Humboldt County General Plan 2025

ENERGY ELEMENT

Draft

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Prepared by
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CHAPTER 1. INTRODUCTION

Energy Fuels Our Everyday Lives

In Humboldt County, as in all parts of the United States, we depend on energy 24 hours a day, and we continuously benefit from direct and indirect use of energy resources. Energy is so pervasive in our daily lives that it can sometimes be taken for granted. From the sun we draw heat, light, and solar power; we depend on it to grow our food, forests, flowers, etc. We depend on fossil fuels to get us to work, school, the local shops, and the hospital; to transport our food, commodities, mail, and even garbage; we depend on it to visit exotic places by plane (and to get to the airport), or to visit a friend by car. Electricity enables us to work after the sun goes down; we depend on it to light our offices, classrooms, and streets; to keep our food cold and our ice cream frozen; to pump water through pipes; and to transmit during this electronic age. Energy in a diversity of forms fuels our industries and business ventures: from powering lumber mills to dairy farms; from firing ceramics to pizzas, and from brewing beer to cooking fry bread. Energy generation and transmission is also an industry in and of itself. Clearly, reliance on energy resources characterizes a large part of our everyday lives.

The production and consumption of energy also affects our daily lives in more indirect ways, particularly with regards to the environment. The burning of fossil fuels has led to damaging environmental effects such as acid rain, smog, water pollution, and global warming. Exploratory drilling and extraction of non-renewable energy sources (such as coal, petroleum, and natural gas), and its attendant infrastructure, has succeeded at the degradation of other natural resources, for example forests, coastal communities, and rainforests. Although these areas may be far away, the environmental impacts can reach Humboldt County.

In addition, in a wide variety of ways, local and national governments expend a portion of their budgets (i.e. tax dollars) on energy resources, including expenditures for procuring oil on the international market; paying for hazardous waste clean-up; subsidizing energy research; or simply maintaining local roadways.

In Humboldt County, energy is used as a transportation fuel and as electrical and heat energy in homes, businesses, industries, and agriculture. In 2003 it is estimated that Humboldt County spent $319 million to meet local energy demands, the majority of which left the county. Approximately half of the energy was used as a transportation fuel (gasoline and diesel), with large amounts also used to meet end use electrical demands and end use natural gas heating demands. It is estimated the county's end use energy consumption totaled about 17.4 trillion Btu's. Because of inefficiencies in the generation and transmission of electricity, it is estimated that the county's primary energy consumption totaled about 24.4 trillion Btus. Primary energy sources were comprised mainly of natural gas, gasoline, diesel, and biomass (wood waste and firewood).

Why an Energy Element?

In today's environment, where conventional energy resources are increasingly constrained and their use is causing unintended adverse impacts, the need for local energy planning is evident. This is particularly true for an area like Humboldt County, which is somewhat isolated and remote from the rest of the energy grid. The importance of local planning has been well understood for issues like transportation, land use, waste management, water supply and housing, but energy planning has not traditionally been a part of the County's planning process.

The development of an Energy Element for Humboldt County's General Plan update can help ensure that policy decisions made now, and which will guide the County for the next twenty years, take into account the region's need for long-term energy sustainability.

What will a sustainable energy plan look like? It is likely to feature policies that will ensure energy supply continuity, reduce energy demand, increase energy efficiency, and advance the use of clean, efficient, and renewable energy resources, especially those that are local. If we develop long-term energy sustainability for our communities, the benefits will be significant. Benefits will likely include the ability to:

- Retain more energy dollars in our local economy;
- Ensure more reliable and secure energy supplies;
- Reduce our dependence on imported energy sources;
- Reduce our susceptibility to energy price shocks;
- Create jobs and diversify our economic base;
- More effectively incorporate the concerns of our local citizens in energy decisions;
- Improve/maintain the quality of our environment;
- Address local and global environmental issues such as climate change; and
- Respond thoughtfully to energy projects that are proposed for our area[1].

Energy Planning Issues

Just as the context for energy use is complex and variable, so too is the context for energy planning. Energy planning must consider a variety of factors, some of which are basically unknown (e.g., How much oil is left?) and therefore must be based on assumptions. Energy assumptions, furthermore, are based on perspectives that can range from cautious to reckless, restrictive to negligent, pessimistic to optimistic, proactive to reactive.

[1] Numerous energy development projects have been proposed for Humboldt County over the last few years, including a coal power plant, LNG terminal, wind power development, and wave power development. By working to develop a local energy plan the community will be better prepared to deal with and respond to the next big proposed energy project that comes along

When considering the implications of different energy planning assumptions and approaches, it is important to recognize both the uncertainty and the range of possibilities the future possesses. Two approaches to energy planning are (i) to anticipate change that is gradual and incremental; and (ii) to anticipate change that is relatively quick and fundamental. Generally, the former approach has predominated: planners have forecast growth and projected current trends, then utility companies accommodate projected growth in their resource plans. This approach based on previous trends is a sort of "business as usual" approach; it assumes uniform availability of energy sources and accommodates an established, growing demand.

The latter approach considers the possibility of more abrupt changes that can reconfigure the provision of energy (some refer to this as "punctuated equilibrium" to describe when basic units change and reconfigure relationships). Energy planning using this approach might anticipate a relatively rapid decline in the worldwide oil supply, for example, with consequential increases in the volatility of energy supplies and, therefore, prices. When using this approach, however, planners contemplate a universe of possible scenarios that is quite large, and assigning likelihoods to them is very challenging.

These two energy planning approaches contrast each other. However, changes in the energy environment can happen either gradually or abruptly, or even with a combination of the two. Factors that will continue to shape the energy landscape, either incrementally or precipitously, include:

- Uncertainty in the supply, reliability, and affordability of energy;
- Decreases in non-renewable energy supplies;
- Improvements in energy efficiency;
- Innovations in renewable energy technologies;
- Shifts toward decentralized power generation ("distributed generation");
- Adoption of policies that could substantially reduce the U.S.'s imported oil dependence;
- Adoption of policies that could substantially reduce the risks of climate change;
- Adoption of energy-related policies in land use, health, safety, and environmental issues; and
- Significant increases in energy conservation practices.

The Energy Element does not substantially address likelihoods of specific fundamental changes in the energy environment. Nevertheless, by the very act of incorporating the Energy Element in its General Plan, the people of Humboldt County are acknowledging that energy issues are relevant for our future, are important for planning our communities, and will be instrumental in improving the current energy environment and creating the most sustainable and beneficial energy environment possible. To this end, the Energy Element's planning approach is to be proactive; to foster self-sufficiency, independence, and local control in energy management; to support diversity and creativity in energy resources, conservation, and efficiency[2]; and to be based realistically on constrained resources. It will also be important to monitor and analyze outcomes to see whether policies adopted by the County are achieving the intended results.

[2] Energy *conservation* is steps taken to use less energy by lowering end use services; energy *efficiency* is steps taken to reduce energy use while still providing the same level of end use services (see Glossary).

Therefore, the Energy Element has implementation measures that facilitate making changes and adjustments for future conditions, and making mid-course policy changes where appropriate (referred to as "adaptive management").

RCEA (Redwood Coast Energy Authority)

The Energy Element is a new addition to the Humboldt County General Plan. The Redwood Coast Energy Authority (RCEA) saw that an exceptional opportunity existed for Humboldt County to include important and timely regional energy policy in the Humboldt County 2025 General Plan Update. In response to RCEA's recommendation, on September 13, 2004, the Humboldt County Board of Supervisors directed staff to prepare an Energy Element as a part of their review and adoption of the *Sketch Plan Alternatives* report[3] for the General Plan update.

RCEA was formed in 2003 as a Joint Powers Association (JPA), representing seven municipalities (the Cities of Arcata, Blue Lake, Eureka, Ferndale, Fortuna, Trinidad and Rio Dell) and Humboldt County. As a JPA, RCEA is governed by a Board composed of a representatives from each jurisdiction. RCEA's mission statement is:

> The Redwood Coast Energy Authority'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.

Currently all of RCEA's funding comes from contracts and grants, bringing resources to Humboldt County that would not otherwise be available. For fiscal year 2004/05, RCEA's funding came from a major two-year contract with Pacific Gas & Electric Company (PG&E) to promote energy efficiency (funded by California ratepayers under the auspices of the California Public Utilities Commission), and a smaller contract with the US Department of Energy to promote the use of solar energy.

One objective of RCEA's "Redwood Coast Regional Comprehensive Energy Information & Education Program" is to assist the local government with the adoption of energy efficiency policies. RCEA coordinated the preparation and adoption of the Energy Element. To assist with this effort RCEA retained an Arcata-based professional planning consultant, Planwest Partners, Inc., whose project team included the local expertise of Schatz Energy Research Center (SERC), Winzler and Kelly, Inc., Center for Environmental Economic Development (CEED), and Net Gain. The planning process included background and technical research, a series of public meetings, drafting a vision, goals, policy language and implementation strategies, and presenting the draft Energy Element to the Humboldt County Board of Supervisors.

[3] The *Sketch Plan Alternatives* (June 2004 draft) describes generalized depictions of proposed planned land uses to illustrate the various General Plan options. They present a range of alternative policy options and buildout futures for Humboldt County. Sketch plan components are expected to evolve based upon public input to provide sound policy choices and buildout scenarios reflective of community values.

The Role of the County & RCEA

The County and the RCEA Board and staff have worked together to prepare this Energy Element. RCEA's staff and consultants' work was funded by RCEA's Public Goods Charge energy efficiency contract with PG&E, and grant funding from both the North Coast Regional Air Quality Management Board and the U.S. Department of Energy's Million Solar Roofs Program. The County and RCEA worked on formulating the vision and goals, and drafting policy language and implementation strategies. Preparing the Energy Element also included an active public participation component, during which RCEA and the project team drew upon the local community for input and ideas.

Adoption of the Energy Element resides with the Humboldt County Board of Supervisors, and they have the primary responsibility to carry out Energy Element goals and policy. The Board of Supervisors uses its discretion to appoint other resources to help carry out the implementation strategies which will achieve energy goals. As the current Regional Energy Authority, the Board has designated RCEA to implement much of the Energy Element's strategies (all implementation strategies and corresponding responsible parties are listed in Chapter 5). The speed at which the RCEA can carry out implementation strategies is contingent upon funding, and the Energy Element policies and strategies shall serve as a tool to pursue future funds.

Once the County Energy Element is adopted, RCEA will use it as a model to be presented to each of the county's seven cities, in the hope of incorporating compatible energy policy into city general plans. The RCEA is also expected to continue, as funding allows, to support emerging technology for renewable energy; provide energy conservation and efficiency information and training; work with vendors to develop a broader range of locally available energy efficient products; and develop the RCEA's organizational capacity (see Redwood Coast Regional Comprehensive Energy Information and Education Program at www.redwoodenergy.org for more detail).

Energy Element Goals

During preparation of this draft Energy Element, the RCEA Board, with input from the broad community (including stakeholders from the homebuilders industry, agriculture, realtors, energy generators, and more), developed the overall goals of the Energy Element. They are:

- **Goal E1** – Develop and implement countywide strategic energy planning.
- **Goal E2** – Increase energy conservation & efficiency.
- **Goal E3** – Increase the supply of energy from renewable sources, distributed generation, and cogeneration.
- **Goal E4** – Pursue opportunities for local management of energy supply.

Relation to Other Elements

The Energy Element is to become Chapter 15 of the General Plan Update. However, as illustrated above, energy issues affect directly or indirectly most, if not all, community issues. Correspondingly, energy-related goals and policies relate directly or indirectly to most, if not all, other General Plan Elements.

Energy planning relates directly to the following planning areas; specific energy polices currently contained in the Energy Element could be effectively incorporated instead into these General Plan elements:

General Plan Part 2 – Building Communities:
Chapter 4. Land Use Element
Chapter 5. Growth Management Element
Chapter 6. Infrastructure and Public Facilities Element
Chapter 7. Circulation Element
Chapter 8. Housing Element
Chapter 9. Community Design Element
Chapter 10. Economic Development

General Plan Part 3 – Natural Resources and Hazards:
Chapter 11. Water Resources Element
Chapter 16. Air Quality
Chapter 21. Emergency Management
Chapter 22. Waste Management

Some aspects of energy planning may be related indirectly to the following planning areas; the relevance of including energy polices in these General Plan elements should be considered:

Part 3 – Natural Resources and Hazards:
Chapter 12. Flooding & Stormwater Management
Chapter 13. Biological Resources
Chapter 14. Cultural and Scenic Resources
Chapter 17. Geologic Hazards
Chapter 18. Fire (summary)
Chapter 19. Noise
Chapter 20. Airport Safety

Structural Framework of Element

The Energy Element is based on an informal hierarchy, which begins with a broad vision and filters down to specific actions. The chain of elements are as follows:

- VISION: The vision expresses the overall desired community to which the Energy Element aspires.

- GOALS: The goals are the desired conditions that will help build the envisioned community.
    - OBJECTIVES: The objectives represent short-term, measurable steps towards fulfilling a goal.
        - POLICIES: The policies give direction to facilitate achieving the goals. Some policies have standards, as applicable.
            - STANDARDS AND IMPLEMENTATION STRATEGIES: The standards and implementation strategies identify specific one-time, recurring, or ongoing actions that are intended to carry out General Plan policies.

Contents of the Energy Element

Chapter 1 is the **Introduction** to the Energy Element. It touches upon the context in which the Energy Element was developed, explains the coordinated roles of the RCEA and the County, and describes the Element's contents.

Chapter 2 is the **Overview of Existing Conditions & Resources**; it summarizes the main topics of *Technical Background Report* that was prepared in conjunction with this Energy Element (the full report is included in the appendix). The topics include local energy demand (existing and projected), and the opportunities and constraints to meet energy current and future demand.

Chapter 3 contains the **Vision & Goals**. The vision describes the energy-related community characteristics and qualities that the County would like to achieve by the year 2025. This chapter then specifies the Energy Element's four primary goals.

Chapter 4 contains the **Energy Objectives and Policies**, which correlate directly to the four Energy Element goals. The four areas of energy policy are:

- Strategic Energy Planning, which includes policies for the County and the Regional Energy Authority to educate the public, provide programs, and apply integrated energy planning and regulations to create energy-efficient communities and jurisdictions;
- Energy Efficiency & Conservation, which includes policies and standards for energy-efficient structural designs and technologies, in both public and private sectors.
- Renewable Energy, Distributed Generation & Cogeneration, which includes policies to increase renewable energy source to meet local energy demands; policies include supporting research and development, incentives, and education projects/programs, and minimizing barriers; and

- Local Management of Energy Supply, which includes policies to increase local management of energy supply, for locally generated energy, imported energy, and exported energy.

To demonstrate the link between the vision statement and policy, the applicable portion of the vision statement precedes each set of policies.

Chapter 5 contains the **Standards and Implementation Strategies** which designate the actions that will support and carry out the policies of Chapter 4. Some implementation strategies are applicable to and may be incorporated with other General Plan elements as they are developed and/or updated (e.g. Land Use Element, Transportation Element, Waste Management Element, etc.). The implementation strategies are presented in a table format; the table identifies the responsible party, available resource(s), and time frame for each action.

At the end of the document there is a **Glossary of Terms** and the **Appendix** (Appendix A. *Technical Background Report*, Schatz Energy Research Center 2005).

CHAPTER 2. Overview of Existing Energy Conditions, Resources and Opportunities

This chapter provides an overview of existing Humboldt County energy conditions, projects future energy demands, and assesses the availability of energy resources and the ability of conservation practices to meet those demands. This chapter summarizes information provided in Appendix A – *Humboldt County Energy Element Background Technical Report*.

Humboldt County Energy Consumption

Energy is used in three primary ways in Humboldt County: 1) as a transportation fuel, 2) as electrical energy in homes, businesses, industries, and agriculture, and 3) as heat in homes, businesses, industries, and agriculture. In 2003 it is estimated that Humboldt County used 17.38 trillion Btu's of energy across all three of these areas. The total retail cost associated with this energy use is estimated to be about $319 million, the majority of which left the county. Figures 1 and 2 show how this energy use and the associated energy expenditures were distributed among various energy sources. Consumption of gasoline and diesel fuel for transportation accounts for the majority (greater than 40 percent) of both energy use and expenditures. Electricity also accounts for greater than 40 percent of total energy expenditures.

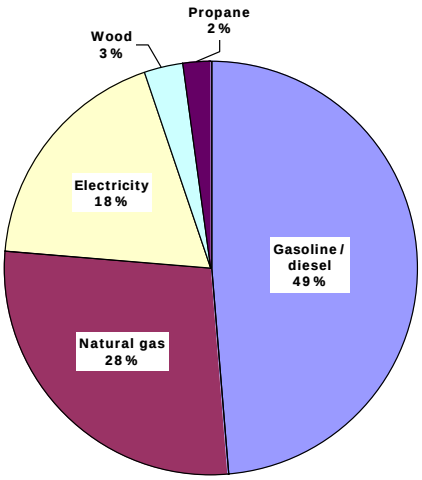

Figure 1. Humboldt County End Use Energy Consumption, 2003 (17.38 trillion Btu's)

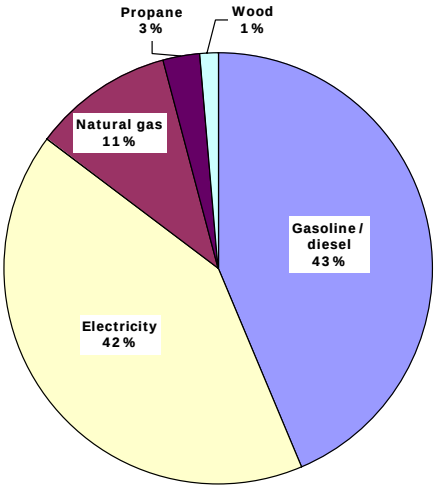

Figure 2. Humboldt County End Use Energy Expenditures, 2003 ($319.4 million)

Figures 1 and 2 illustrate characteristics of Humboldt County's "end use" energy consumption. "End use" energy consumption refers to the amount of energy consumed at the point of use (i.e. energy used by the consumer to provide end use services such as light, space heat or motive power). As discussed below, a large portion (approximately 70 percent) of Humboldt County's

electricity is generated locally. This electricity is primarily generated in steam electric power plants that burn natural gas (PG&E's Humboldt Bay Power Plant, Samoa pulp mill) and biomass (Fairhaven Power Plant, Pacific Lumber Company). These plants typically run at thermal efficiencies of 20%-30%. Consequently, the amount of "primary" energy consumed in Humboldt County in 2003 is estimated to be 24.35 trillion Btu's. "Primary" energy consumption refers to the amount of end use energy consumption plus losses that occur in the generation, transmission, and distribution of energy. Figure 3 illustrates how this primary energy consumption was distributed among the various energy sources.

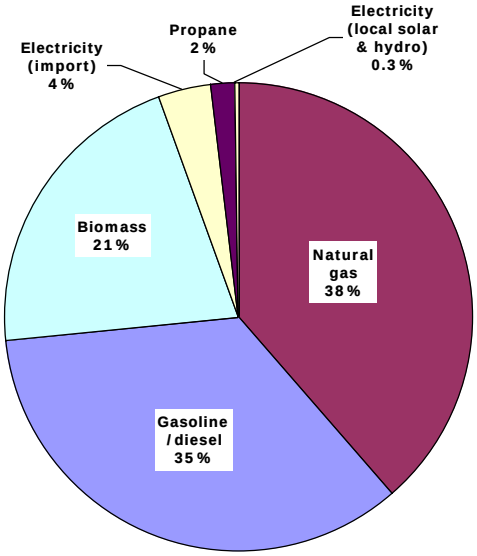

Figure 3. Humboldt County Primary Energy Consumption, 2003 (24.35 trillion Btu's)

Electricity and natural gas, provided by Pacific Gas and Electric Company (PG&E), are used in the residential, commercial, industrial, and agricultural sectors. Figures 4 and 5 show the amount of electricity and natural gas, respectively, consumed in each sector in 2003. Total electricity consumption was 940 GWh, and total peak electrical demand was 158 MW. Due to cool coastal summers and the resulting minimal use of air conditioning, Humboldt County is one of the few areas in the state where electricity use peaks in the winter rather than in the summer. The total amount of natural gas consumed is estimated at 93.9 million therms. Almost half that amount was burned to generate electricity. The peak demand for natural gas occurs in the winter months as well.

Figures 6 and 7 show the end use categories where the majority of electricity and natural gas, respectively, are likely used (based on statewide data) in the both the commercial and residential sectors. Lighting and refrigeration account for the majority of electricity consumption in these sectors; space heating and water heating account for the majority of natural gas consumption. Electricity use in the industrial sector is primarily in sawmills, with a small amount used in the food products and durable and non-durable goods industries. Similarly, natural gas use in the industrial sector is almost entirely associated with sawmills (for drying wood), with the remainder being used in the food products and non-durable goods industries.

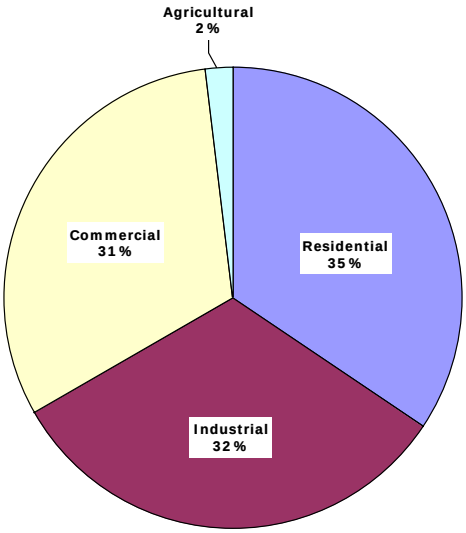

Figure 4. Electricity Consumption by Sector, 2003 (940 GWh)

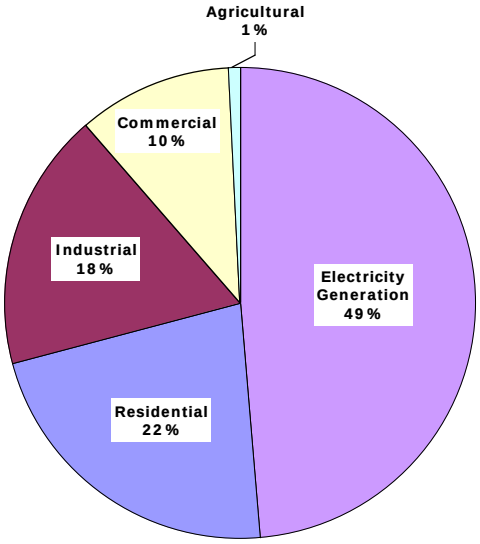

Figure 5. Natural Gas Consumption by Sector, 2003 (93.9 million therms)

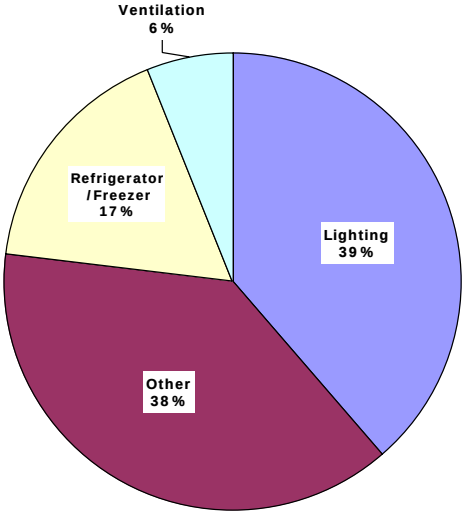

Figure 6. Commercial and Residential Electricity Consumption by End Use, 2003 (619 GWh)

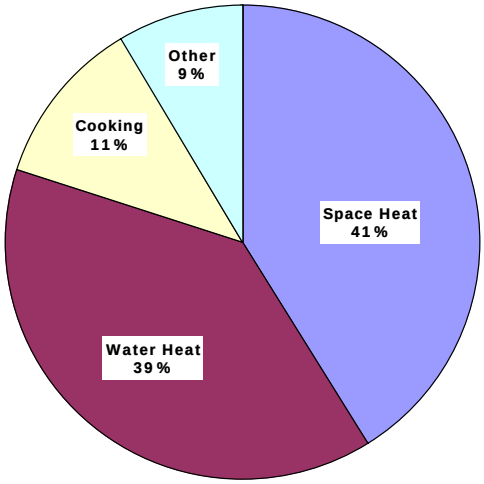

Figure 7. Commercial and Residential Natural Gas Consumption by End Use, 2003 (30.6 million therms)

Electricity and natural gas use in Humboldt County showed modest change over the period of 1990 to 2003. Between 1990 and 2000, total electricity use increased 1.3% per year and use in all sectors (residential, commercial, industrial, agricultural) increased slightly. During this same period the gain in the county's population was 0.6% per year. However, between 2000 and

2003, electricity use in the industrial sector (mainly the timber industry) declined by about 30%, causing a slight dip in total consumption. Natural gas use in Humboldt County (not including gas used for electricity generation) between 1990 and 2003 decreased at an average rate of 1.0% per year. Again, most of the decrease occurred in the industrial sector.

It is expected that natural gas and electricity consumption in the county will grow modestly over the next 10-20 years. Based on past behavior, it is likely that the growth in electricity consumption will range from about 0.5% to 1.5% per year. PG&E predicts the growth in electricity demand in Humboldt County will average 0.6% per year. Statewide estimates for growth in natural gas demand (excluding growth for electricity generation) are about 1% per year. Natural gas demand growth in Humboldt County may be substantially lower. However, future natural gas demand is difficult to forecast. For example, if PG&E or an independent power producer were to build a new gas-fired electric generating facility in Humboldt County, natural gas consumption would grow sharply.

Gasoline consumption in 2003 in Humboldt County is estimated at 54.5 million gallons, and diesel consumption is estimated at 16.8 million gallons. Between 1997 and 2003 the estimated gasoline consumption in Humboldt County increased at an average of 1.5% per year. Transportation fuel consumption is directly related to the number of vehicle miles traveled, which in turn is strongly related to land use development patterns.

Humboldt County, because of its rural nature, exhibits higher levels of vehicle miles traveled than more densely populated regions. This is due both to a greater number of personal vehicle miles traveled, as well as to the need to transport the majority of consumer goods into the county, and other materials (like lumber and municipal refuse) out of the county. According to the 2000 US Census, 72% of the workers in Humboldt County drive alone to work, 13% carpool, 7% walk, 1% use public transit, and 6% work at home.

Local and Imported Energy Sources

The majority of energy consumed in Humboldt County is imported, with the exception of biomass energy. Biomass energy in the form of firewood and waste wood (used for space heating and for electricity generation) essentially all comes from within the county. Table 1, below, gives an estimate of the quantity of various energy sources consumed in the county in 2003, including estimates of the percentage imported versus from local sources.

Although the majority of electricity (73%) is generated within the county, a large portion of it is generated using natural gas (PG&E Humboldt Bay Power Plant, Samoa pulp mill) that is primarily imported (89%). The other locally-generated electricity is produced primarily from biomass (Pacific Lumber, Fairhaven), with the remainder coming from local hydroelectric facilities and a very small amount from distributed wind energy and solar electric systems.

Table 1. Consumption of Local Versus Imported Energy Sources, 2003

Source	Amount	MMBtu's	% imported	% local
Gasoline	54,569,000 gal	6,275,435	100%	0%
Diesel	16,800,000 gal	2,184,000	100%	0%
Natural gas*	93,860,628 therms	9,386,063	89%	11%
Electricity	940 GWh	3,208,220	27%	73%
Biomass**	849,645 tons	5,182,919	0%	100%
Propane	4,210,900 gal	384,581	100%	0%

* Includes natural gas used for electricity generation and for all end uses.

** Includes biomass burned for electricity production and residential space heating only; does not include biomass burned for process heating (e.g. wood drying kilns in sawmills).

Figure 8 shows the proportion of electricity coming from each source. A portion of the power produced by local generators is used to serve on-site loads (e.g. motors, lights, process equipment). For Pacific Lumber this accounts for about 15-25% of their generated power. For the Samoa pulp mill this accounts for essentially all of their generated power, while the Fairhaven plant provides all of their power to the electrical grid.

Although 27% of the electricity used in the county is imported, there is actually enough local generation capacity to meet all of the local electrical energy needs. PG&E's Humboldt Bay Power Plant, because it is old and relatively inefficient, is not run frequently at its full capacity. If this plant were run consistently near full capacity, all the county's current electricity needs could be met with power supplied from local generators.

Recent developments offer opportunities for Humboldt County to meet a larger share of its electrical power needs with locally generated power. In February of 2005, PG&E announced a request for offers (RFO) to replace the power that is being generated at its 130 MW Humboldt Bay plant, thereby taking steps to ensure future long-term reliability of electric service for its

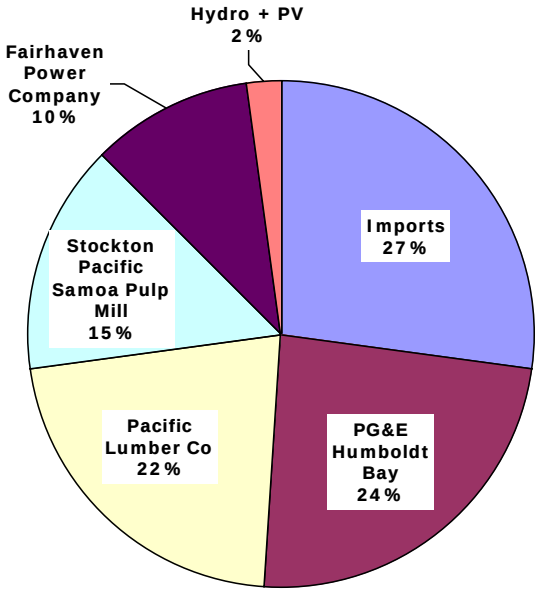

Figure 8. Humboldt County Electricity Supply by Source, 2003 (940 GWh)

customers on the North Coast. PG&E is seeking bids for 135 to 150 MW of new generating capacity. The new generation may be located at the Humboldt Bay plant location or another site in the area, or PG&E may purchase power from other local generators. If approved by the Public Utilities Commission, the replacement generation is expected to be available by 2008. There is a good possibility that this replacement generation will be more efficient and cleaner than the existing Humboldt Bay Power Plant. If this is the case it will likely be run more consistently near its full capacity and will thereby lessen the county's dependence on imported electricity.

The Fairhaven Power Plant was purchased by DG Energy Solutions of San Diego, CA, in 2005. DG Energy Solutions is also interested in purchasing and restarting the Ultrapower 3 biomass power plant in Blue Lake, CA. These developments could serve to lessen the county's dependence on imported electricity as well as increase fire prevention and forest health.

Humboldt County's reliance on imported energy resources results in a large portion of energy expenditures immediately leaking out of the county economy. In addition, a strong reliance on imports increases the county's susceptibility to price volatility and decreases the reliability and security of the county's energy supply. This decrease in reliability and security is due in part to the fact that Humboldt County is remotely located at the end of terminating spurs of both PG&E's electrical and natural gas grids. The county's remoteness provides few alternatives for importing energy. In addition, all of the propane fuel used in the county is imported by truck, and there are only two key highway connections that can effectively handle this transport: Highway 101 and Highway 299. This can pose serious supply problems if highway travel is inaccessible, as is common in the winter months due to slides. Gasoline and diesel fuels are imported by barge to the Chevron terminal on Humboldt Bay, and access to the Bay inlet can also be impaired during winter storms.

Opportunities to Reduce Energy Use

Electricity and Natural Gas

Numerous studies have been conducted to estimate the energy efficiency savings potential on both a national and statewide scale. One set of statewide energy efficiency studies was conducted by Xenergy, Inc.[1] These studies looked at both electricity and natural gas savings potential in California over the next ten years. The studies estimated the maximum "achievable" energy efficiency savings to be equivalent to 10% of California's total electricity consumption and 5% of total natural gas consumption (excluding natural gas used to generate electricity). These "achievable" savings estimates only considered technologies that are readily available for widespread use today, focused on equipment that could be easily replaced as opposed to measures requiring major renovations, only considered measures that would be cost-effective, and accounted for the fact that not everyone is going to install efficiency measures even if they

[1] *California's Secret Energy Surplus: The Potential for Energy Efficiency*, September 23, 2002; *California Statewide Commercial Sector Energy Efficiency Potential Study*, July 9, 2002; *California Statewide Residential Sector Energy Efficiency Potential Study*, April 2003.

are cost-effective. These same studies have been used by the California Public Utilities Commission to adopt energy efficiency goals for the state over the next ten years.

Scaling these statewide estimates down and adjusting them to apply to Humboldt County's end use requirements (e.g. no air conditioning), it is estimated that in ten years electricity savings in Humboldt County could total 84.8 GWh per year (8% of the county's projected total electricity use), and natural gas savings could total 2.6 MTh per year (5% of the county's projected total natural gas use).

Transportation Fuels

Decreasing vehicle miles traveled is the most effective local measure for reducing transportation energy use. Implementing land use planning that locates housing, jobs, and shopping in proximity, and provides bicycle, pedestrian, and public transit access will encourage alternative transportation modes and results in reduced vehicle travel. Vehicle miles traveled can also be reduced by increasing local goods production and consumption (such as growing food locally) and local waste processing (through recycling, reusing and composting). Increasing the proportion of energy-efficient vehicles can help lower energy consumption, and alternative-fueled vehicles may serve to diversify the energy resources upon which the transportation sector relies.

Meeting Energy Needs Using Local Energy Resources

The *Humboldt Energy Element Background Technical Report* (Appendix A) assessed the availability and potential of Humboldt County's local energy resources. It is estimated that total local electricity generation from renewable resources could provide as much as 1500 MW of generating capacity and over 6000 GWh per year of electrical energy. This energy supply potential is over six times the county's current consumption rate. Figure 9 shows the estimated electricity generation potential of the various resources. Table 2 presents a list of local energy resources that were examined, and summarizes some of their characteristics. These are rough estimates that are intended to provide a relative sense of magnitude. A more detailed analysis would be required to more accurately estimate the potential of each of these resources.

There are many technological, economic, and regulatory uncertainties involved in estimating local energy resource potential. This is especially true for energy resources whose technologies are still early in their development, like wave energy systems. The estimate for wave energy potential, although by far the largest component of the estimated renewable electricity sources, is the most uncertain, and the wave energy resource is the least likely to be significantly developed in the near term. Even for well-proven resources like wind, solar, and hydropower there are many potential barriers that could impede development, including high costs, regulatory hurdles, lack of financing, siting and transmission access issues , and lack of public support. Nonetheless, the potential of these local resources is large.

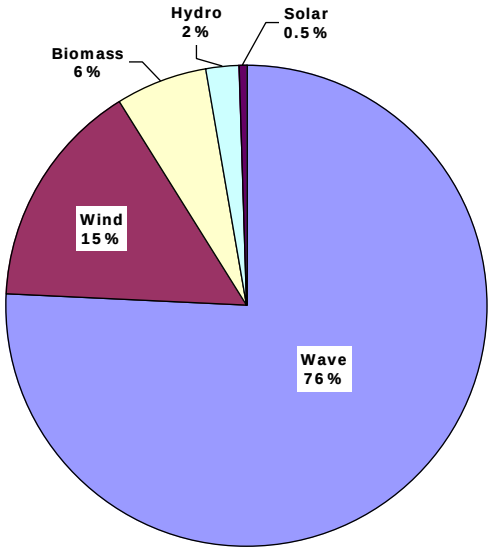

Figure 9. Humboldt County Electricity Generation Potential
(6,950 GWh/yr, note that development of wave power is very uncertain)

Table 2. Potential Local Energy Resources for Humboldt County

Resource	Potential	Technology Status	Geographic Location	Comments
Wind Electricity	Large 400 MW, 1000 GWh/yr	Mature	Cape Mendocino, other	Good resource, need transmission access, few viable sites
Wave Electricity	Large 500-1000 MW, 2500-5000 GWh/yr	Early Develop-ment	Coastline	Good resource, technology too early to tell
Biomass Electricity	Medium ≥60 MW, 300-400 GWh/yr	Mature	Variable	Already developed, may be room for growth
Natural Gas	Medium >1 million MCF/yr	Mature	Eel River Basin	Existing, further development underway, non–renewable
Hydroelectricity	Medium 20-40 MW, 80-160 GWh/yr	Mature	Rivers	Existing, more potential but barriers
Solar Electricity	Medium 10-30 MW, 10-30 GWh/yr	Mature	Dispersed	Many small systems
Solar Water Heating	Medium	Mature	Dispersed	Many small systems
Solar Space Heating	Small	Mature	Dispersed	Hard to retrofit
Biogas Fuels	Small	Mature	WW Treatment, Landfill, Dairies	Existing, room for growth
Biodiesel Fuel	Small 40,000-80,000 gal/yr	Mature	Variable	Existing, room for growth

Some energy resources are intermittent and variable, such as solar, wind, and wave energy. These energy sources may eventually be able to provide a substantial portion of the county's electrical energy needs; an energy storage system would need to be employed before they could provide all the county's needs. The use of a large energy storage system adds complexity and cost to the system. Therefore, in the near term it will be more practical for the county to develop a diverse portfolio of energy resources. At times when the intermittent renewable resources are available, their use should be maximized. When they are not adequately available, they should be supplemented with other dispatchable electricity sources, such as biomass fired power plants, natural gas fired power plants, or imported electricity.

There is limited transmission capacity for exporting electricity out of the county. In addition, PG&E claims that it is currently undesirable to export electricity out of the Humboldt area because most of the export ends up in the Cottonwood area, and this area is resource rich and already faces congestion problems in exporting its resources. These conditions would need to change in order for substantial export of electricity from Humboldt County to be practical.

In addition to renewable sources of electricity, Table 2 lists other local energy resources that have potential for new or continued development. This includes local natural gas resources; biogas fuels from wastewater treatment plants, dairies, and the Cummings Road Landfill; biodiesel fuel from waste oil; and solar energy for water and space heating.

Assessment of Energy Transmission Infrastructure

Humboldt County is remotely located at the end of the electrical and natural gas supply grids, and this limits both energy supply options and system reliability. PG&E owns the natural gas and electricity transmission and distribution systems in Humboldt County. There is one major natural gas supply line that comes from Gerber in the Central Valley. According to PG&E, this line is capable of transporting enough natural gas to meet our current local needs; however, it is unclear if this pipeline is capable of meeting much growth in demand.

The Humboldt area electrical grid is connected to the larger PG&E transmission system by four transmission circuits. Electricity imports are mainly through two circuits from the east at Cottonwood, with additional supply from lesser capacity circuits from the south at Bridgeville-Garberville and from Trinity in the east via Maple Creek. The total electrical transmission capacity into Humboldt County through the existing lines is approximately 70 MW (PG&E Market Power Filing – Appendix B, July 1996), which is less than half of the county's current peak demand. Therefore, local electrical generators (PG&E Humboldt Bay, PALCO, Fairhaven, etc.) are critical to meeting local electricity needs.

The power import requirement for the Humboldt transmission system is a function of the load within the Humboldt area and the amount of local generation. The peak electrical demand for the Humboldt area occurs in the winter. The peak loads during the period of 2001 through 2004 ranged from about 153 to 158 MW. PG&E's estimate of the worst-case (10% probability) peak load for the Humboldt area is about 190 MW. This accounts for additional loads experienced under extreme cold weather conditions. With 70 MW of transmission capacity and over 200

MW of local generation capacity, there is currently enough local generation and import capacity to meet local demand under normal system conditions. However, the system must be robust enough to handle unexpected transmission and generation system outages.

The California ISO (Independent System Operator) is a not-for-profit public benefit corporation that operates the state's wholesale power grid. It has identified Humboldt County as a region of concern for electricity supply due to congestion of the transmission system, stability issues, voltage collapse, and thermal overload issues. These problems are compounded by a reduced level of local generationof capacity due to age, generator maintenance outages, and potential shortages or limitations of fuel (e.g. natural gas, oil, wood chips). A recent PG&E study (Humboldt Long-Term Study, PG&E, 2002) found that with existing local generation, the transmission system is sufficient to serve the Humboldt area load reliably for the next ten years. However, PG&E is planning to retire the Humboldt Bay Power Plant, which is rated at approximately 130 MW. If 30 MW or more of local generation is retired, the system would not reliably be able to serve the projected worst-case 2012 load of 198 MW under the emergency condition of losing one transmission facility. If 100 MW or more generation were retired, the system would not be able to serve the 2012 load under even under normal operating conditions.

When the Humboldt Bay Power Plant is retired, there will be a need to replace its electrical generating capacity. Increased capacity could rely upon outside resources in the form of additional electricity imports. Investments for increasing local generating capacity could also be pursued. One option would be to develop additional local electricity generators and transmission capabilities that could help meet local demand and potentially could lead to economic development opportunities. In addition, the role for local demand response and distributed generation should also be considered.

One option that has been considered is to build a new high-voltage transmission line from Cottonwood to Humboldt via Bridgeville at a cost of $180 to $270 million (Humboldt Long Term Transmission Assessment, Final Study Report, PG&E, February 24, 2005). However, a large capital investment in expanded transmission capacity could seriously influence future energy options for the county, and therefore should be thoroughly examined in light of what would be best for Humboldt County's long-term energy goals. A recent California Energy Commission report (Comparative Study of Transmission Alternatives, Background Report, CEC, June 2004) identified strategically located generation and demand management as two alternatives to transmission system upgrades. If new local generation is brought on-line to replace the aging Humboldt Bay Power Plant, then a new 115 kV transmission line between Cottonwood and Humboldt probably would not be warranted solely for meeting county demand. However, if energy-generating capacity is developed for export, significant transmission-line investment could be warranted in the future.

Trends, Opportunities and Constraints in the Electric and Natural Gas Sectors

Electricity Sector

California faced serious electricity supply constraints in 2001, resulting in rolling blackouts throughout the state. Although the situation has improved, future supply constraints are forecasted if adequate planning and implementation efforts are not carried out. Implementation efforts include the statewide development of new electrical generating and transmission capacity and aggressive energy efficiency efforts. In order to meet future energy demands, the State of California has developed energy policies that favor energy conservation and efficiency first, renewable energy and distributed generation second, and clean, central station fossil fuel generation and improvements to the electricity transmission and distribution system last.

Energy conservation and efficiency measures are favored because they can be implemented the fastest and they offer the greatest societal benefit, both economic and environmental. Examples of economic benefits include effective use of public resources and savings on household utility bills; environmental benefits include reducing pollution and global warming impacts. In terms of new generation, renewable energy sources are favored because they are sustainable over the long term. Renewable energy sources are not dependent on depleting resources, they present the fewest environmental impacts, and they can be locally generated.

Distributed generation is also being promoted and is gaining broader appeal. Distributed generation primarily refers to utility customers who install on-site generators to reduce the amount of electrical power they purchase from their utility company. The on-site generators are typically powered by solar, wind, hydro, biomass, biogas, or natural gas. They typically operate in parallel with the utility and are not used to sell power to third parties. Distributed generation can offer numerous advantages. It is modular and can be added in small increments. It can provide grid support and eliminate or reduce the need for transmission and distribution system upgrades. It eliminates losses in the transmission system. It can potentially provide the customer with lower energy costs, higher service reliability, higher power quality, increased energy efficiency, and energy independence. It allows for the use of local renewable energy resources and can utilize cogeneration systems that use energy more efficiently.

In an effort to promote the development of renewable energy resources, the California legislature passed SB 1078 in 2002, establishing a renewable portfolio standard (RPS). This legislation requires that all retail sellers of electricity increase their procurement of renewable energy resources by at least 1% per year until at least 20% of retail sales are procured from eligible renewable energy resources. Since California currently generates about 10% of its electricity using renewable energy resources, this legislation will approximately double the amount of renewable electricity generated in the state.

Starting in 1998 the State of California attempted to deregulate the electric utility industry with the goals of using competition to increase electricity supply and reduce costs for customers. Under deregulation, the investor-owned utilities in California were required to sell off their generating capacity and allow customers to buy electricity directly from suppliers of their choice

(referred to as "direct access"). Unfortunately, the combination of poorly structured deregulation laws and major fraud and manipulation by suppliers resulted in power outages and billions of dollars in increased costs for customers. Deregulation, including direct access, was suspended in September of 2001. At this time it is uncertain what form of electricity industry regulation/deregulation will prevail in California. Although there is no sign that direct access will return for individual customers.

In 2002, the California legislature passed Assembly Bill 117 (AB 117), the community choice aggregation (CCA) law. This legislation allows local governments, alone or jointly, to aggregate the retail electric customers in their jurisdictions for the purpose of purchasing power. Local governments may not purchase or acquire the local distribution system, but may enter into contracts to provide the energy component of the electric bill. The utility still provides billing services and remains the default provider for any customers who choose to "opt out" of the program. This legislation allows communities to choose from whom they buy electrical power and what type of power to buy, as well as allowing them to negotiate how much they pay. Assembly Bill 117 also allows local governments, or other entities, to apply to administer energy efficiency programs in their jurisdictions. Although no jurisdictions in California have yet instituted a CCA program, many are pursuing the opportunity.

An option that has long been available for local communities to have more control over their electricity provider is to form a municipal utility. Municipal utilities typically own the electrical distribution system. Some also own generating facilities; others purchase wholesale electricity. Municipal utilities can offer many advantages. They are owned by and accountable to the people they serve. They empower local communities to make their own decisions about their electric power. They can typically provide power to their customers at lower costs than investor-owned utilities, and they keep more of the energy dollars circulating in the local economy. In today's electricity environment it is typically a long, expensive, difficult effort to form a municipal utility, often involving a legal battle with the investor-owned utility that has been granted the existing electric franchise.

Another development in the electricity market is the possible repeal of the qualifying facility provisions of the Public Utility Regulatory Policies Act of 1978 (PURPA). This could affect the development of new renewable electricity generation plants, as well as existing facilities operating under PURPA contracts (including the Fairhaven power plant, PALCO power plant, Baker Creek hydroelectric facility and Mill and Sulphur Creek hydroelectric facility). PURPA was enacted by the federal government in 1978 to encourage cogeneration and the use of renewable energy. It is overseen by the Federal Energy Regulatory Commission (FERC). PURPA guarantees that qualifying facilities (QFs) that meet certain criteria (i.e. cogeneration facilities and electricity generators using renewable energy) will receive a guaranteed rate for their power equal to the utilities' avoided cost of not having to generate that power themselves or procure it elsewhere. There have been several attempts to repeal section 210 of PURPA, the part that requires the utilities to buy QF power. This is an ongoing legislative battle.

Natural Gas Sector

The demand for natural gas in the U.S. continues to grow, with use for electrical power generation being the prime driver. The demand for natural gas is increasing throughout North America, and supplies are not as plentiful as previously expected. As a consequence, the U.S. will likely become increasingly reliant on natural gas from Canadian and overseas liquefied natural gas (LNG) imports to meet growing demand. Prices for natural gas will likely rise faster than inflation due to growth in gas demand, restricted supply, and the expense of developing new gas wells and pipeline capacity. The California Energy Commission (CEC) estimates that overall demand for natural gas in California will grow approximately one percent per year between 2003 and 2013. Within California, the CEC predicts that PG&E will need additional natural gas receiving capacity or storage after 2006.

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.).

CHAPTER 3. Vision & Goals

3.1 Energy Element Vision

The vision expresses the community qualities and characteristics that the Energy Element aspires to achieve. These are the desires of how Humboldt County could be described by the end of the General Plan's twenty-year planning horizon.

In 2025…
Humboldt County is no longer a net importer of energy. We achieve a high degree of energy independence and self-sufficiency through high levels of energy conservation and efficiency combined with locally-produced and -managed energy generation. Most of our energy comes from renewable sources. Significantly less money spent on energy leaves the county.

Individual communities have developed greater energy self-sufficiency and independence as has the county overall. Citizens have a diversity of choices for how to meet their energy needs. We have much more local control over energy prices. We have been able to readily adapt to any major external changes in energy supply or technology.

Our rate of energy consumption is level, due to increasing conservation and efficiency to offset increases in growth-related demand.

Our overall quality of life is as good as or better than it was in 2005. The population is healthier as a result of leading energy-conserving lifestyles. It is safe, pleasant, economically favorable, and typical to have a lifestyle that doesn't consume much energy.

Energy conservation education has reached, and continues to reach, effectively, everyone in the county.

Energy considerations and decisions are integrated with all other decision-making arenas.

The County is energy efficient through neighborhood design. Good community planning has reduced sprawl. There are fewer automobiles and there is less automobile dependence. Public transportation is conveniently available and well utilized and walking, bicycling and other non-automobile forms of transportation are commonly used. There is much less consumption of energy from non-renewable sources for transportation.

All buildings are energy efficient. All new construction is done in the most energy-efficient manner, starting with building design. All existing buildings have been upgraded to be more efficient. Energy efficiency is integral to building standards, which have flexibility and include meaningful incentives. Many homes and businesses produce more energy than they consume.

The County is a thriving research and development center and incubator for energy technology and related manufacturing, which is a stable source of local jobs.

3.2 Energy Element Goals

From the vision stems the Energy Element's goals. The goals are the desired conditions that will help build the envisioned community. The goals also reflect the priority of approaches identified in the *State of California Energy Action Plan* and referred to as the "loading order" of energy resources.[1] The loading order has been established to guide the decisions made by the State's principal energy agencies. The State priorities, in order, are: 1) to increase energy conservation and efficiency ; 2) to meet energy generation needs first by renewable energy resources and distributed generation; 3) to support additional clean, fossil fuel, central-station generation to allow time for preferred resources to "get to scale"; and to simultaneously improve the electricity transmission grid and distribution facility infrastructure (i.e., supply management).

In this Energy Element, countywide strategic energy planning is added as a top priority (Goal E1). Energy conservation and demand response are addressed in Goal E2. Goal E3 addresses renewable energy and Goal E4 addresses supply management.

Goal E1. Develop and implement countywide strategic energy planning.

Integrate energy planning into all county plans and planning activities, in order to maximize the effectiveness and success of energy policies and programs. Promote, coordinate, administer, and/or disseminate comprehensive strategic energy planning at all levels, and with other local governments. Have a long-term energy plan for sustainable energy use and increased self-reliance. Be prepared for emergencies that impact energy supply and transmission.

Integrate energy efficiency measures into standards and regulations for land use, zoning, site design, building, and transportation facilities.

Goal E2. Increase energy efficiency & conservation.

Decrease energy consumption through increased energy conservation and efficiency. Increase self-reliance and sustainability by decreasing dependence on non-renewable, non-local energy sources. Increase conservation and efficiency in all sectors: building, transportation, business, industry, government, water and waste management, i.e., in all activities that consume energy. Reduce peak demand through efficiency and load management.

Goal E3. Increase the supply of energy from renewable sources, distributed generation, and cogeneration.

Have energy from renewable sources as the primary energy supply in the county. Increase distributed generation. Have a balanced, diverse array of available energy sources. Increase energy independence by decreasing the purchase and use of non-renewable and non-local energy.

Goal E4. Pursue opportunities for local management of energy supply.

Have greater local control over energy supply sources and prices.

[1] *State of California Energy Action Plan*, adopted jointly by the Consumer Power and Conservation Financing Authority, the Energy Resources Conservation and Development Commission, and the Public Utilities Commission on May 8, 2003. (http://www.energy.ca.gov/energy_action_plan/2003-05-08_ACTION_PLAN.PDF)

CHAPTER 4. Energy Objectives & Policies

Objectives and policies are derived from the vision and goals in the previous chapter. Integrating energy use and generation policies into the General Plan can ensure that future development not only enhances the local economy, but also the local environment and quality of life. For example, energy efficiency means lower residential and commercial utility bills, which will improve business competitiveness, help retain jobs, and reduce air pollution and environmental compliance costs. Standards and implementation strategies to carry out objectives and policies are found in Chapter 5.

4.1 Strategic Energy Planning

The following policies are designed to provide programs, and apply integrated energy planning strategies to create safe, healthy, energy-efficient communities and jurisdictions that are culturally, economically, and environmentally sustainable. These policies address community development and land use planning issues.

4.1.1 Regional Energy Authority

Objectives: To foster, coordinate, and facilitate countywide strategic energy planning.

The policies below carry out the following part of the vision: *Energy considerations and decisions are integrated with all other decision-making arenas.*

4.1.1a **Regional Energy Authority.** Recognize the RCEA as the Regional Energy Authority to foster, coordinate, and facilitate countywide strategic energy planning and education, and administer as applicable.

4.1.1b **Regional Energy Forum.** Encourage the Regional Energy Authority to serve as the primary forum for countywide energy issues and to provide an open public review processes for development proposals relating to energy facilities.

4.1.1c **Coordinated Regional Energy Planning.** Encourage the Regional Energy Authority to coordinate energy planning and strategic planning with Humboldt County, the cities within Humboldt, tribal governments, colleges and school districts, and other local agencies.

4.1.1d **Regional Energy Funding**. Support the efforts of the Regional Energy Authority to act as the fiscal agent and funding clearinghouse for countywide energy projects/programs.

4.1.2 Emergency Preparedness Planning

Objectives: To be prepared in the event of energy supply or transmission/distribution disruptions. To have diverse and redundant energy systems for energy and transport needs.

The policies below carry out the following part of the vision: *Individual communities have developed greater energy self-sufficiency and independence as has the county overall. Citizens have a diversity of choices for how to meet their energy needs. It is safe, pleasant, economically favorable, and typical to have a lifestyle that doesn't consume much energy.*

4.1.2a. **Minimize Energy Interruptions.** Work with the Regional Energy Authority and local utility providers to minimize the likelihood and impact of weather-, disaster-, terrorism-, and market-related power outages.

4.1.2b. **Energy Facility Emergency Planning.** Require energy facility operators within Humboldt County to prepare and periodically update emergency plans and coordinate such plans with the Humboldt County Office of Emergency Services.

4.1.3 Energy-related Research & Economic Development

Objectives: To provide economic incentives and opportunities for energy research and development to generate and retain energy revenues locally.

The policies below carry out the following part of the vision: *The County is a thriving research and development center and incubator for energy technology and related manufacturing.*

4.1.3a **Development Zoning.** Encourage energy-related business development by identifying, appropriately zoning, and streamlining permit procedures for suitable energy research and development sites.

4.1.3b **Development Incentives.** Provide incentives to encourage the generation of local renewable energy that could be offered for sale at competitive prices.

4.1.3c **Emerging Energy Technologies.** Support emerging energy technology from local sources, such as Humboldt State University's Industrial Technology Department and the Schatz Energy Research Center, local innovators and inventors, as well as from non-local sources.

4.1.4 Plan Active and Healthy Communities

Objectives: To plan communities that encourage and enable active lifestyles which maximize human energy and human-powered movement. To build communities with the greatest potential for sustaining healthy air, water, soil, climate, and other natural resources. To maximize wise use of energy resources through integrated energy, land use, transportation, and air quality planning and objectives. To foster development which, by its location and design, minimizes the consumption of energy resources used for transportation, buildings, and infrastructure. To create

more balanced access to alternative modes of travel, and thus eliminate the predominant reliance on the single-occupant vehicle.

The policies below carry out the following part of the vision: *The County is energy efficient through neighborhood design.*

The policies for 4.1.4 are presented as follows:

- Integrated Energy, Land Use, Transportation, & Air Quality Planning: Land Use & Zoning; and Rehabilitation & Redevelopment.
- Transportation-Related Energy Conservation: Balanced Transportation Modes; Bicycle & Pedestrian Facilities; Transit Access; and Telecommunications.

INTEGRATED ENERGY, LAND USE, TRANSPORTATION, & AIR QUALITY PLANNING

LAND USE & ZONING

4.1.4a **Land use and development review.** The energy-efficiency of proposed new development shall be considered when land use and development review decisions are made.

4.1.4b **Development planning to reduce automobile miles traveled.** Adopt land use patterns which reduce the need to travel outside the local community for basic services. Promote and favor development and redevelopment plans that minimize the energy used for commuting, such as higher density and mixed land uses, infill development, transit- and pedestrian-oriented developments, and increased jobs-to-housing balance, maximum street interconnectivity, and minimization of cul-de-sacs. Higher residential densities shall be encouraged in areas that are served by public transit routes and are close to major employment or commercial centers.

4.1.4c **Transportation linkages.** Regulate development patterns to provide clear, safe, and convenient linkages between all modes of travel, including access to transit stations and stops, and bicycle and pedestrian path connections between work, home, school, and commercial services.

REHABILITATION & REDEVELOPMENT

4.1.4d **Revitalization and reinvestment in existing resources.** Support revitalization of and reinvestment in existing core areas (commercial, business, employment, and civic centers). Rehabilitation and revitalization of older existing buildings shall be favored over replacement when doing so would conserve energy resources.

TRANSPORTATION-RELATED ENERGY CONSERVATION

BALANCED TRANSPORTATION MODES

4.1.4e **Balanced access to transportation modes.** Make decisions on land use, energy, and transportation planning to facilitate and provide balanced access to alternative modes of travel, and to reduce single-occupancy automobile travel.

4.1.4f **Transportation management plans.** Major commercial, business, industrial, or mixed-use facility developments shall be required to submit a transportation management plan that addresses energy conservation measures such as connectivity to alternative transportation modes; preferential parking for carpools, vanpools, motorcycles, mopeds, and bicycles; shuttle services; alternative fueling stations; transit passes; bike lockers; and locker room facilities. Management plans should include policies to encourage local employers to offer flex-time and/or shifting work schedules which minimize employees' impacts on peak hour traffic and to provide incentives for employees to use alternatives to the single-occupancy automobile mode of travel.

4.1.4g **Rail Service.** The County supports rail service modernization that would provide improved energy conservation and safety in freight and passenger service.

BICYCLE & PEDESTRIAN FACILITIES

4.1.4h **Bicycle and pedestrian connectivity.** Provide new and improved bicycle and pedestrian links to important destinations including transit, schools, colleges, commercial/shopping and employment centers, residential neighborhoods, civic destinations, nature trails, and other recreation opportunities. *[Supports Goal 2-A from* HCAOG Pedestrian Needs Assessment*]*

4.1.4i **Inclusion of Bicycle Facilities.** Bicycle support facilities shall be encouraged, and required when appropriate, in private and public uses. Local businesses shall be encouraged to provide indoor bicycle parking for their employees as well as secure bicycle parking for their customers. *[Supports Policy 2.4(*3.3) *from* HCAOG 2004 Regional Bike Plan*]*

4.1.4j **Community design planning.** Provide for bicycle and pedestrian circulation system links between residential neighborhoods, major employment, commercial and civic centers, and transit services.

TRANSIT

4.1.4k **Transit-oriented development.** Apply land use patterns that provide favorable access to local transit, provide appropriate multimodal transit facilities along public transit routes, and facilitate the provision of regional transit routes. Actively support the efforts of regional transit providers to expand transit service and attract an increasing percentage of travel.

4.1.4l **Energy conservation efforts in transit.** Participate in the energy management and conservation efforts of the Regional Transportation Authority, HCAOG, and encourage transit system improvements which enhance overall energy conservation, such as alternative fuel fleets, bike racks on buses, bike racks at major bus stops, and multimodal transit stations.

TELECOMMUNICATIONS

4.1.4m **Telecommunication systems.** The reduction of automobile trips through telecommuting shall be encouraged by allowing home occupation businesses, and by encouraging broad-band telecommunication systems that connect outlying residents and businesses with services in core (urban) areas.

4.1.5 Countywide Site Design Standards

Objectives: To have consistent codes and standards that facilitate application of appropriate energy-efficient site design and landscaping.

The policies below carry out the following part of the vision: *Energy considerations and decisions are integrated with all other decision-making arenas.*

SITE DESIGN

4.1.5a **County Site Design Standards** Conform site design standards for County building to the US Green Building Council's LEED (Leadership in Energy and Environmental Design) energy efficiency standards. Promote the "LEED Silver" certification level or higher, in concert with State Executive Order S-20-04 in County buildings. Incorporate incentives for private developments to meet the LEED Silver rating or higher.

4.1.5b **Compact Planned Development.** Encourage clustering, zoning densities and mixed-uses for compact development that exceeds current energy efficient design requirements.

4.1.5c **Solar access.** Require energy efficient site planning and design with adequate solar access in all planned unit development and subdivisions. Lots and buildings in subdivisions and new development shall be oriented and designed to maximize and protect solar exposure.

4.1.5d **Natural heating and cooling.** encourage site design to maximize natural heating and cooling factors such as cooling breezes, natural ventilation, solar access and to utilize landscaping to aid in passive cooling and wind protection.

4.1.5e **Street layout and connectivity.** Promote design guidelines for energy efficient site and street layout design and circulation patterns that emphasize maximum solar access such as east/west alignment for local streets, bike, pedestrian and trail connectivity and links

to residences, neighborhoods, transit stops and services. Cul-de-sacs should be avoided where possible.

4.1.5f **Private Site Design Standards.** Promote site design standard conformance, consistent with the US Green Building Council's LEED energy efficiency standards for private construction.

LANDSCAPING

4.1.5g **Energy-Efficient Landscape Design.** Require energy-efficient landscape design in development projects, subdivisions, and in new and existing streets and parking areas in order to reduce impervious surfaces, heat and glare, control soil erosion, conserve water, and to promote pedestrian safety and vehicular traffic calming measures.

4.1.6 Energy Education & Policy Dissemination

Objectives: To increase awareness and understanding of local, regional, national, and global energy issues. To educate the community about the benefits and opportunities of energy efficiency, energy conservation, and renewable energy generation. To promote and facilitate sound energy planning and policy-making. To galvanize the community to choose energy conservation and energy-efficiency, and renewable energy generation options.

The policies below carry out the following part of the vision: *Energy conservation education has reached, and continues to reach, effectively, everyone in the county.*

4.1.6a **Energy Efficiency Education and Training.** Support the Regional Energy Authority in its effort to provide community education on energy issues, including the benefits of reduced energy consumption, and increased energy efficiency. Support REA collaborating with schools and colleges for energy-related research, education, and conservation practices.

4.1.6b **Education on Balanced Modes of Travel.** Educate the public on the need to reduce automobile travel, and encourage energy-efficient, health-promoting modes of travel such as walking, bicycling, and public transit.

4.1.6c **Education on Renewable Energy and Distributed Generation.** Provide educational and promotional programs that encourage and demonstrate the use of renewable energy and environmentally-preferable distributed energy generation and cogeneration systems.

4.1.6d **Energy Policies and Plans.** Encourage other jurisdictions and entities to adopt and implement sound energy plans and policies, including encouraging Humboldt County cities to include energy elements and/or energy policies in their General Plans and ordinances. Advocate and disseminate energy planning strategies, policies, and other information.

4.2 Energy Conservation & Efficiency

Policies for the County to lead by example in strategic and consistent application of energy-efficient and energy conservation practices in County services, facilities, and operations. To offer education, promotion, incentives, and directives for incorporating energy conservation and energy-efficient structural designs and technologies in both public and private sectors. In contrast to 4.1, the following policies address energy issues related more to structures, technologies, and operations.

4.2.1. Public Services, Facilities and Operations

Objectives: To increase energy efficiency in County purchasing policies, and facilities and operations.

The policies below carry out the following part of the vision: *We achieve a high degree of energy independence and self-sufficiency through high levels of energy conservation and efficiency combined with locally-produced and -managed energy generation.*

4.2.1a. **Municipal Purchasing and Procurement.** Encourage the purchase and use of administrative supplies and building materials made from recycled materials and renewable resources whenever cost-effective (considering life-cycle costs). Purchase or operate Energy Star® electrical equipment whenever cost-effective (considering life-cycle costs). Follow principles of energy-efficient source reduction and resource recovery for its own operations, and promote these principles in the community.

4.2.1b. **Access to Alternative Transportation.** Locate public facilities, events and activities in areas easily served by transit and other forms of alternative transportation.

4.2.1c. **New, Renovated, and Leased Facilities.** Consider energy efficiency and potential energy cost reductions when prioritizing County facility renovation, construction, and procurement of leased space. For new and renovated county facilities follow LEED Silver rating standards or higher. For leased office space seek and favor buildings with a U.S. EPA Energy Star® rating.

4.2.1d. **Landscaping and Lighting of County Facilities.** Plant native and non-invasive drought-tolerant landscaping, and install efficient irrigation systems at County parks and grounds. Maximize use of trees and vegetation in public projects in order to minimize pavement, conserve water, and reduce energy use. Install or upgrade to energy efficient street and exterior lighting on County roadways and at County facilities. Lighting to be shielded or otherwise directed downward.

4.2.2 Buildings

Objectives: To increase energy conservation and efficiency in new and existing buildings and structures.

The policies below carry out the following part of the vision: *All buildings are energy efficient.*

4.2.2a. **Energy Efficient Construction.** Encourage the use of the most energy-efficient design, construction technologies, equipment, appliances, building materials and operations. Encourage maximum use of daylighting and alternative energy-related equipment, and minimum use of non-renewable energy for lighting, space heating and cooling, water heating, and electrical power.

4.2.2b. **Waste Management in Construction.** Continue to support construction waste reduction and recycling programs and the use of recycled-content building materials wherever possible.

4.2.2c **Energy Audits and Retrofits.** To encourage full knowledge of the costs and benefits of energy-efficiency retrofitting in all structures, support programs that encourage and facilitate energy audits for all existing buildings and developments.

4.2.2d **Retrofitting for Energy Efficiency.** Promote Retrofit of existing buildings to meet or exceed current energy efficiency standards.

4.2.3 Water, Wastewater, and Solid Waste Management

Objectives: To save energy resources by implementing water conservation and waste reduction practices.

The policies below carry out the following part of the vision: *Our rate of energy consumption is level, due to increasing conservation and efficiency to offset increases in growth-related demand.*

4.2.3a **Water Conservation Saves Energy.** Commit to the principle that water conservation is also energy conservation given the significant energy required for water pumping, water treatment, and wastewater pumping and treatment.

4.2.3b **Water Efficiency.** Promote the efficient use of water in residences, businesses, industries, and agriculture by requiring water-saving plumbing and landscaping devices in new developments, plumbing-related remodels, or upon change of ownership.

4.2.3c **Material Waste Reduction.** Continue to support its established Integrated Waste Management programs, and shall continue to cooperate with the Humboldt Waste Management Authority, and with cities, tribes, and other jurisdictions, to reduce energy consumption of raw materials through waste reduction and elimination; reuse and recycling; composting and soil remediation; decreased landfill transport; and reclamation of waste and sewage.

4.3 Renewable Energy, Distributed Generation, & Cogeneration

Policies facilitating County goals to meet local energy demands and increase supply reliability with, to the greatest extent possible, renewable energy sources, distributed energy generation, and cogeneration systems.

4.3.1 Renewable energy, distributed generation, and cogeneration

Objectives: To facilitate the advancement from non-renewable energy sources to renewable energy sources. To increase renewable energy options through research and development, incentives, projects/programs, and minimizing barriers.

The policies below carry out the following part of the vision: *We achieve a high degree of energy independence and self-sufficiency, with most of our energy from renewable sources.*

4.3.1a **Renewable Energy Resources as First Choice.** Consistent with the *California Energy Action Plan*, the County will promote policies that seek to meet new generation needs first with renewable energy resources, distributed generation, and cogeneration.

4.3.1b **County Operations and Facilities.** Develop renewable energy and distributed energy resources for County operations and facilities where feasible, environmentally preferable, and cost effective based on life-cycle cost.

4.3.1c **Energy Facilities Siting.** Allow the appropriate and safe siting of renewable and distributed energy facilities. Promote such facilities by minimizing permitting barriers and updating standards as new information and technology warrant.

4.3.1d **Incentives for Using Alternative Energy.** Provide incentives to encourage the use of renewable energy and environmentally preferable distributed energy generation systems in the county.

4.3.1e **Resource Development and General Plan Consistency.** Encourage the REA and energy generators to develop renewable energy and environmentally-preferable distributed energy generation systems in the county, while ensuring that such development is done in a manner consistent with overall General Plan goals and policies.

4.4 Local Management of Energy Supply

Policies for the County to increase energy self-sufficiency and independence through increased local management of energy supply, for locally-generated energy, imported energy, and exported energy.

4.4.1 New energy production and transmission facilities

Objectives: To meet projected future needs with new, locally-produced energy and improved transmission facilities. To alleviate potential future electrical shortfalls by increasing the electricity supply from local, intermittent renewable sources.

The policies below carry out the following part of the vision: *We achieve a high degree of energy independence and self-sufficiency.*

4.4.1a **Diversity in local sources.** Pursue development of a diverse, locally-produced energy supply that is price-competitive in the California market and that can be generated in a way that minimizes adverse environmental impacts.

4.4.1b **Transmission assessments and monitoring**. Continue to work with PG&E to develop long-term transmission assessments and, if necessary, electrical and natural gas transmission grid expansion plans. Monitor local electricity and natural gas transmission system planning to ensure that projected growth areas are adequately served.

4.4.1c **Looped Electrical Distribution.** Require main electric distribution lines to be interconnected (looped) wherever feasible to facilitate the reliable electricity delivery and export within the county.

4.4.2 Local utility development and management options

Objectives: To maximize local energy management, purchasing options, and aggregation opportunities in the county. To maximize the availability and viability of renewable resources to significantly contribute to the county's electric supply.

The policies below carry out the following part of the vision: *We achieve a high degree of energy independence and self-sufficiency through high levels of energy conservation and efficiency combined with locally-produced and -managed energy generation. Most of our energy comes from renewable sources. Significantly less money spent on energy leaves the county.*

4.4.2a **Public Utility Management.** Identify or adapt to the best energy delivery mechanism for local public utility management. Options to be considered include continuing with Investor Owned Utility, a municipal power authority, and community choice aggregation.

4.4.2b **Intermittent Renewable Resource Development.** Pursue local intermittent renewable resources that could significantly contribute to the county's electrical generation.

CHAPTER 5. STANDARDS & IMPLEMENTATION STRATEGIES

The standards and implementation strategies of the General Plan Energy Element will be carried out contingent on available funding; however, the policies and strategies of the General Plan are designed, in part, to facilitate efforts to pursue grants and secure funding.

5.1 STRATEGIC ENERGY PLANNING

5.1.1 Regional Energy Authority

Standards and Implementation Strategies	Responding Agencies[1]	Measurable Outcome	Time Frame[2]
REA. Designate the Redwood Coast Energy Authority as the Regional Energy Authority for Humboldt County	County Board of Supervisors	County Resolution	
Energy Element Review. Periodically review and update, as necessary, the Energy Element to reflect changing production and transmission facility developments and encourage new energy production and transmission facilities.	CEC, County CDS, PG&E	General Plan Energy Element	

5.1.2 Emergency Preparedness Planning

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Energy Emergency Response Procedures. Prepare energy emergency response procedures for the Humboldt County Emergency Response Plan.	ISO, OES, REA	Humboldt County Emergency Response Plan	
Energy Supply and Transmission/Distribution Report. Prepare a regional energy supply and transmission/distribution report that is updated every five years or sooner, as required.	CEC, ISO, PG&E, REA	Regional Energy Supply & Transmission/ Distribution Report	

[1] Listed alphabetically.
[2] All time frames are 2007 unless otherwise indicated.

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Energy Facility Emergency and Contingency Planning. Adopt an ordinance requiring emergency plans for energy facilities. Prepare an energy system contingency plan that is updated every five years.	County Board of Supervisors, REA	Energy System Contingency Plan	
Energy Resource Center. Establish an energy resource center. The center shall be open to the public and provide energy conservation, energy planning, renewable energy, and energy efficient building design and retrofit information.	REA	Energy Resource Center	

5.1.3 Energy-related Research & Economic Development

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Development of Distributed Generation. Develop environmentally preferable distributed generation and cogeneration energy systems where appropriate. Develop and publicize demonstration sites. Conduct a study to identify key facilities in the county that would benefit from distributed generation and cogeneration energy systems.	California Energy Commission, County CDS	Co/generation Energy Distribution Study/ site identification	
Small-Scale Biomass Generation Sites. Monitor feasibility of smaller and/or mobile biomass electric generators fed with wood waste and very small diameter logs (e.g. from thinning for fire safety and timber harvest slash in National Forest areas). If/when technology proves feasible and cost effective, promote its use in county areas near National Forests where existing electric transmission lines are available; support projects to convert biomass into competitively-priced renewable energy.	County, REA, USDA-FS	Study and monitor feasibility of small biomass electric generation projects.	
Development Incentives. The REA will collaborate with the County Economic Development Division to identify opportunities for developing jobs in the field of energy conservation, efficiency and renewable sources.			

5.1.4 Plan Active and Healthy Communities

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Energy Conservation in GP Elements. Incorporate energy conservation objectives and policies in applicable General Plan elements, including but not limited to the Circulation, Land Use, Growth Management, Design, Water Resources, and Waste Management Elements.	County CDS	General Plan Elements	
Energy-Efficient Award Program. Initiate award program for high-performing energy-efficient land use and community designs that reflect the goals and objectives of the GP Energy Element.	CEC, PG&E, REA	REA Award Program	
Alternative Transportation Infrastructure. Encourage, and in certain cases require, facilities and infrastructure supporting alternative transportation modes.	County CDS	County Codes and Standards, General Plan	
Alternative Transportation Programs. Promote alternatives to automobile travel, including but not limited to vanpooling and carpooling programs; comprehensive support facilities for bicycling; expanded and coordinated local and regional transit; and multi-modal linkages and facilities.	REA	REA Award Program, General Plan, County Ordinance/ County Codes and Standards	
Alternative Transportation Incentives. Offer incentives that encourage the private sector to incorporate alternative and multimodal transportation facilities and connections in all land uses: commercial, residential, industrial, and mixed use.	Caltrans, County CDS, REA	REA Award Program	
Encourage Bicycle Parking. Encourage local businesses to provide indoor bicycle parking for their employees as well as secure bicycle parking for their customers. [*supports HCAOG 2004 Regional Bike Plan policy 2.4(3.3)*]	County CDS, REA	General Plan, County Ordinance/ County Codes and Standards	

Commuting. Encourage alternatives to employee commuting by individual drivers through such means as parking space allocation, ridesharing coordination, and bus and car-pool incentives.	REA, County CDS, Caltrans	General Plan, County Codes and Standards	
Circulation System Links. Provide guidelines for bicycle and pedestrian circulation system links between residential neighborhoods, major employment, commercial and civic centers, and transit services.	County CDS	General Plan, Community Design Element	

5.1.5 Countywide Building Codes and Standards

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Site design standards and incentives. In accordance with LEED standards, site design for County buildings shall maximize energy efficiency by considering natural factors such as maximum solar access, water availability, slope, and air flow and prevailing wind directions (for cooling breezes or wind protection) to reduce energy demand. Other energy efficient standards shall include energy efficient heating and cooling systems; lighting; use of recycled and durable materials; waste reduction; site development to reduce erosion, impervious surfaces and water run-off; and water conservation measures in construction techniques, structures, appliances, and landscaping. Incentives for LEED Silver energy ratings shall include allowing greater flexibility in the site design than otherwise possible through strict application of zoning regulations.	County CDS, REA	LEED Standards	
Solar access protection – Proposed structures and landscaping shall be designed and located to avoid blocking views and solar access from other properties to the maximum extent feasible. The lot size, configuration and proposed building envelope in a subdivision or planned development shall be oriented to ensure	County CDS, REA	Solar Ordinance Update	

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
that no additional shadows will be cast on the south side of an existing building between the hours of 10:00 a.m. and 2:00 p.m. on December 21. A shadow analysis shall be required identifying proposed height and orientation of proposed building and slope of land to determine the length of shadow.			
Street layout and design. Within subdivisions and planned development, street layouts shall make the best use of the natural terrain contours to jointly minimize grading and maximize solar access to the maximum extent feasible. Street widths may vary in size, and shall include bicycle, trail and pedestrian pathways in new streets and street widening projects with such paths are to be separate from the roadway where possible. Common driveways that serve more than one parcel are encouraged, and may be required, to reduce the total amount of grading and pavement.	County CDS, REA	Updated Subdivision Ordinance	
Bicycle facilities in developments. In new development/redevelopment: new commercial, business, industrial, and residential development and redevelopment shall be required to provide on-site bicycle parking and/or secure bike storage. *[supports* HCAOG 2004 Regional Bike Plan policy *2.2(1.5) and 2.4(3.1)]* In multi-family residential facilities: safe, secure, weather-tight bicycle storage shall be required for all new multi-family developments and redevelopments.	HCAOG	Updated RTP	
Energy-conserving landscaping. Landscape plans where required shall demonstrate energy-efficient landscape design practices including the use of appropriate native and water-conserving trees and plants; the use of groundcovers or mulch; minimal, water-permeable paving materials; and retention of on-site water run-off for irrigation. Landscape plans should show the entire project site including landscaping along streets, paths, and in parking areas as applicable.	County CDS, REA	County Ordinance/ Codes and Standards	

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Develop a water-conserving landscape ordinance, for use of natural and drought-resistant planting materials and efficient irrigation systems in new development. Provide information handouts and education to residents on tree selection and preferred siting of trees to reduce energy demand. ***Potential Resources:*** *Water-Efficient Landscape Design* model ordinance and *WaterWise Landscaping Best Practices Manual*, Office of Smart Growth, Colorado Dept. of Local Affairs (DOLA). www.dot.state.co.us/smartgrowth.			
LEED Green Building Information. Develop and promote programs detailing LEED "Green Building" certification standards and rating categories in addition to Title 24 requirements for the County as a resource for the wider community.	County CDS, REA	County Ordinances, UBC, U.S. Green Building Council	
Energy Efficiency Standards. Develop and implement energy efficiency standards for subdivision, mixed use, infill and planned unit development that shall incorporate LEED Green Building standards, which may include compliance incentives such as tax credits, fee reductions or faster-track permitting for silver rating or higher compliance with LEED standards.	County CDS, REA	County Ordinances, UBC, U.S. Green Building Council	
Solar Access Ordinance. Review, and where appropriate revise the County Solar Access Ordinance for solar energy use and guaranteed solar access that set higher standard limits on permitted shading from new construction and development siting. Solar access protection is defined by a hypothetical "solar fence" on the property lines of the protected building and protects access for a 4-hour period on December 21.	County CDS, REA	County Ordinance	
Energy Efficiency-Based Utility Allowance. Encourage use of Energy Efficiency-Based Utility Allowance schedule in all affordable housing.	County CDS, REA	Energy Efficiency-Based Utility Allowance in affordable housing projects	
Alternative Energy Use. Develop regulations that eliminate obstacles to alternative energy use. Regulations may include, but are not limited to:	County CDS, REA	County Ordinance/ County Codes and Standards	

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
A) Allowing height exceptions for solar equipment; B) Allowing alternative heating and cooling systems components such as collectors, shading louvers, or reflectors, to project into yards in a manner similar to cornices and canopies. C) Defining solar heating systems and cogeneration facilities as accessory uses. D) Preventing planned development CC&R's from unreasonably restricting alternative energy systems.			

5.1.6 Energy Education & Policy Dissemination

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Educational Program. Develop educational displays for the first few renewable energy systems, cogeneration systems, and distributed energy systems installed in County facilities. Displays to provide county residents and businesses with information on how the systems work and how well they perform. Educate County residents about the importance of developing local energy resources and the associated benefits, as well as the associated impacts of local energy resource development.	County CDS, REA	Educational displays/handouts/ programs in County facilities, Energy Resource Center	
Energy Guidelines. Develop energy-efficient guidelines and information handouts and make them available to applicants in the process of obtaining development and land use permits.	County CDS, REA	General Plan, County Codes and Standards, handouts	
Water Conservation Education Program. Initiate a water conservation education program for citizens with incentive programs that encourage efficiency and water conservation.	REA, County CDS, Community Services Districts	REA/CSD water conservation incentive programs	
Energy Elements. Disseminate/encourage the adoption of Energy Elements in other jurisdictions.	Cities, REA	Energy Elements in other General Plans	

5.2 Energy Efficiency

5.2.1 Energy Efficiency In Public Services, Facilities, & Operations

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Government Energy Consumption Reduction. Develop a comprehensive program to reduce government energy consumption in operations including: public buildings and facilities; street lighting; vehicle fleet management; equipment procurement; employee energy awareness program.	County CDS, REA, State and Federal agencies	Energy Reduction Program for Public Buildings, Facilities & operations	
County Facility Efficiency Fund. Establish a "County facility efficiency" fund as a source of funds to support implementation of this Energy Element. The fund would receive up to 50 % of the County's monetary savings from improved municipal energy efficiency and conservation practices.	County CDS, REA	Municipal Facility Energy Efficiency fund	

5.2.2 Energy Efficiency In Buildings

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
On-site Waste Management. Promote use of source separation recycling storage areas for all multiple-unit residential developments, and commercial developments.	County CDS	UBC, County Ordinances	
Energy Efficient Equipment. Encourage the use of the most energy-efficient equipment for space and water heating, ventilation, lighting, refrigeration, and air conditioning in all new buildings and developments, including residential and commercial facilities. Solar water heating and solar electric systems shall be encouraged where solar access is available. The County shall endorse the LEED Silver rating, or higher, as the desired level of energy conservation and efficiency in buildings.	County CDS, REA		

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Solar Equipment. Encourage new construction and renovations/remodeling of appropriate scale to incorporate solar-friendly, "no-regrets" construction[3] features. This shall include the installation of electrical and plumbing connections for potential future solar electric and solar hot water systems, proper solar orientation, and adequate unobstructed south facing roof slopes where solar energy equipment can be installed.	County CDS, REA		
Energy Efficient Retrofits. Investigate energy-efficient retrofitting in the renovation and remodeling of existing buildings and/or at the time of sale or transfer of ownership. Employ a clear permitting process to encourage energy conservation retrofit improvements in existing buildings. This may include, but is not limited to: upgrading to Title 24 standards for energy efficiency; adding passive solar and natural daylighting; protection of solar access; insulation and weather-stripping; water-conserving and energy-conserving devices; and installation of on-site renewable energy generation. Retrofit improvements for energy conservation and efficiency are applicable to all land uses.	County CDS, REA		
Energy-Efficient Performance Standards. For County buildings, apply 'performance standards' (based on LEED Silver rating) for on-site energy efficiency in buildings, including but not limited to: • space heating, cooling/air conditioning systems and appliances; • insulation requirements; • water heating; • indoor and outdoor lighting and natural illumination. • standard could include: high-efficiency lighting and glass, automatic controls for lighting, photocell dimming, insulation	County CDS, REA	County Ordinances, UBC amendment	

[3] Refer to Glossary for definition.

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
levels, and reflective rooftops. • labeling, such as *Energy Star*, for systems and appliances.			
Energy Audit Program. Program energy audits (i.e., energy efficiency analysis/home energy rating) for planning and building projects that require County approval. The energy audit will review design, energy systems, processes and equipment, will recommend methods for reducing energy demand, and will give costs and savings estimates. Support programs to offer "energy efficient mortgages." Property sellers or property managers shall provide current energy audits and historical energy use data to prospective buyers prior to closing, exchange, or transfer of ownership; to leasers prior to leasing; and to occupants prior to a change in use, service, or license.	Board of Realtors, County CDS, REA	Energy Audit review system, "energy efficient mortgage" program	
Shared Energy Facilities. Amend County Building Codes as necessary to eliminate barriers that may inhibit major commercial, industrial, and public uses from installing and/or using shared energy facilities, such as district heating/cooling systems, solar water heating, photovoltaic grids, and cogeneration systems.	County CDS, REA	County Ordinances, UBC	
Retrofits in Existing Buildings. Investigate both voluntary and mandatory energy efficiency retrofit programs. Provide incentives to property owners to upgrade their homes, businesses, or other properties for improved energy conservation and energy efficiency techniques (i.e. energy efficiency retrofits). County incentives may be clear permitting procedures and fee reductions for projects that either exceed title 24 by 20%, install a renewable energy system that meets 75% of building's needs, or comply with LEED checklist. Incentives could also include providing assistance to property owners in obtaining rebate programs for retrofitting residential and commercial buildings. Promote the voluntary residential retrofit energy program by encouraging homeowners associations to do the following:	County CDS, REA	County Ordinances, UBC, permit streamlining	

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
• Purchase bulk solar systems and conservation materials. • Sponsor buying clubs, cooperative or other suitable mechanism to purchase, install, and maintain retrofit measures.			
Energy Audits at Time of Sale/Transfer of Ownership. Investigate options for combining energy audits with existing inspections, financing, and data collection activities. Develop policies and guidelines to enact appropriate transfer-of-ownership regulations/programs. A primary objective of this program would be to provide prospective homebuyers with an energy efficiency comparison of available units, thereby encouraging potential sellers to retrofit their properties.	County CDS, REA	Energy Audit guidelines and programs for time-of-sale/transfer-of-ownership	
Develop Incentives for Private Sector. Develop incentives to encourage the installation of cost effective energy efficiency measures in all new construction and building retrofits. Incentives may include: density bonuses, fast-track permitting, fee reductions, expedited low-cost approval of standardized designs, property tax exemptions, sales tax rebates, and award programs that recognize builders and developers for well-designed systems.	County, REA		

5.2.3 Water, Wastewater, & Solid Waste Management

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Water Efficiency. Apply appropriate permitting conditions on new development and reconstruction/rehabilitation projects in order to maximize conservation and efficient water use in new and existing development.	CSDs, REA	County Ordinances, Codes and standards, UBC, CSD requirements	
Wastewater and Reclaimed Water Efficiency. Solicit cooperation from water suppliers, industry, golf courses, landscapers, and agriculture to conserve water through the use of properly treated reclaimed water and wastewater.	Community Service Districts (CSDs), County CDS, Helth Dept. & REA	County ordinances, codes and standards, UBC, CSD requirements	

Water Conservation. Encourage local water providers to enforce water conservation measures cooperatively, using state-mandated powers, to reduce energy consumption at water facilities, associated with various phases of pumping, distribution, treatment, and reclamation.	CSDs, REA	County Ordinances, Codes and standards, UBC, CSD requirements	
Conservation Management Plan. Implement a County-wide water conservation management plan, which is based on conservation of energy and water resources to maintain and promote water conservation and water recycling programs as a means of conserving energy.	County CDS, CSDs, REA	County Water Conservation Management Plan	

5.3 RENEWABLE ENERGY, DISTRIBUTED GENERATION, & COGENERATION

5.3.1 Countywide Renewable Energy, Distributed Generation, & Cogeneration

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Prepare County Facility Energy Study. For County facilities, prepare a report that examines the economic feasibility of using renewable energy systems (including solar electric and solar hot water), cogeneration systems, distributed energy systems, and district heating systems.	CEC, County, DOE, LGC, National Renewable Energy Lab		
Develop County Facility Guidelines. For County facilities, establish guidelines for designing and installing renewable energy, cogeneration, distributed energy, and/or district heating systems in existing, new and acquired County facilities.	County, REA		
Install County Systems. Pursue the installation of cost-effective renewable energy systems, cogeneration systems, distributed energy systems, and district heating systems in County facilities. Systems considered to be cost-effective shall be those that exhibit a net dollar savings (compared to reasonable alternatives) over the life of the project.	County, REA	CEC Emerging Renewables Rebate Program, CPUC Self Generation Incentive Program	

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Assess Existing Regulations. Assess the existing subdivision, zoning, and building code implications associated with the potential development of renewable energy and distributed energy generation facilities and related electrical transmission lines.	County CDS		
Fair Regulations. Develop a clear permitting process to provide for the installation of renewable energy and distributed energy generation systems. Identify zones where renewable energy and distributed energy generation facilities will be allowed as a permitted use. Identify small-scale systems that meet annual onsite energy needs, and that would not require a use permit. Zoning regulations should address the following types of renewable energy and distributed energy generation facilities: commercial wind farms, wave and tidal energy facilities, biomass energy facilities, biogas energy facilities, small scale hydroelectric facilities, cogeneration and distributed generation facilities, solar electric and solar heating facilities.	County		
Preserve Resource Options. Update the Project Independence Report to identify the land use issues that could prohibit or facilitate the development of renewable energy and distributed energy generation facilities. Identify the necessary steps to preserve these resource options, including utility easements, rights of way and land set-asides.	County		
Develop Incentives for Private Sector. Develop incentives to encourage the installation of cost effective cogeneration, distributed generation, district heating systems, solar electric and solar heating systems in the private sector. Incentives may include: density bonuses, clear permitting procedures, fee reductions, expedited low-cost approval of standardized designs, property tax exemptions, sales tax rebates, and award programs that recognize builders and developers for well-designed systems.	County, REA		

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Use of Waste Biomass for Energy Production. Promote forest fuel-reduction programs that provide sustainable forest practices, fire safety, and the use of forest biomass as an energy source. Develop and maintain statistics on the use and availability of forest waste biomass resources for energy production. ***Potential Resources:*** Six Rivers National Forest, Institute for Sustainable Forestry, Humboldt Fire Safe Council, USFS Forest Products Laboratory, USDA Forest Service Pacific Northwest Research Station, University of California Division of Agriculture & Natural Resources, Humboldt State University Forestry Department, local forest products industry.	County, USDA Forest Service		
Biogas Development. Develop the use of biogas at the Cummings Road Landfill. Develop and publicize dairy biogas demonstration sites and work with local farm organizations to promote dairy biogas energy systems where appropriate. Publicize the use of biogas at existing local wastewater treatment facilities and encourage its use at additional facilities where appropriate. ***Potential Resources:*** Power and Heat Generation Feasibility Study for Cummings Road Landfill (SCS Energy 2004), Feasibility Study on Implementing Anaerobic Digestion Technology on Humboldt County Dairy Farms (Schatz Energy Research Center, June 1, 2003).	Dairy Cooperative, Humboldt Waste Management Authority, REA		
Support Wave and Tidal Energy Demonstration Projects. Promote and support local wave and tidal energy systems research and development. Work with private companies to develop wave and tidal energy demonstration projects. ***Potential Resources:*** California Energy Commission, Electric Power Research Institute.	County	California Energy Commission, Electric Power Research Institute.	
Wind Energy Development. Develop wind-permitting guidelines for residential and small commercial scale wind energy systems. Adopt and modify, as appropriate, the guidelines established in California State Law AB 1207 which are due to expire in July 2005. Educate the public about the benefits of	County		

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
small-scale wind energy systems. ***Potential Resources:*** California State Law AB 1207, October 2001; Recommendations for a Zoning Ordinance for the Permitting and Installation of Small Wind Energy Systems in Humboldt County, California (C. Lessmann, January 1, 2005); Permitting Small Wind Turbines: A Handbook (CEC/AWEA).			
Large-Scale Wind Energy. Provide information about cost-effective commercial scale wind farms in the county and in off-shore areas adjacent to the county. Assess wind resources in the county and prepare a model draft EIR for large-scale onshore and offshore wind energy facilities. Educate the public about the benefits and impacts of wind energy systems. Focus especially on presenting accurate and balanced information on bird and bat kills and noise and visual impacts. ***Potential Resources:*** California Energy Commission, American Wind Energy Association, National Renewable Energy Laboratory.	County	California Energy Commission, American Wind Energy Association, National Renewable Energy Laboratory	
Natural Gas Development. Support efforts to develop local natural gas resources. Develop an updated assessment of onshore natural gas resources in the county. ***Potential Resources:*** California Department of Conservation Division of Oil and Gas and Geothermal Resources.	County		
Small Hydroelectric Development. Support local efforts to develop cost-effective, environmentally-sensitive, small-scale, run-of-the-river hydroelectric facilities in the county. Conduct an updated assessment of small hydroelectric resources potential in the county. ***Potential Resources:*** An Analysis of Small Hydroelectric Planning Strategies (Oscar Larson and Associates, May 1982).	County		
Solar Energy Development. Support local efforts to develop solar electric systems and solar hot water systems in the county. Develop a training program for solar contractors and installers.	County, REA		

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Educate the public about the benefits of solar energy systems. Develop a database of solar energy systems installed in the county. ***Potential Resources*:** Million Solar Roofs Initiative, North American Board of Certified Energy Practitioners, California Energy Commission.			
Biodiesel Development from Waste. Utilize waste oils and other biomass wastes for biodiesel production. Assess available waste resources for biodiesel production. Provide current information on the potential opportunities, benefits, and limitations of waste biodiesel production and use in the county. Focus on waste oils and other biomass that are not already being used for other purposes. Develop guidelines and standards for the safe and environmentally responsible production of biodiesel in the county.	County		
Energy Grid Connection. Promote appropriate small-scale energy generation where cost-effective connections to the distribution system are available or planned. Standardize local rules for connecting to the grid, consistent with IEEE interconnection standards. Connections for small generators (under 100 kW) should be simplified and standardized.	County, PG&E		
Vehicle-to-Grid Connection. Evaluate long-term integration of motor vehicles with the electric grid, including battery electric vehicles, fuel cell vehicles, plug-in hybrid electric vehicles, and solar-electric vehicles. Evaluate development status of vehicle-to-grid interconnect standards and the use of grid-connected vehicles for short-term energy storage.	County, PG&E		

5.4 LOCAL MANAGEMENT OF ENERGY SUPPLY

5.4.1 New Energy Production and Transmission Facilities

Standards and Implementation Strategies	Responsible Party	Measurable Outcome	Time Frame
Energy Feasibility Study. Examine feasibility of wind, solar and hydro-power as short term intermittent sources, and also emerging technologies such as wave energy as longer term possibilities. The feasibility study will also examine potential for local electrical energy storage systems capable of smoothing out electrical generation fluctuations. Intermittent renewable resource load profiles will be studied.	County and REA	Energy Feasibility Study	

5.4.2 Local Utility Management and Development Options.

Standards and Implementation Measure	Responsible Party	Resource or Product	Time frame
Investors-Owned Utility System. Examine the capital and operating costs for any proposed new utility, factoring in various power supply alternatives, then estimate property value (determining the general condition of the facilities to be acquired) and the cost of separating the new system's facilities from the remaining part of the Investors Owned Utility system. If building a new, alternative distribution system is to be considered as an option, the feasibility study will estimate the cost of new construction of a distribution system using current technology	County and REA		
Municipal Power Authority/agency Feasibility. Conduct a preliminary feasibility study to examine the viability of establishing a Municipal Power Authority/agency (MPA).	County and REA		
Community Choice Aggregation. Explore the feasibility of becoming community-choice aggregators, using funding from the CEC and the U.S. DoE, and with the technical assistance of Navigant Consulting, Inc**.** Apply for technical assistance to	County and REA		

Standards and Implementation Measure	Responsible Party	Resource or Product	Time frame
determine cost issues and for information needed to file CCA implementation plans with the California Public Utilities Commission (CPUC).			
Renewable Energy Portfolio Standard. Review compatible energy resource development projects that would assist the State of California in meeting Renewable Portfolio Standard goals. In particular, the REA shall engage in the CPUC-led process that directs utilities to investigate transmission upgrades to support the development of renewable energy resources.	County and REA		
Pursue Feasibility Studies for Utility Resource Portfolio. Conduct studies to focus on fuel diversity, environmental concerns, and market uncertainties that are increasingly important in electric utility resource planning and to identify renewable energy technologies that are becoming significant components in utility resource portfolios. Pursue available grant programs to fund feasibility studies, including funding sources from the CEC which offers support to a wide range of research and development projects through its Public Interest Energy Research (PIER) Program. The U.S. Department of Energy, Energy Efficiency and Renewable Energy program is also to be monitored for funding opportunities.	County and REA		
Interconnected (Looped) Electrical Grid. Work with PG&E to evaluate an interconnected (looped) electrical grid for the county. Support systems that will provide land use and population trend data to inform long-term plans for transmission assessments and transmission grid expansion.	County, ISO, PG&E		

GLOSSARY & ACRONYM LIST

Term	Abbre-viation	Definition
Air Source Heat Pump		A heat pump that draws its heat from (or dumps heat to) the ambient air.
Alternating Current	AC	Electric current that reverses direction many times per second. Most electrical generators produce alternating current.
Alternative Fuel Vehicle	AFV	Vehicle powered by fuel other than (or in addition to) gasoline or diesel. Includes electric, compressed natural gas, hydrogen, and hybrid vehicles, among others.
American Council for an Energy Efficient Economy	ACEEE	
Anaerobic Digester Gas	ADG	Combustible gas (chiefly methane) derived from anaerobic wastewater treatment processes.
Anaerobic Digestion	AD	Process of capturing methane gas from wastewater or manure.
Arcata and Mad River Transit System	A&MRTS	
Availability		The number of hours per year a power plant could potentially produce electricity if dispatched (less an allowance for planned outages) as a percentage of the total number of hours in the year.
Biodiesel		Any liquid biodegradable fuel (biofuel) suitable as a substitute, additive, or extender to petroleum diesel fuel. Biodiesel, an ester, is made using vegetable oils, animal fats, algae, or recycled cooking greases. It is manufactured in the transesterification process, combined with alcohol (ethanol or methanol). Biodiesel can be used as a diesel additive to reduce vehicle emissions or in its pure form to fuel a vehicle. (Source: U.S. Department of Energy)
Bioenergy		Energy generated from biomass.
Biogas		Gaseous fuels, principally methane, derived from biological processes taking place in sources such as landfills, wastewater treatment plants, and livestock manure.
Biomass		Plant-derived material used to generate energy in the form of electricity, heat, and fuels. Wood is the largest source of biomass-derived energy; other sources are non-woody plants, residue from agriculture or forestry, and the organic component of municipal and industrial wastes. Biomass uses include ethanol, biodiesel, electric power generation, and industrial process energy. (Source: U.S. Department of Energy)
British Thermal Unit	Btu	An energy unit measuring the heat energy needed to raise the temperature of one pound of water by one degree Fahrenheit.
California Energy Commission	CEC	The state agency responsible for energy policy (established by the 1974 Warren-Alquist State Energy Resources Conservation and Development Act). The Commission's five major areas of responsibilities are to: promote energy conservation and efficiency measures; forecast future statewide energy needs; developing renewable and alternative energy resources including providing

Term	Abbre-viation	Definition
		assistance to develop clean transportation fuels license power plants; planning for and directing state response to energy emergencies.
California Independent System Operator	CAISO	See Independent System Operator.
California Power Authority	CPA	The CPA "is charged with ensuring reasonably priced, long-term availability of reliable supply of electricity and natural gas, promoting environmentally friendly supply and demand solutions, and achieving adequate capacity reserves by 2006." (Source: CPA)
California Public Utilities Commission	CPUC	The state agency that regulates the rates and services of natural gas, electric, water, steam, pipeline, sewer, telephone, cellular and radio telephone, and telegraph utilities as well as trucking, railroad, airline, moving and privately-owned bus companies.
Capacity factor		The amount of energy that a power system produces at a particular site as a percentage of the total amount that it would produce if it operated at rated capacity during the entire year.
Carbon Dioxide	CO_2	A gas released by the combustion of all hydrocarbon fuels (including fossil fuels and biomass-derived fuels). CO_2 releases to the atmosphere from both manmade and natural sources are believed to be the main cause of global climate change.
Climate Change		"…[A] statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer). Climate change may be due to natural internal processes or external forcings, or to persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the United Nations Framework Convention on Climate Change (UNFCCC), in its Article 1, defines 'climate change' as: 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.' The UNFCCC thus makes a distinction between 'climate change' attributable to human activities altering the atmospheric composition, and 'climate variability' attributable to natural causes." (Source: Food and Agriculture Organization)
Coefficient of Performance	COP	An efficiency unit used for heat pumps; measures the heat output for each unit of energy input.
Cogeneration Also known as "co-gen" and "combined heat and power"		The simultaneous production of electricity and useful thermal energy (e.g. heat or steam) from a common fuel source. The byproduct heat ("waste" heat) from industrial processes can sometimes be used to power an electric generator. Conversely, byproduct heat from an electric generator can often be used for industrial processes or for other heating purposes. By harnessing an otherwise wasted energy source, cogeneration improves the overall efficiency of energy systems.
Combined Heat and Power	CHP	See Cogeneration.
Community Choice Aggregation	CCA	The community choice aggregation law (California Assembly Bill 117, 2002) allows local governments, alone or jointly, to aggregate the retail electric customers in their jurisdictions for the purpose of

Term	Abbre-viation	Definition
		purchasing power. Under CCA, local governments do not purchase or acquire the local distribution system, but rather enter into contracts to purchase wholesale electricity and resell it to residents and businesses in the community. The utility still provides electric distribution, meter reading, and billing services and remains the default provider for any customers who choose to "opt out" of the program. This legislation allows communities to choose from whom they buy electrical power and what type of power to buy, as well as allowing them to negotiate how much they pay.
Core Transport Agent	CTA	
Demand Side Management		**"**Policies and programs designed for a specific purpose to influence consumer demand for goods and/or services. In the energy sector, for instance, it refers to policies and programs designed to reduce consumer demand for electricity and other energy sources." (Source: Food and Agriculture Organization, www.fao.org/clim/glossary.htm, accessed June 16, 2005.) Demand-side management can also refer to load shifting strategies that may not reduce total energy consumption but cut the utilities' peak load.
Diameter (of a tree) **at Breast Height**	DBH	
Direct Current	DC	Electricity that flows continuously in one direction.
Dispatchable Power		Power that can be produced "on demand" in order to meet changing loads and command the highest value.
Distributed Generation		Generation located at customer sites on a utility's distribution system for the purpose of meeting local electrical loads. This can reduce the need to build additional (or upgrade) transmission and distribution lines or centralized energy generation facilities.
Electric Power Research Institute	EPRI	
End Use		Energy consumed at the point of use (i.e. energy used by the consumer to provide end use services such as light, space heat or automotive power).
Energy Conservation		Behavioral steps taken to use less energy by lowering end use services (e.g. turning off unneeded lights, limiting automotive trips, and putting on a sweater rather than turning up the heat).
Energy Efficiency		Steps taken to reduce energy use while still providing the same end use service level (e.g. installing energy-efficient lighting fixtures using less energy while providing the same light level); or increasing productivity or manufacturing output per unit of energy consumed.
Energy Return on Energy Invested	EROEI	An efficiency unit equal to the units of energy output an energy "source" can produce for each unit of energy input. If EROEI <1, the energy "source" is actually an energy sink. An energy "source" with EROEI < 1 could be worthwhile if the output energy is in a more convenient form than the input energy.
Energy Star		A program of the U.S. EPA (Environmental Protection Agency); it

Term	Abbre-viation	Definition
		began in 1992 as a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. The Energy Star® label identifies products that deliver the same or better performance as comparable models while using less energy and saving money. The program includes major appliances, office equipment, lighting, home electronics, new homes, and commercial and industrial buildings.
Ethanol		Ethyl Alcohol; (CH3CH2OH) A colorless, flammable liquid produced by fermentation of sugars.
Eureka Transit System	ETS	
Federal Energy Regulatory Commission	FERC	An independent agency that regulates the interstate transmission of natural gas, oil, and electricity, and natural gas and hydropower projects. FERC is composed of up to five commissioners who are appointed by the President of the United States with the advice and consent of the Senate.
Fossil Fuels		Carbon-based fuels derived from fossil carbon deposits, including coal, petroleum, and natural gas.
Fuel Cell		Device that electrochemically combines a fuel (typically hydrogen) with oxygen (typically from the air) to produce electricity at high efficiency with low emissions.
Fuel Switching		Strategic use of an alternative fuel or energy source to gain some advantage (e.g. cost savings or pollution reduction).
Full-cost Pricing		Pricing commercial goods, including electric power, to include both the private costs of inputs faced by the end user, and the costs of externalities created by their production and use (e.g. costs in health care and lost work caused by smog-related illness; cleanup costs and lost fishing and tourism revenues from an oil spill).
Gigawatt	GW	A power unit equal to 1 trillion (10^9) Watts.
Gigawatt-hour	GWh	An energy unit equal to 1 trillion (10^9) Watt-hours.
Ground Source Heat Pump		A heat pump that draws its heat from (or dumps heat to) the ground and/or groundwater.
Heating, Ventilating and Air Conditioning	HVAC	Collective term for all equipment used to heat, cool, and ventilate a building.
Heat Pump		A device that moves heat energy from one place to another and from a lower to a higher temperature by using electricity to power a compressor motor that drives a vapor-compression refrigeration cycle. Refrigerators and air conditioners are heat pumps, but the technology can also be used for space or water heating.
Humboldt Bay Municipal Water District	HBMWD	
Humboldt Bay Power Plant	HBPP	
Hybrid Electric Vehicle		A vehicle that is powered by a combination of an internal combustion engine and an electric motor.
Independent	ISO	An organization created to control the operation of the power system,

Term	Abbre-viation	Definition
System Operator		monitor reliability and coordinate the supply of electricity in a region.
Intermittent Resources		Energy resources that are not available at all times in consistent amounts, such as wind and solar energy.
Joint Powers Authority	JPA	Redwood Coast Energy Association (RCEA) is a JPA.
Joule		A standard international unit of energy; 1055 Joules is equal to 1 BTU.
Kilovolt	kV	1000 Volts.
Kilowatt	kW	A power unit equal to 1000 Watts.
Kilowatt-hour	kWh	An energy unit equal to 1000 Watt-hours; basic unit utility uses for billing for electric energy use.
Kinetic Energy		The energy that a body possesses by virtue of its motion.
Landfill Gas	LFG	Gas derived from a landfill, mostly methane, which can be combusted as an energy source.
Leadership in Energy and Environmental Design	LEED	Green Building Rating System® is a voluntary national standard for developing high-performance, sustainable buildings. LEED provides a complete framework for assessing building performance and meeting sustainability goals. LEED emphasizes strategies for sustainable site development, water savings, energy efficiency, materials selection, and indoor environmental quality. LEED is developed and administered by the US Green Building Council. (Source: www.usgbc.org, accessed June 16, 2005.)
Liquefied Natural Gas	LNG	Liquefied natural gas, or LNG, is natural gas in a liquid form. When natural gas is cooled to minus 259 degrees Fahrenheit (minus 161 degrees Celsius), it becomes a clear, colorless, odorless liquid and has approximately 600 times the density of uncompressed natural gas at room temperature.
Local Government Commission	LGC	
Megawatt	MW	1 million (10^6) Watts. *Power unit*
Megawatt-hour	MWh	1 million (10^6) Watt-hours.
Megawatt Electric	MWe	An energy unit equal that measures electric output of a power plant in megawatts. The electric output of a power plant is equal to the thermal overall power multiplied by the efficiency of the plant.
Methanol		Methyl alcohol having the chemical formula CH30H. Methanol is usually produced by chemical conversion at high temperatures and pressures. Also known as wood alcohol. Although usually produced from natural gas, methanol can come from gasified biomass (syngas).
Million Btu	MMBtu	An energy unit equal to one million British Thermal Units.
Million cubic feet	MCF	
Million Solar Roofs	MSR	Federal program that supports the use of solar energy (both solar electric and solar thermal).
Million Therms	MTh	An energy unit equal to one million therms (one therm equals 100,000 British Thermal Units).
Mobile Electric Power Plant	MEPP	
Municipal Solid Waste	MSW	

Term	Abbre-viation	Definition
National Renewable Energy Laboratory	NREL	The nation's primary federal laboratory for renewable energy and energy efficiency research and development.
Natural Gas		An odorless, colorless, gaseous hydrocarbon mixture made up of methane (CH_4) and a small percentage of other light hydrocarbons. Natural gas is found naturally underground or produced by gasification of coal. Natural gas is the cleanest burning fossil fuel.
No-regrets Construction		The practice of designing and constructing a building to make future energy-efficient and renewable energy retrofitting as structurally easy and low-cost as possible.
North Coast Railroad Authority	NCRA	
Off-Grid		Power systems that operate independently of the electric power utility.
On-Grid		Power systems that are connected to the electric power utility.
Operations and Maintenance	O&M	
Pacific Lumber Company	PALCO	
Payback Time		The time period required for an investment to recover the initial capital cost. In the case of energy efficient equipment, payback time (in years) equals capital cost divided by yearly energy cost savings.
Peak Oil		Theory originated by M. King Hubbert in the 1950's that global oil production would rise to a peak then go into permanent, long-term decline.
Pacific Gas and Electric Co.	PG&E	The utility company serving Humboldt County and much of Northern and Central California.
Photovoltaic	PV	Direct solid-state production of electricity from light (usually sunlight).
Power		Rate of energy use (in electrical devices instantaneous Power = Voltage (in Volts) X Current (in Amps)).
Primary Energy Consumption		The amount of end use energy consumption plus losses that occur in the generation, transmission, and distribution of energy.
Public Utility Regulatory Policy Act	PURPA	The Public Utilities Regulatory Polices Act of 1978 (PURPA) was enacted to encourage energy conservation and domestic energy production. Section 210 of PURPA requires utilities to purchase energy, at the utility's avoided cost, from renewable or cogeneration projects.
Qualifying Facility	QF	Under PURPA, QFs are allowed to sell their electric output to the local utility at avoided cost rates.
Redwood Coast Energy Authority	RCEA	A Joint Powers Authority representing seven municipalities: the Cities of Arcata, Blue Lake, Eureka, Ferndale, Fortuna, Trinidad and Rio Dell, and Humboldt County.
Redwood Transit System	RTS	
Regional Energy Authority	REA	

Term	Abbre-viation	Definition
Renewable Energy		Energy derived from non-fossil-fuel sources.
Run of River		Hydroelectric system that does not employ a reservoir or dam, instead diverting part of the flow from the stream.
Solar Water Heating		Technology that uses the sun's thermal energy directly to heat water.
Standard cubic feet per minute	scfm	
Steam Electric Generator	SEG	
Therm		An energy unit equal to 100,000 Btu and used for billing for natural gas usage. *Note:* Natural gas meters read in units of 1000 cu-ft. The utility converts this into an energy quantity based on the actual number of Btus per cu-ft, which can vary over time.
Thousand Btu	MBtu	An energy unit equal to one thousand British Thermal Units.
Time of Use	TOU	Utility electric rates that change with time of day according to the utility's peak demand pattern.
Title 24		The section of California Code of Regulations that establishes energy efficiency requirements for buildings.
US Green Building Council		A national coalition of leaders in the building industry and planning profession working to promote buildings and neighborhoods that are environmentally responsible, profitable, and healthy places to live and work. The Council developed, and continues to expand, the LEED (Leadership in Energy and Environmental Design) Green Building Rating System®. (Source: www.usgbc.org, accessed June 16, 2005.)
Vehicle Miles Traveled	VMT	Total miles traveled by all vehicles in a given area over a given time period.
Vehicle to Grid	V2G	The concept of using battery electric, hybrid, and fuel cell vehicles as distributed, grid-connected power generation and energy storage devices.
Volt		An electric unit equal to amount of force required to drive a steady current of one ampere through a resistance of one ohm. Most domestic and office electrical systems have 120 volts.
Wastewater Treatment Plant	WWTP	
Watt	W	A power unit equal to 1 Joule per second.
Watt-hour		An energy unit equal to power (in watts) multiplied by time (in hours).
Wave Energy Conversion	WEC	Use of the energy in ocean waves to generate electricity.