitory facilities and serves kitchen facilities. The newer system is a 750 kW system that will reduce the consumption of the

[29] Information based on a phone conversation on June 18, 2004 with Michael J. Ruffatto, President, North American Power Group, Ltd.

[30] Net metering allows self-generation solar systems of less than 1 MW to return excess generation capacity to the grid at retail rates.

university by approximately 5.6 million kWh per year. The system will be receiving a $750,000 rebate from the CPUC Self-Generation Program[31].

Renewables

Humboldt County is a leader in renewable energy resources. Over 80 percent of the region's electricity peak demand is currently served by in-region renewable resources. This compares to the State of California that in 2001, about 10.5 percent of retail electricity sales in California came from renewable energy resources.

For the purposes of qualifying for renewable incentives and meeting the statewide renewable portfolio standard, the State of California defines "eligible renewable energy resources" as

biomass, solar thermal, photovoltaic, wind, geothermal, fuel cells using renewable fuels, small hydroelectric generation of 30 megawatts or less, digester gas, municipal solid waste conversion, landfill gas, ocean wave, ocean thermal, or tidal current, and any additions or enhancements to the facility using that technology.

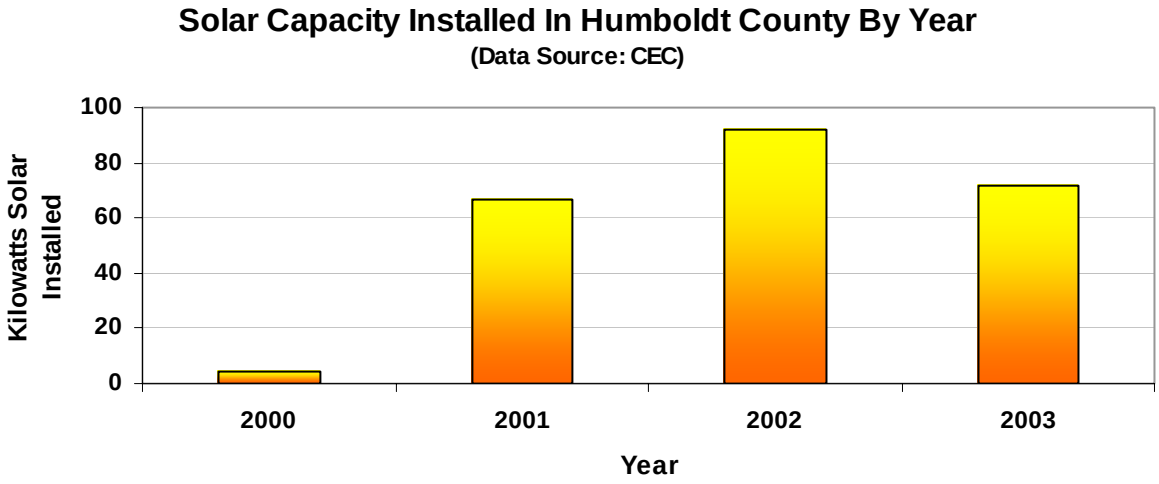
Solar

Humboldt County has seen a tremendous amount of solar electric systems installed for residential and small commercial use. Between 2000 and 2003 alone, there were over 108 systems installed with a total combined capacity of 257 kilowatts[32]. This does not include the dozens of systems that were likely installed prior to 2000. The Redwood Alliance is in the process of installing a solar system that would provide sufficient electricity for its entire facility[33]. Many builders throughout California are offering homes that integrate solar into the design.

On a proportional basis, the amount of solar installed in Humboldt County during this timeframe exceeds that which was installed in PG&E service territory by over 260 percent and installed throughout California by nearly 300 percent[34]. The capacities installed from 2000 through 2003 are shown in Figure 9.

[31] From conversations with George Wright, HSU Chief Engineer for Plant Operations.
[32] All systems installed in Humboldt County have been less than 30 kW. Systems 30 kW and greater would receive a 50 percent incentive from the CPUC Self-Generation Program. To date, no projects in Humboldt County have applied to this program.
[33] See http://www.redwoodalliance.org/.
[34] Over 7,600 solar systems have been installed in California between 2000 and 2003, for a combined total capacity of over 47.6 MW. Over 400 large systems (>30 kW) are under development for an additional 64.5 MW (Data Source: CPUC Self-Generation Program).

Figure 9



The RCEA recently received funding from the Department of Energy for the Million Solar Roofs Program. This program will work to identify and overcome local barriers to deploying solar systems.

Many question the cost effectiveness of solar. In fact, compared to the current total costs of electricity on the grid, solar is a very cost effective. Although smaller solar systems are still expensive (about $8-10 per watt), larger systems are being installed throughout the State of California for less than $5 per watt.

Biomass[35]

According to a study conducted by Humboldt State University, there is some potential for on-site energy production at larger dairy farms fueled by recovered biogas by using an anaerobic digestion process[36].

Electricity produced by utilizing biogas in an engine-generator can be used on the farm or sold to a local utility. Thermal energy for heating water or buildings can be acquired by directly burning biogas in a boiler or furnace, or from a heat recovery system connected to the engine-generator set.

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[35] This section adapted from the FEASIBILITY STUDY ON IMPLEMENTING ANAEROBIC DIGESTION TECHNOLOGY ON HUMBOLDT COUNTY DAIRY FARMS, Humboldt State University. Antonio Reis and Richard Engel, Schatz Energy Research Center, Humboldt State University, Arcata, CA 95521, June 1, 2003.

[36] Anaerobic digestion is a biological process in which bacteria break down organic matter in an airless environment, with biogas as the end product. Biogas derived from dairy manure is comprised of approximately 60% methane (CH_4), 40% carbon dioxide (CO_2), and trace amounts of other gases, including hydrogen sulfide (H_2S). Due to its high methane content, biogas can be used as a fuel for energy conversion devices (Source: FEASIBILITY STUDY ON IMPLEMENTING ANAEROBIC DIGESTION TECHNOLOGY ON HUMBOLDT COUNTY DAIRY FARMS, Humboldt State University. Antonio Reis and Richard Engel, Schatz Energy Research Center, Humboldt State University, Arcata, CA 95521, June 1, 2003.)

An anaerobic digester on a Humboldt County dairy could produce between 4 million and 6.4 million cubic feet of biogas and 124,000 to 198,000 kilowatt-hours of electricity annually, leading to potential annual avoided electrical costs of $11,100 to $23,800. Valuable thermal energy for water or space heating could be recovered from the engine-generator set displacing between 3,400 and 5,500 therms of natural gas per year, leading to a potential annual savings of $2,800 to $4,500 on heating costs.

The barriers to the use of this technology included the high capital investment necessary for installing the system, which is between $500 and $1,000 per cow, leading to an installed cost of $200,000 to $400,000 for the complete system. Additionally, operations and maintenance costs for a typical Humboldt County digester designed to handle the manure from 400 dairy cows are estimated to be $10,000 to $20,000 annually.

There are many programs designed to help dairy operators fund and install AD systems on their farms. With these types of assistance, implementation of AD technology on a suitable Humboldt County dairy would become more feasible than previously indicated. The best case payback period is reduced to 2.6 years with outside financial assistance. The Dairy Power Production Program (DPPP) offers up to 50% of project capital cost or up to $2,000/kW capacity. The remaining portion of the project cost could be partially offset with PG&E's Self-Generation Incentive Program (SGIP) that would pay a rate of $1,500/kW or up to 40% of the projects' capital cost. The available financial assistance can significantly decrease the simple payback period of an AD system installed on a suitable Humboldt County dairy. These results, combined with the project's intangible benefits, could make AD technology a viable option for a local dairy's manure management system. The USDA's Rural Development Program also offers funding for purchase of renewable energy systems, including biogas generators, by agricultural producers.

Wind

Wind energy is one of the most cost effective means to produce renewable energy. Larger systems produce energy at less than 6 cents per kilowatt hour, which compares very favorably to the costs of gas-fueled turbines. According to the American Wind Energy Association (AWEA), California was the first U.S. state in which large wind farms were developed, beginning in the early 1980's. California's current installed capacity is 2042.6 MW with an addition 307 MW planned. The estimated wind energy potential is 6,770 MW37.

Humboldt County has potentially valuable wind resources in its mountain ranges to the east and on the southern coastal regions. There may even be a potential for an offshore wind farm off Cape Mendocino.

A wind resource map for northern California is shown in Figure 10 and a resource map for all of California is shown in Figure 11. The wind resource maps estimate the resource in terms of wind power classes, ranging from class 1 (the lowest) to class 7 (the highest). Each class represents a range of mean wind power density (in units of watts per square meter) or equivalent mean wind speed at the specified height(s) above ground. Areas designated class 3 or greater are suitable for most wind turbine applications, whereas class 2 areas are marginal. Class 1 areas are generally not suitable, although a few locations (e.g., exposed hilltops not shown on the maps) with adequate wind resource for wind turbine applications may exist in some class 1 areas.

[37] http://www.awea.org/projects/california.html

According to the National Renewable Energy Laboratory (NREL), the annual average wind power for exposed coastal areas of California north of Point Conception is estimated to be largely class 3, except for class 4 around Cape Mendocino. Because the prevailing wind direction is northwest during spring and summer and between the winter storms, and because much of the California coastline is oriented northwest to southeast, coastal areas that protrude into the flow experience the highest wind power.

Almost 5 years of site data from a DOE-installed tower at Point Arena indicated class 3 wind power at 50 m (164 ft). This site, which is well exposed to prevailing strong winds, is considered largely representative of exposed coastal areas of central California. Limited data from a site on the exposed ridge crest at an elevation of about 450 m (1,476 ft) on Cape Mendocino indicate class 6 annual average wind power.

From Cape Mendocino northward, wind power is about equal in winter and spring, because strong winds associated with winter storms are more frequent along the northern California coast than the central and southern coast. Exposed areas on Cape Mendocino are estimated to have class 3 or greater wind power in every season.

According to the California Energy Commission, there have been at least six (6) new grid-tied, wind turbine installations in Humboldt County between 2000 and 2003, with a total capacity of 38.7 kilowatts[38]. There are likely many more that have been installed and not been connected to the electrical grid.

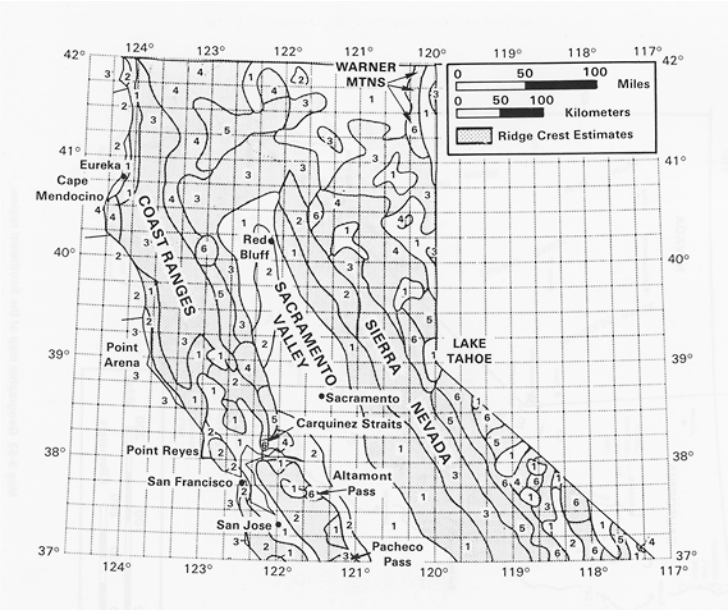

Figure 10: Wind Resource Map for Northern California (Source: http://rredc.nrel.gov/wind/pubs/atlas/maps/chap3/3-54m.html)

There is some anecdotal evidence that Humboldt County has sufficient wind resources in areas like Thompkins Hill and near Petrolia to consider the development of more wind turbine systems[39]. In the 1980's there was a report that PG&E was considering installing wind turbines around Pt. Arena and at sites near Bear River Ridge. Like many sites that have sufficient wind resources, they may not be ideal for larger systems since the availability of transmission is not adequate to tie the output to the electrical grid. This would not prevent smaller systems from being installed to serve the needs of individual homes and businesses.

In January 2003, the CPUC directed the utilities to issue a general solicitation letter to industry participants to afford developers the opportunity to fund transmission conceptual (including cost) studies for the projects that they are interested in developing to address the

[38] Data provided by the CEC on grid-tied systems that received a CEC rebate as of September 15, 2003.
[39] Based on a phone conversation with Henry Hough, former PG&E employee and renewable energy expert.

statewide renewables goals[40]. It is not known whether any developers are looking at potential wind resources in Humboldt County, but facilitating these studies may be an opportunity for the RCEA.

[40] CPUC Order Instituting Investigation Into Implementation of Assembly Bill 970 Regarding the Identification of Electric Transmission and Distribution Constraints, Actions to Resolve Those Constraints, and Related Matters Affecting the Reliability of Electric Supply. 00-11-001. January 2003.

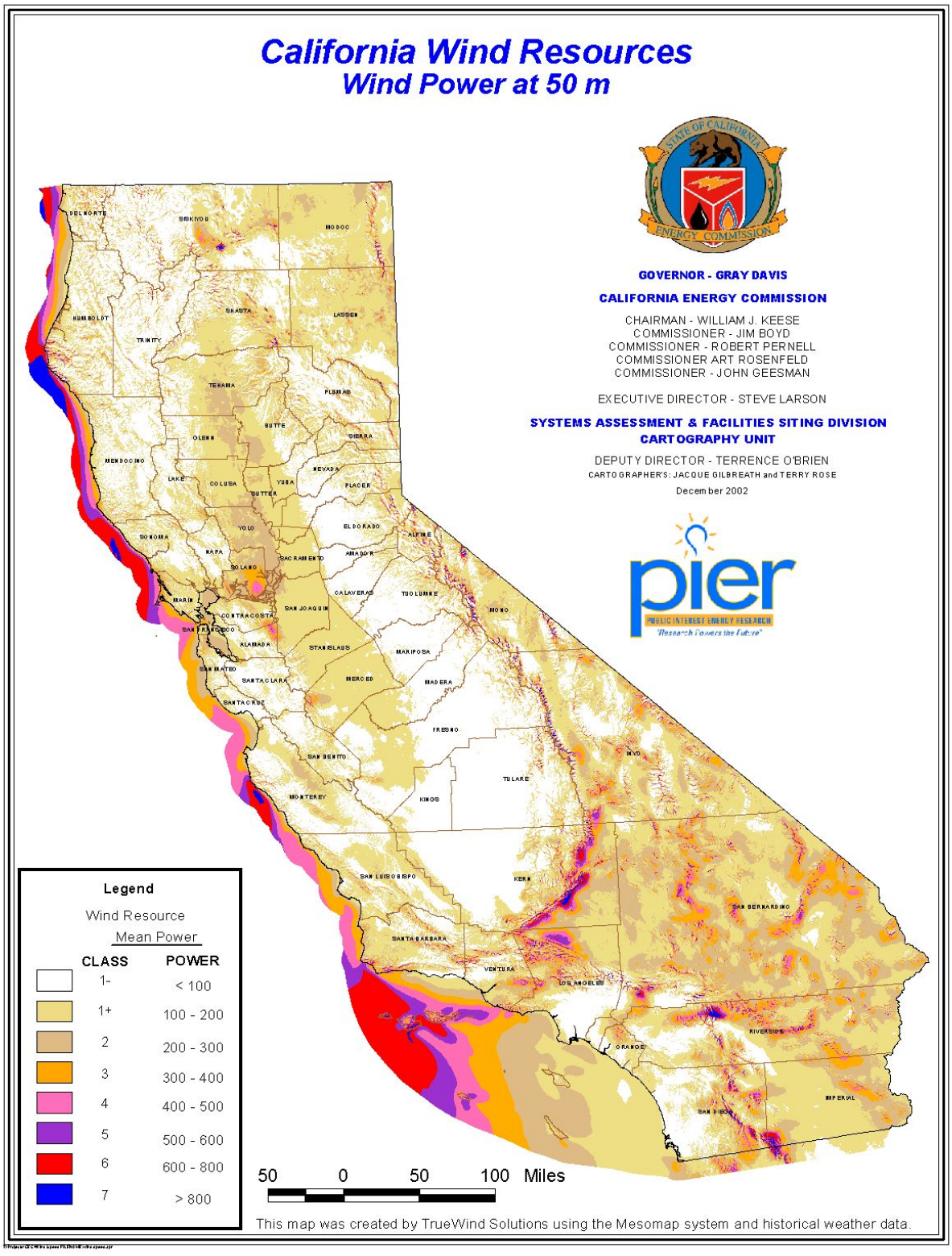

Figure 11: Wind Resource Map for California (Source: California Energy Commission.

Biomass

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OCEAN ENERGY[42]

Generating technologies for deriving electrical power from the ocean include tidal power, wave power, ocean thermal energy conversion, ocean currents, ocean winds and salinity gradients. Of these, the three most well-developed technologies are tidal power, wave power

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[41] Anaerobic digestion is a biological process in which bacteria break down organic matter in an airless environment, with biogas as the end product. Biogas derived from dairy manure is comprised of approximately 60% methane (CH4), 40% carbon dioxide (CO2), and trace amounts of other gases, including hydrogen sulfide (H2S). Due to its high methane content, biogas can be used as a fuel for energy conversion devices (Source: FEASIBILITY STUDY ON IMPLEMENTING ANAEROBIC DIGESTION TECHNOLOGY ON HUMBOLDT COUNTY DAIRY FARMS, Humboldt State University. Antonio Reis and Richard Engel, Schatz Energy Research Center, Humboldt State University, Arcata, CA 95521, June 1, 2003.)

[42] Adapted from the CEC http://www.energy.ca.gov/development/oceanenergy/

and ocean thermal energy conversion. Tidal power requires large tidal differences which, in the U.S., occur only in Maine and Alaska. Ocean thermal energy conversion is limited to tropical regions, such as Hawaii, and to a portion of the Atlantic coast. Wave energy has a more general application, with potential along the California coast. The western coastline has the highest wave potential in the U.S.; in California, the greatest potential is along the northern coast.

Wave energy conversion takes advantage of the ocean waves caused primarily by interaction of winds with the ocean surface. Wave energy is an irregular and oscillating low-frequency energy source that must be converted to a 60-Hertz frequency before it can be added to the electric utility grid.

Although many wave energy devices have been invented, only a small proportion have been tested and evaluated. Furthermore, only a few have been tested at sea, in ocean waves, rather than in artificial wave tanks.

As of the mid-1990s, there were more than 12 generic types of wave energy systems. Some systems extract energy from surface waves. Others extract energy from pressure fluctuations below the water surface or from the full wave. Some systems are fixed in position and let waves pass by them, while others follow the waves and move with them. Some systems concentrate and focus waves, which increases their height and their potential for conversion to electrical energy.

A wave energy converter may be placed in the ocean in various possible situations and locations. It may be floating or submerged completely in the sea offshore or it may be located on the shore or on the sea bed in relatively shallow water. A converter on the sea bed may be completely submerged, it may extend above the sea surface, or it may be a converter system placed on an offshore platform. Apart from wave-powered navigation buoys, however, most of the prototypes have been placed at or near the shore.

The visual impact of a wave energy conversion facility depends on the type of device as well as its distance from shore. In general, a floating buoy system or an offshore platform placed many kilometers from land is not likely to have much visual impact (nor will a submerged system). Onshore facilities and offshore platforms in shallow water could, however, change the visual landscape from one of natural scenery to industrial.

The incidence of wave power at deep ocean sites is three to eight times the wave power at adjacent coastal sites. The cost, however, of electricity transmission from deep ocean sites is prohibitively high. Wave power densities in California's coastal waters are sufficient to produce between seven and 17 megawatts (MW) per mile of coastline.

As of 1995, 685 kilowatts (kW) of grid-connected wave generating capacity is operating worldwide. This capacity comes from eight demonstration plants ranging in size from 350 kW to 20 kW. None of these plants are located in California, although economic feasibility studies have been performed for a 30 MW wave converter to be located at Half Moon Bay. Additional smaller projects have been discussed at Fort Bragg, San Francisco and Avila Beach. There are currently no firm plans to deploy any of these projects.

As of the mid-1990s, wave energy conversion was not commercially available in the United States. The technology was in the early stages of development and was not expected to be available within the near future due to limited research and lack of federal funding. Research and development efforts are being sponsored by government agencies in Europe and Scandinavia.

Many research and development goals remain to be accomplished, including cost reduction, efficiency and reliability improvements, identification of suitable sites in California, interconnection with the utility grid, better understanding of the impacts of the technology on marine life and the shoreline. Also essential is a demonstration of the ability of the equipment to survive the salinity and pressure environments of the ocean as well as weather effects over the life of the facility.

Permitting Issues

Some of the issues that may be associated with permitting an ocean wave energy conversion facility include:

- Disturbance or destruction of marine life (including changes in the distribution and types of marine life near the shore)
- Possible threat to navigation from collisions due to the low profile of the wave energy devices above the water, making them undetectable either by direct sighting or by radar. Also possible is the interference of mooring and anchorage lines with commercial and sport-fishing.
- Degradation of scenic ocean front views from wave energy devices located near or on the shore, and from onshore overhead electric transmission lines

Chapter 8: Recommendations for Additional Research and Next Steps

Chapter 1: Background and Introduction

1. The RCEA should engage local stakeholders in a collaborative process to review the draft report and to consider developing a more comprehensive Regional Energy Plan.

Chapter 2: Electricity and Natural Gas Demand

2. A better, more consistent means to measure per capita electricity consumption is needed. This is particularly important since the State of California is proposing goals for energy efficiency based on per capita targets. While per capita consumption may be appropriate for the residential sector, better metrics may be available for commercial and industrial sectors, like energy intensity (the amount of energy per unit of business output, normally Gross Domestic (or Regional) Product).

Chapter 3: Regulatory Environment

Chapter 4: Electricity Supply

3. The RCEA should consider actively engage discussions with PG&E on the future disposition of the Humboldt Bay Power Plant. Future repowering of the plant to more efficient technology would greatly increase its efficiency and reduce its demand for natural gas.

Chapter 5: Natural Gas

Chapter 6: Energy Efficiency

4. As part of the current CPUC Information and Education Program, conduct surveys to gauge participation in energy efficiency programs and the potential of energy efficiency in all sectors.

Chapter 7: Distributed Generation and Renewables

5. Evaluate the potential benefits of the restart or expansion of the Ultrapower Plant in Blue Lake. If benefits are positive, consider supporting the project developer in an application to the CPUC for project approval. In addition, should the region pursue Community Choice Aggregation, an ownership in a portion of the HBPP would enable Humboldt County to either pass significant savings on to its customers, or to invest potential revenues into additional alternative programs such as energy efficiency and renewables development.

6. Very few larger distributed generation systems have been installed and received incentives from the PG&E Self-Generation Program. The RCEA should work with PG&E to identify how more self-generation projects could be pursued in the area (including a marketing and outreach/education program for commercial and industrial customers in conjunction with the RCEA's energy efficiency information programs).

7. The RCEA could consider joint procurement of DG systems and assistance with financing their costs.

8. The RCEA should work with potential developers of wind, biomass, and landfill gas generation, and other renewable resources, to assist with the development of these resources to meet the future needs of Humboldt County, as well as PG&E and the State of California to reach its aggressive Renewable Portfolio Standard goals. In particular, the RCEA may wish engage in the CPUC-led process that directs utilities to investigate transmission upgrades to support the development of renewable energy resources (R.00-11-001), the RCEA could assist industry stakeholders to investigate exploring potential wind sites in Humboldt County.

9. The RCEA should work with waste agencies to assess whether there is landfill gas generation opportunities.

Appendix A: Energy in General Plans

It is not required that energy be addressed as a specific element in General Plans[43]. There are a number of significant energy issues that should be addressed throughout the general planning process within the context of required and optional elements of the general plan. Some of the issues that could be addressed in various elements are outlined in the following Table.

General Plan Element	Energy Issues
Land Use/ Circulation	Building intensity or density can be delineated, which often has implications on per capita energy consumption. May provide an inventory and location of existing and proposed power plants, oil and natural gas pipelines, and major electric transmission lines and corridors. Future siting of such energy infrastructure facilities can be based upon population projections and proposed land use, which could prevent conflicts that often preclude the development of needed energy infrastructure. May consider such factors as the demand for transmission facilities, the transport and storage of hazardous materials, local transportation impacts of current and future power plant developments and the potential co-location of facilities (e.g. transmission lines along major interstate corridors). Public Utilities Code §12808.5 requires cities and counties approving electrical transmission and distribution lines of municipal utility districts to make a finding concerning the consistency of the lines with the general plan. May provide an inventory of areas available for the management or utilization of natural resources such as mineral resources (e.g. natural gas), wind energy generation, hydroelectric power, geothermal power, and large-scale solar power. May enable the analysis, approval, and regulation of future energy plants (e.g. power plants, liquefied natural gas plants, etc). Could assist in planning for the adequacy and availability of existing community electrical and natural gas utilities (along with water, sewer, and drainage facilities) and the need for expansion and improvements. Policies could assist in the development, improvement, timing and location of community electrical, natural gas along with sewer, water, and drainage lines and facilities to minimize impacts on communities.
Housing Element	Provides for the basis of enforcement of building codes (e.g. Title 24[44]).

[43] State of California General Plan Guidelines, State of California Department of Land Use and Planning.

[44] Title 24, Part 6 (California's Energy Efficiency Standards for Residential and Nonresidential Buildings) were first established in 1978 in response to a legislative mandate to reduce California's energy consumption. The

Housing Element (cont'd)	May establish requirements for site improvements that have energy usage implications (e.g. street widths, tree shading, solar orientation of subdivision lots, etc.). May identify opportunities for energy conservation and local energy supply (e.g. clean self generation and solar) in the design and construction of individual units and in the overall design of subdivisions. Could mandate higher levels of energy conservation and solar resources to mitigate cost-of-living impacts in assisted housing developments and other housing for lower income households. Could establish the use of local public financing mechanisms to finance public improvements and services for housing, such as for energy efficiency improvements and installation of self-generation and solar systems (e.g. by using special assessment districts, Mello-Roos community facilities districts, etc.). Provide for regulatory incentives and concessions that will be used to facilitate and encourage energy efficient buildings and alternative energy supplies.
Safety	Could consider the impact of seismic activity on potentially hazardous energy facilities, such as power plants (i.e. nuclear, hydroelectric), fuel processing facilities, and transmission lines.
Air Quality (optional element)	May assess and limit the potential impacts of energy generation facilities.
Capital Improvements/ Public Facilities (optional element)	May recommend and/or adopt a preferential energy resources plan that provides for higher levels of energy efficiency in all public buildings, including conservation measures, alternative energy sources, and cost effective supplies. May provide incentives for developers to implement capital improvements such as "power parks" that provide cost effective supplies of heat and power to support beneficial economic development. May develop a role for public agencies in the ownership of energy supply infrastructure in order to ensure a base level of electricity supply that is not subject to the risks of price volatility of private ownership.
Economic/ Fiscal Development (optional element)	May identify energy development areas (e.g. new technologies, renewables, etc.) which could support a variety of industrial, commercial, and professional businesses will produce tax revenue.

standards are updated periodically to allow consideration and incorporation of new energy efficiency technologies and methods. New standards were adopted by the Commission in 2001 as mandated by Assembly Bill 970 to reduce California's electricity demand. The new standards went into effect on June 1, 2001.

	May identify strategies which provide for adequate infrastructure and reasonably-priced energy supplies to foster the competitiveness of existing businesses.