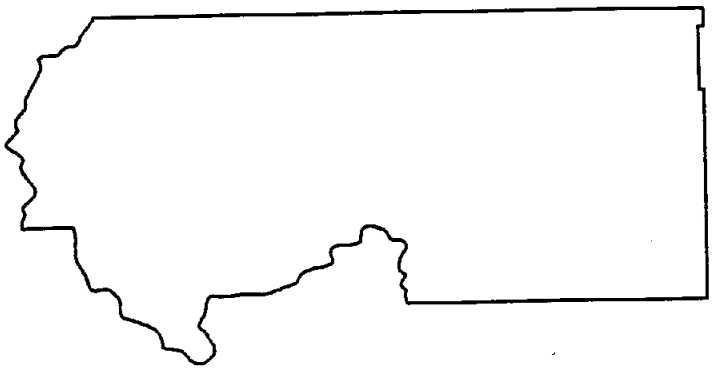
SISKIYOU COUNTY GENERAL PLAN

ENERGY ELEMENT



March 1993

SISKIYOU COUNTY GENERAL PLAN
ENERGY ELEMENT

Board of Supervisors

Clancy Dutra
Jerry Giardino
George Thackeray
Ivan Young
Roger Zwanziger

Planning Commission

Judy Grensted
Hal Bowman
Ben Brazie
Michael Bryan
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Elden Hoy
Ron Stevens

Planning Department

Robert Sellman, Director
Richard Barnum, Assistant Director
Martin Taylor, Associate Planner
Dan Breedon, Assistant Planner
Mark Hoffner, Senior Cadastral Drafter
Sidney Dais, Department Secretary
Marcia Gebhardt Board Clerk
Barbara Robbins, Administrative Clerk II

Consultant Criterion Planners/Engineers

Funding California Energy Commission

RESOLUTION OF THE BOARD OF SUPERVISORS OF THE COUNTY OF SISKIYOU, STATE OF CALIFORNIA, ADOPTING THE ENERGY ELEMENT TO THE SISKIYOU COUNTY GENERAL PLAN

WHEREAS, Siskiyou County, under a California Energy Commission Grant, prepared a Draft Energy Element for adoption as an Element of the General Plan; and

WHEREAS, the Element was circulated to all interested agencies and individuals for review and comment; and

WHEREAS, at a duly noticed public hearing held on January 6, 1993, all interested persons were given an opportunity to be heard on this Energy Element to the Siskiyou County General Plan; and

WHEREAS, the Planning Commission, on January 6, 1993, considered the Negative Declaration and Energy Element and recommended the approval of both; and

WHEREAS, the Board of Supervisors considered the Negative Declaration for the Energy Element and approved said Negative Declaration; and

WHEREAS, the Board has considered the Energy Element to the Siskiyou County General Plan.

NOW, THEREFORE, BE IT RESOLVED that the Planning Commission, on January 6, 1993, recommended approval to the Board of Supervisors.

FURTHER, BE IT RESOLVED by the Board of Supervisors, after due consideration and upon recommendation of the Planning Commission, that the Energy Element to the Siskiyou County General Plan be adopted.

The foregoing resolution was adopted at a regular meeting of the Siskiyou County Board of Supervisors of the County of Siskiyou, State of California, held on the 9th day of March 1993, by the following vote:

AYES: Supervisors Dutra, Thackeray, Zwanziger and Giardino.

NOES: None.

ABSENT: None.

Chairman
Siskiyou County Board of Supervisors

ATTEST:
Lisa Chandler, County Clerk

By: _____
Deputy

SISKIYOU COUNTY
RESOLUTION
No. 93-48

BEFORE THE BOARD OF SUPERVISORS

COUNTY OF SISKIYOU, STATE OF CALIFORNIA

9th day March 19 93

PRESENT: Supervisors Clancy Dutra, George Thackeray, Ivan Young, Roger Zwanziger and Jerry Giardino. Chairman Young presiding.

ABSENT: None

Assistant COUNTY ADMINISTRATOR: Darby Hayes

Deputy COUNTY CLERK: Sherrie Bennett and Cindy Dieter

COUNTY COUNSEL: Frank J. DeMarco

PURPOSE OF MEETING: Regular

RESOLUTION ADOPTED (PUBLIC HEARING) - ADOPTING THE ENERGY ELEMENT TO THE SISKIYOU COUNTY GENERAL PLAN.

This was the time set for the continued public hearing to consider adoption of the Energy Element to the Siskiyou County General Plan.

Planning Director Robert Sellman presented staff response to the California Energy Commission re minor corrections and clarifications to the Energy Element, recommending approval of the Energy Element subject to corrections.

There being no public input, the public hearing was declared closed.

Following a brief discussion, it was moved by Supervisor Giardino, seconded by Supervisor Zwanziger and unanimously carried, that the Energy Element to the Siskiyou County General Plan, is approved subject to corrections. Further, Mr. Sellman is to provide a final copy of the Energy Element to the Board.

Later in the day.

Following Planning Director Robert Sellman's presentation of resolution adopting the Energy Element to the Siskiyou County General Plan, it was moved by Supervisor Giardino, seconded by Supervisor Dutra and unanimously carried that Resolution No. 93-48, being a resolution adopting the Energy Element to the Siskiyou County General Plan, is adopted and the Chairman authorized to sign.

STATE OF CALIFORNIA)
COUNTY OF SISKIYOU) ss

I, LISA CHANDLER, County Clerk and Ex-Officio Clerk of the Board of Supervisors, do hereby certify the foregoing to be a full, true and correct copy of the minute order of said Board of Supervisors passed on 3-09-93

Witness my hand and the seal of said Board of Supervisors, this 17th day of March, 1993

cc: File
Planning (2)

LISA CHANDLER
County Clerk and ex-Officio Clerk of the Board of Supervisors of Siskiyou County, California

By Cindy Dieter
Deputy Clerk

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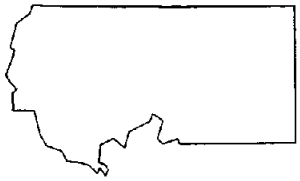
- *Measuring Energy*

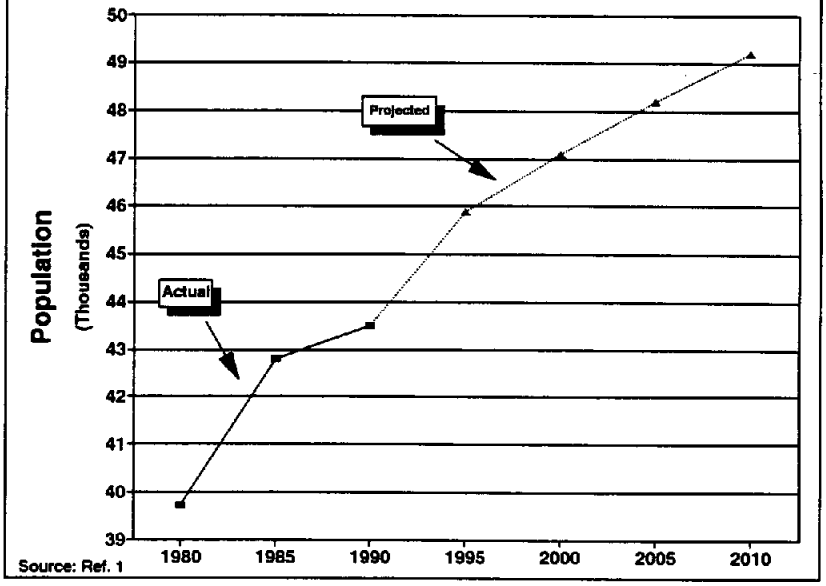


SISKIYOU COUNTY & THE NEED FOR AN ENERGY ELEMENT

Energy is important to the citizens, business, and local governments of Siskiyou County because its present and future uses significantly affect the economy, environment, and general livability of the County. Every year, $80 million or more is spent on energy in the County, and much of that expenditure leaves the local economy for imported, non-renewable supplies that detract from the community's sustainability and environmental quality. The significance of these issues is certain to increase as the County and its energy demands grow over time.

The County's 1990 population was 43,531 persons. Of this total, roughly one-half reside in nine incorporated municipalities, including Yreka the County seat. Figure 1 displays historic and projected population growth (ref.1). Based on forecasted population growth, the county may need as much as 15% more energy in the year 2010 than it uses now.

Fig. 1. Siskiyou County Population Growth

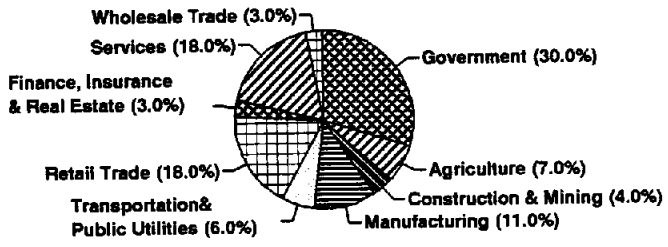


SISKIYOU COUNTY & THE NEED FOR AN ENERGY ELEMENT *Continued*

Since 1970, a majority of the County's growth has occurred in unincorporated areas, which has noteworthy implications for rural energy supply infrastructure, and the energy usage and cost consequences of a dispersed, low-density population. Over the next 20 years the County's population is projected to grow about 13%; where and how that growth is located will have a significant impact on future energy needs and costs.

Historically, the local economy has been based on agriculture, forestry, and recreation. Figure 2 presents 1990 Countywide employment by economic sector. Recent trends have included declining lumber and wood products jobs due to recessionary market conditions and environmental concerns; modestly increasing agricultural employment due to strong market demands for local crops; no growth in government jobs due to budgetary constraints; and continuing modest growth in tourism and recreation-related service jobs (ref. 2). The energy implications of these trends include declining industrial requirements; continuing needs for agricultural efficiency improvements; and modest growth in service and retail sector energy consumption.

Fig. 2. Countywide Employment by Industry (1990)



Source: Ref. 2

SISKIYOU COUNTY & THE NEED FOR AN ENERGY ELEMENT *Continued*

A distinguishing characteristic of the County is that nearly three-quarters of its total land area is in public ownership, including the Klamath and Shasta-Trinity National Forests, Tulelake and Lower Klamath National Wildlife Refuges, and the Lava Beds National Monument. Of these, the most significant is the Klamath National Forest, which occupies about one-third of the County's total land area and whose resources underpin much of the local economy. The prominence of this federal role is noteworthy for local energy planning because a majority of the County's renewable energy resources are managed under federal policies and standards. It is therefore particularly important for the County to clearly articulate its energy priorities as advisory input in federal land planning processes.

The County's climate is characterized by warm, dry summers and cold, wet winters. Low temperatures in January average 27°F and high temperatures in August average 83°F. Annual precipitation levels are around 15 inches in most valley areas, and as much as 60 inches in some of the western mountainous areas. Annually, the climate creates about 5,800 heating degree days and 250 cooling degree days (degree days measure the amount of building space conditioning needed by the difference between a given base temperature, usually 65°F, and the mean outside temperature over 24 hours). From an energy standpoint, the County's cold winter months are noteworthy because of the heavy demands on building space heating and the consequent importance of energy-efficient building construction.

In summary, energy is a major factor in the County's present livability, and its importance can only increase as the County grows and diversifies its economy. By addressing these issues now, and formulating a plan for meeting future needs, the County should be able to accommodate growth and diversification by relying on local efficiency improvements and renewable resource development, instead of having to import more conventional, non-renewable supplies.

ENERGY ELEMENT OBJECTIVES

In response to the needs just described, an Energy Element is being prepared for the County General Plan that will:

- Contain comprehensive information on the County's energy resources, and present and future energy needs; and establish a planning framework for the energy issues of concern to citizens, businesses, and local government.
- Evaluate Countywide energy uses and opportunities for improving the efficiency of usage, including benefits to the local economy and environment from such improvements.
- Evaluate major opportunities and constraints surrounding renewable energy resource development in the County; and articulate the type and quality of energy development desired.
- Establish an energy strategy to meet future needs through self-sufficient efficiency and renewable actions to the greatest extent practical.
- Establish policies and implementation measures to carry out the strategy and thereby achieve a reliable, affordable, and environmentally-sound energy future for the County.

Scope and Planning Horizon

The scope of the Energy Element includes: all energy supplies currently used in the County; efficiency opportunities in all end-use sectors; and renewable resource development opportunities and constraints. Renewable energy resources include solar, biomass, geothermal, wind, and hydro. Oil and natural gas deposits are not known or expected to occur in the County, and are therefore not addressed as potentially developable energy sources. Similarly, because the likelihood of fossil-fueled power generation is considered low, it is addressed solely through policies that are applicable to all types of power plants regardless of fuel source. Transmission facilities of all types are addressed.

ENERGY ELEMENT OBJECTIVES *Continued*

The Element's planning horizon is the year 2010. This approximate 20-year time frame is considered to be the longest planning horizon that is reasonable without becoming unreliably speculative. As with other elements of the General Plan, the Energy Element will require periodic updating in order to retain its usefulness. Energy conditions can change relatively fast, making it important to maintain a current, factual basis for policy and implementation decisions. Over time the Element can serve as a periodically-updated baseline against which to measure the County's achievements in building a sustainable energy future.

LOCAL GOVERNMENT ENERGY RESPONSIBILITIES

Identifying present and future energy needs, and establishing a plan to meet them, is important to Siskiyou County because of its following energy responsibilities (which are also shared by municipalities in the County):

- Land-use planning and zoning, which control the location of energy production and transmission facilities, as well as the location and intensity of energy end-uses (residences, businesses, industries). End-use locations and intensities are important determinants in local energy needs and costs, particularly transportation energy.
- Lead agency environmental impact analysis and mitigation authority pursuant to the California Environmental Quality Act (CEQA), which affects the siting and operational character of energy production and transmission facilities, and major end-uses.
- Building code administration, which affects the efficiency of energy use in homes and businesses.
- Administration of public health and safety regulations, which insure that energy production, distribution, and use do not endanger citizens and workers.
- Energy use by local government-owned facilities and vehicles, where local government itself is a major energy consumer.
- The optional authority for local government-owned energy generation projects, where local government itself may function as an energy resource developer. This is a role that Siskiyou County is already performing with its hydroelectric plant at Box Canyon.

These local government energy responsibilities are the local tier in a hierarchy of regional energy policy-making and regulation that extends across California and throughout the West Coast. Local governments' energy responsibilities are shared with state and federal agencies that, in some cases, may have ultimate authority over certain types of energy projects. Federal and state agency responsibilities that may affect energy development in Siskiyou County are summarized in Appendix E. Figure 3 illustrates the regional energy planning that affect Siskiyou County, including Pacific Northwest processes because of the County's location on the Oregon border, and the consequent attractiveness of County resources to power developers in both California and the Pacific Northwest. Figure 3 also cites the Forest

LOCAL GOVERNMENT ENERGY RESPONSIBILITIES *Continued*

Service's planning process in recognition of its significant effect on renewable resource potentials and the County's environmental setting in general. Preparation of the Energy Element has been notably constrained by the Klamath National Forest's incomplete planning process, and when the Klamath Forest Plan is completed it will be worth reexamining several Element issues that are likely to be impacted by final Forest Service policy, e.g. biomass and geothermal resources.

The local planning process used to prepare the Element is shown in Figure 4. This process is intended to evaluate local needs and trends in light of the regional influences described above, and to formulate community-based actions that can secure the kind of energy future desired by Siskiyou County.

Fig. 3

Regional Energy Planning Affecting Siskiyou County

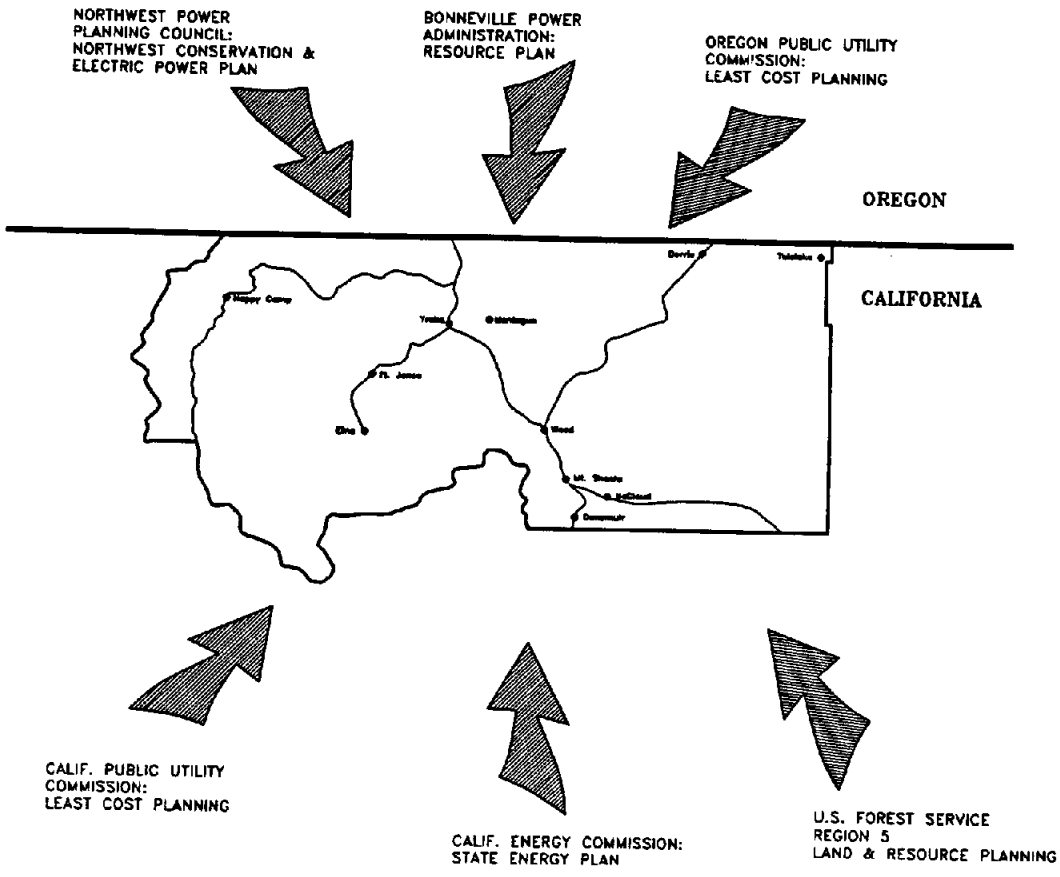
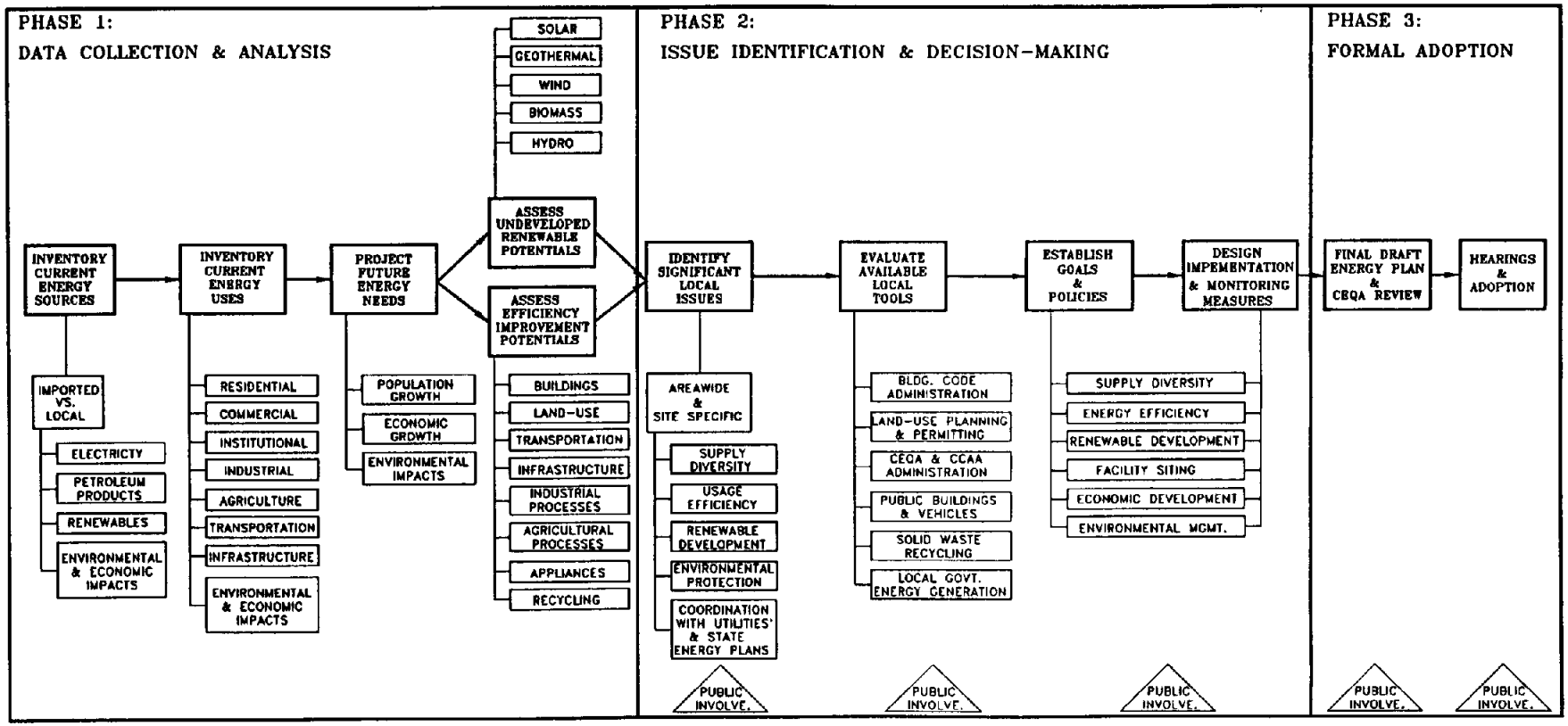


Figure 4

The Local Energy Planning Process



Source: Criterion

MEASURING ENERGY

Community energy planning necessarily involves measuring a variety of energy fuels and end-uses, from gallons of gasoline to kilowatt hours of electricity. The two main types of energy to be measured are electric power and thermal energy.

The basic unit for measuring electric power is a watt. One watt equals the rate of energy transfer equivalent to one ampere flowing under the potential of one volt with a power factor of 100%. One thousand watts is equivalent to a kilowatt (kW), and one million watts is equal to a megawatt (MW). Using a rule-of-thumb, one MW of installed electrical generating capacity is usually considered sufficient to meet the electric needs of about 1,000 households.

The standard unit for measuring thermal energy, which can come from electricity or any other source of energy, is the British thermal unit (Btu). One Btu is the amount of thermal energy required to raise the temperature of one pound of water 1°F at sea level. Btu's are often measured in million Btu (MMBtu), and this is used in the Energy Element as a common unit for measuring different fuels and end-uses. To give a frame of reference, a moderately weatherized Siskiyou County home could be expected to use about 60 MMBtu for space heating every year.

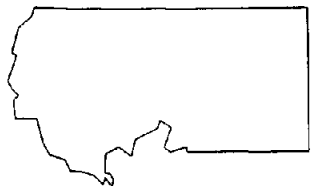
Btu conversions for the types of energy used in the County include:

	Btu
One kilowatt-hour (kWh) of electricity	3,412
One gallon of propane	90,000
One gallon of unleaded gasoline	125,000
One gallon of No. 1 fuel oil	139,000
One ton of pine wood pellets	16,000,000
One cord of lodgepole pine	20,000,000

The petroleum and wood conversions given above are approximations; exact Btu content will vary based on specific product type; and in the case of wood, moisture content.

ENERGY SUPPLIES

- Electricity
- Petroleum Products
- Propane
- Firewood
- Solar & Geothermal



OVERVIEW

This chapter of the Energy Element describes the ***supplies*** of energy presently relied upon in the County, including:

- Electricity
- Petroleum products (gasoline, diesel, fuel oil)
- Propane
- Firewood
- Geothermal and solar

Supplies are an important baseline for local energy planning because of local dependence on the adequacy and reliability of those supplies, and the economic and environmental consequences of that dependence. From a community perspective, major considerations in evaluating energy supplies include:

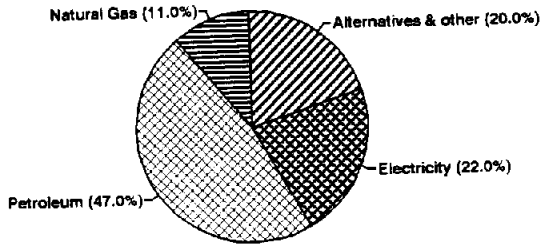
- Are the supplies produced locally or imported from outside the County?
- Are the supplies derived from renewable or non-renewable sources?
- How diverse is the mix of supplies, and is there over-reliance on any particular source?
- What are the long-term economic and environmental implications of using these types of supplies?
- To what extent can energy conservation and efficiency be used as a supply resource to meet the County's energy needs?

Figure 5 summarizes the County's current mix of supplies compared against statewide sources. A significant 78% of all County supplies are imported due to transportation fuel demands which must be met by West Coast oil refineries, and electrical needs that are partially satisfied by power generation located outside the County.

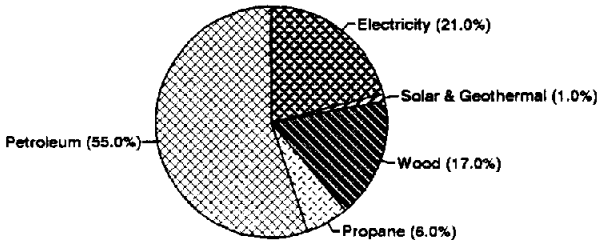
Figure 5

Current Energy Supplies
(1990)

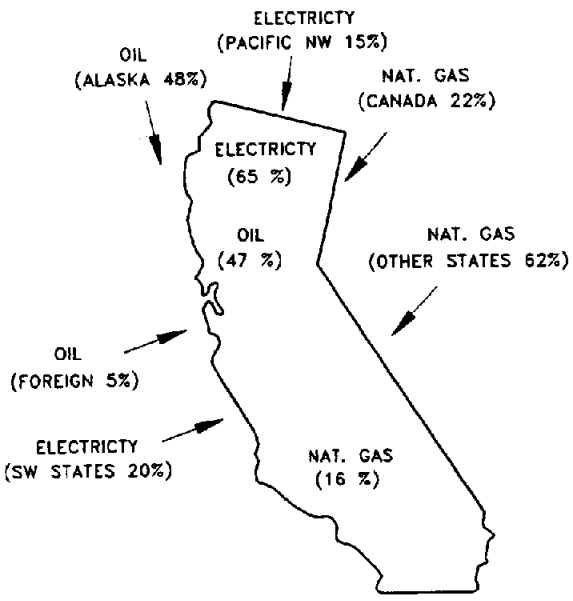
Statewide



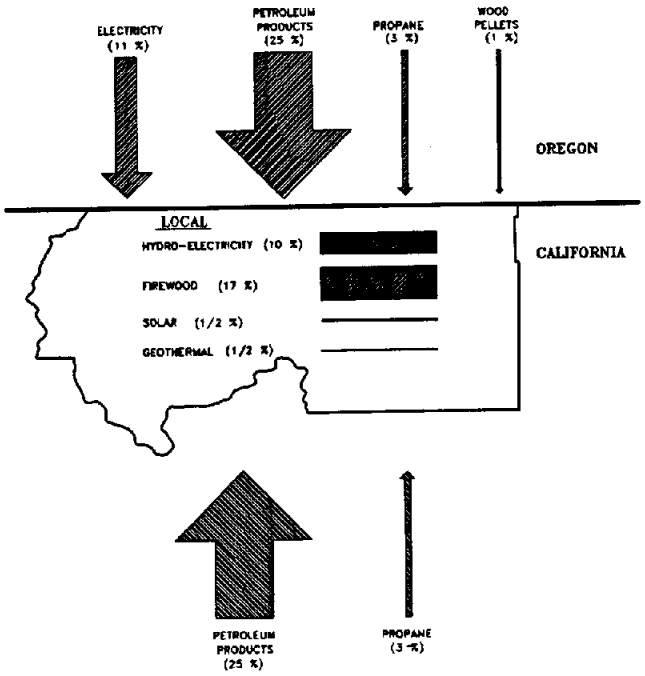
Siskiyou County



Statewide



Siskiyou County



Source: Ref. 7, 19-21.

ELECTRICITY

Sources

The County is served primarily by one electric utility, Pacific Power & Light Company (PP&L). PP&L is an investor-owned utility headquartered in Oregon with a service territory extending throughout the Pacific Northwest and northern California. In this portion of its service territory its electric supplies are primarily hydro-generated; the closest of PP&L's hydro facilities are located in Siskiyou and Klamath Counties on the Klamath River. The plants inside Siskiyou County have a total installed capacity of 65 MW (these are inventoried in the hydro section of the Element's renewable resources chapter). At an assumed annual availability factor of 25%, these hydro plants are believed to generate roughly 200,000 MWh per year or about half of the County's annual electric needs.

In addition to PP&L, Pacific Gas & Electric Company (PG&E) provides electricity to a small number of customers in the southeastern corner of the County near Pondosa. Like PP&L, PG&E's electric supplies are primarily hydro-generated in this portion of its service territory. PG&E does not operate any power plants in Siskiyou County, but does purchase the output of three independently-owned small hydro plants with a total installed capacity of 0.2 MW. There are also an estimated 100 small and micro-hydro installations operated Countywide by individuals for their own personal on-site use (data are not available to describe the locations or capacities of these personal installations). Hydro generation is discussed further in the renewable resources chapter of the Energy Element.

While much of the County's electricity has been hydro-generated in the past, most regional power plans assume less large-scale hydro reliance in the future, with growth in electric demand to be accommodated by conservation, other renewable generation, industrial cogeneration, electric grid efficiency improvements, and natural gas and coal-fired generation. An exception to the trend away

ELECTRICITY
Continued

from hydro is the continuing viability of small and micro-sized installations that are able to function under minimal flow conditions usually without adverse environmental effects.

Transmission and Distribution

Figure 6 shows the location of major electric lines in Siskiyou County and interconnections with adjoining electric grids. In addition to PP&L and PG&E lines, two major interstate transmission lines operated by the Western Area Power Administration (WAPA) and the Transmission Agency of Northern California (TANC) pass east of the County near Tulelake and through the southeastern corner of the County near Pondosa. The presence of these interstate transmission lines is noteworthy because of the implied potential to use them to export local renewable-based electric generation to other West Coast markets.

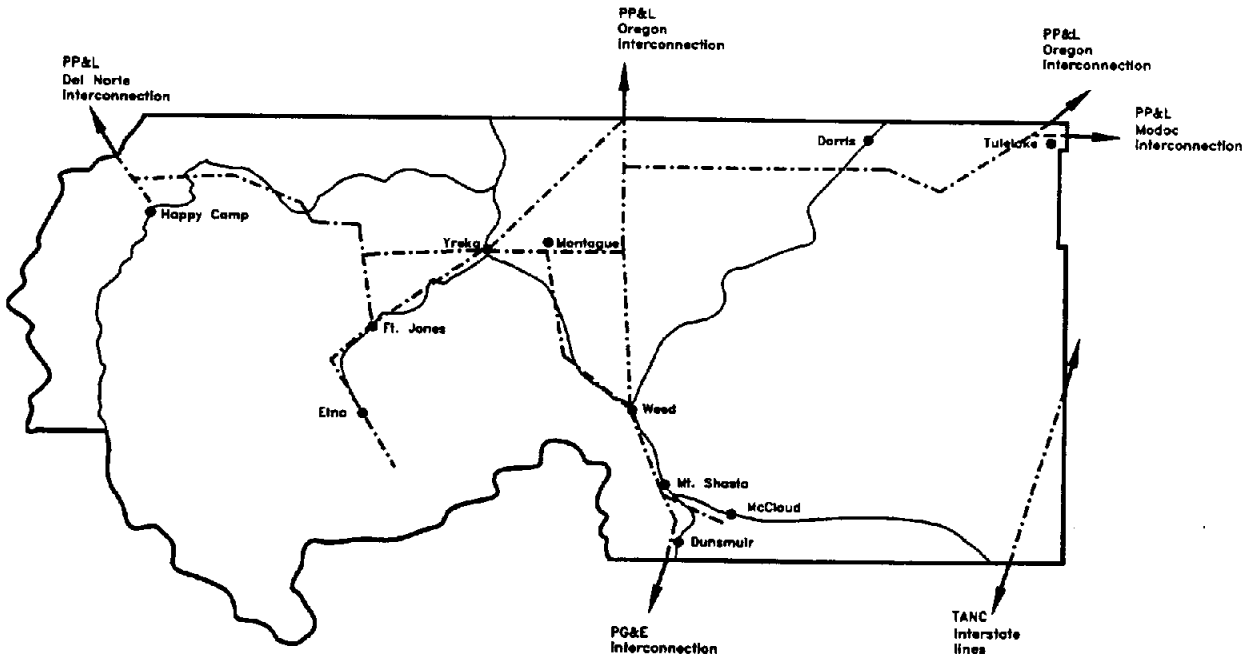
No electric transmission or distribution line proposals are pending or known to be under preparation in the County. However, the following transmission situations warrant monitoring:

- One or more new lines from potential Medicine Lake geothermal generation in Siskiyou County connecting with the interstate lines described above, or possibly other local lines. Virtually all of this would occur on federal lands, and is contingent upon further confirmation of geothermal resource viability for power generation. The timing of such confirmation is uncertain since the lead Medicine Lake developer, Unocal, recently put its geothermal leases up for sale.

- Additional interstate transmission capacity that may be developed over the long term between California and the Pacific Northwest, including expanded use of the existing interstate corridor near Tulelake and Pondosa, most of which is on federal lands. It should be noted that this is a transmission corridor that is closely shared with Modoc County, and given the inter-county impacts of potential Medicine Lake geothermal development, coordinated energy

Figure 6

Generalized Electric Supply Grid



Source: PP&L, WAPA, and TANC.

ELECTRICITY
Continued

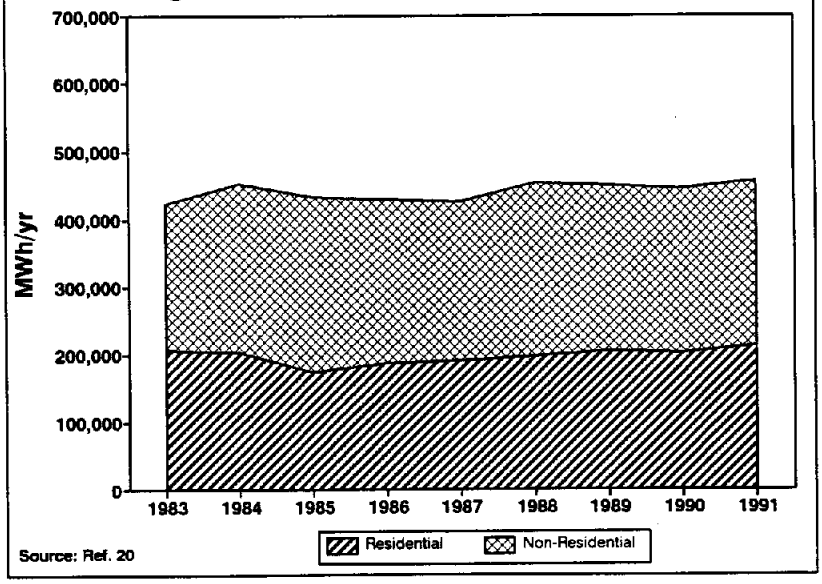
planning between Siskiyou and Modoc will be important in the future. Additional interstate transmission planning information is provided in reference 5.

Regulatory authority over transmission activities will depend on project location (responsible land management agency), size of transmission line, type and size of any related power plant, and type of transmission line developer (investor-owned utility versus municipal utility). These regulatory responsibilities are discussed further in the Element's renewable resources chapter and in Appendix E.

Consumption

Total Countywide electric consumption is shown in Figure 7 for the past several years (ref. 20).

Fig. 7. Countywide Electricity Consumption



ELECTRICITY
Continued

On a per capita basis, Countywide electricity consumption has been staying relatively constant at about 10,000 kWh/yr per person during recent years. This is somewhat contrary to statewide trends of falling per capita electric consumption (due to improved new construction and appliance efficiency standards, more efficient design and construction practices, and retrofitting of older structures), indicating that Siskiyou County may not be keeping up with other parts of the State in these areas. The County's electric end-uses are addressed further in the next Element chapter on energy use.

Current Costs

Current electric rates in the County are summarized below according to approximate cost ranges for major customer categories:

	¢/kWh
Residential	6-7
Small nonresidential	9-10
Large nonresidential	8-9

These are approximate ranges of melded rates that include both energy and demand charges. PP&L and PG&E rate schedules should be consulted for exact charges which will vary according to the specific amount and pattern of each customer's electric consumption. In total, the annual value of electricity presently sold in the County is approximately $28 million.

Environmental Issues

Environmental issues associated with electricity are typically related to its generation and transmission, and not its ultimate end-use. Since the only operating power plants in the County are hydro, the

ELECTRICITY
Continued

environmental effects of generation are addressed in the Element's renewable section on hydro resources.

The transmission and distribution of electricity via power lines can impact biological resources, land-use, scenic qualities, and public health and safety. These effects can be most significant during transmission line siting and construction, which are also addressed in the Element's renewable resources chapter in connection with future development.

Environmental issues associated with the County's existing power lines involve right-of-way maintenance using pesticides and herbicides with soil or water pollution potentials that are preventable with correct application procedures; and electromagnetic fields (EMF) emanating from power lines. EMF results when electric currents pass through transmission lines or other electrical conductors, and public concern about living near high-voltage transmission lines has heightened in recent years because of the possibility of health effects from long-term exposure to EMF. However, there is still considerable uncertainty surrounding the health effects of such exposure, and responsible California agencies are continuing to research the subject before issuing any new regulatory standards (ref. 6). Electric distribution facilities may also contain hazardous substances such as polychlorinated biphenyls (PCBs) which are used as insulating oils in transformers. These can contaminate soil and water if accidentally released, and must be disposed of in special landfills.

In general, local experience has shown that electricity distribution and use in the County is environmentally benign, and any significant environmental issues related to electricity are likely to be associated with future renewable-based generation.

PETROLEUM PRODUCTS

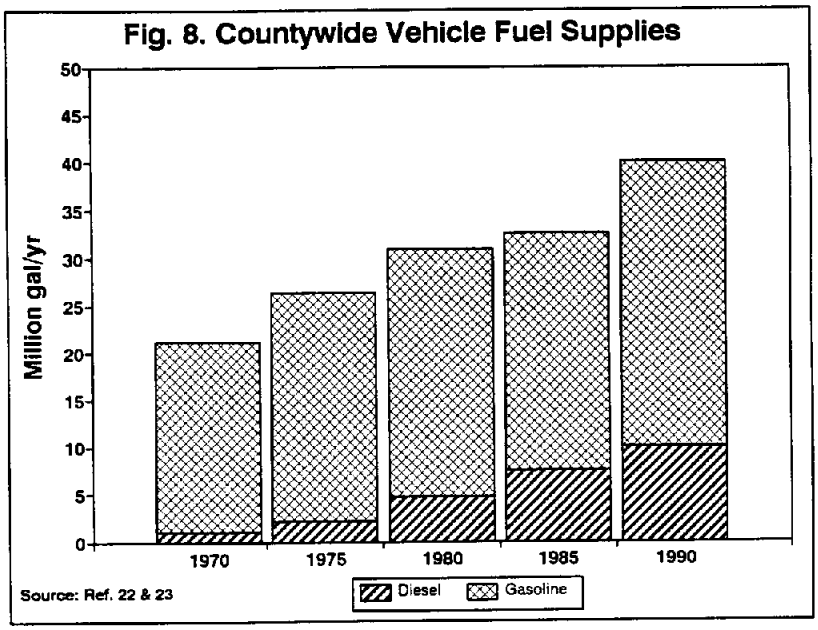
Sources and Distribution

Petroleum products (gasoline, diesel, and fuel oil) are shipped by rail and truck to local Siskiyou distributors from refineries in California and Washington. Wholesale and retail distribution of these products occurs through four distributors in local communities and others in adjoining counties. These firms distribute fuel oil to customers throughout the County, and provide bulk gasoline and diesel supplies to large commercial customers and an estimated 43 gasoline stations in the County. Except for a small number of propane vehicles, there is presently no distribution of alternative transportation fuel, such as methanol, within the County.

Consumption

Calculating the exact quantity of petroleum products used in the County is difficult because of the multiplicity of sources, distributors, and end-uses. Figure 8 displays estimated gasoline and diesel consumption over recent years (ref. 22, 23). When expressed on a per capita basis, transportation fuel consumption has increased approximately 13% since 1980, from about 800 gal/yr per person to 900 gallons in 1990. This is consistent with statewide trends stemming from relatively inexpensive gasoline during the 1980's and subsequent increases in driving. Siskiyou's fuel consumption is particularly affected by high through-traffic volumes on Interstate 5 and Highway 97. Current Countywide gasoline and diesel consumption stands at an estimated 40 million gal/yr (ref. 22-25).

PETROLEUM PRODUCTS
Continued



Comparable historic data for fuel oil sales is not available, but the 1990 federal census revealed that approximately 8% of the County's residences use fuel oil as their primary space heating fuel (ref. 16). Assuming an average household consumption of 500 gallons per year, and allowing 250,000 gallons for Countywide nonresidential use, total Countywide fuel oil consumption is estimated at approximately one million gallons annually.

The end-uses of transportation fuels and fuel oil are discussed further in the following Element chapter on energy use.

Current Costs

The costs of petroleum-based energy fluctuate based on regional, national, and international market influences. These costs also vary as a function of customer type (large bulk purchaser versus individual

PETROLEUM PRODUCTS *Continued*

small-volume consumer), and location in the County (Happy Camp versus Dunsmuir versus Tulelake). The following price ranges have recently been observed along the Interstate 5 corridor in the County:

	$/Gallon
Gasoline (unleaded)	1.10-1.20
Diesel (No. 2)	1.05-1.15
Fuel Oil (No. 1)	1.15-1.25

At current prices, about $45 million is spent on transportation fuel annually, and another $1.2 million on fuel oil for space heating.

Environmental Issues

Since petroleum products are not produced or refined in the County, the only notable environmental issue associated with them locally is air pollution from motor vehicle fuels and fuel oil-based space heating. The combustion of petroleum products emits carbon monoxide, nitrogen oxide, sulfur oxide, hydrocarbons, and other compounds, which, in high enough concentrations, can be hazardous to human health and natural ecosystems.

Petroleum use is not considered to be a major environmental threat in the County, but the Air Pollution Control District's (APCD) monitoring of ozone levels indicates that State ozone standards are nearly violated five or six days each year when temperatures are especially high. APCD staff attribute much of this problem to automobile emissions, noting that some improvement has been occurring as local gas stations are retrofitted with gasoline vapor recovery equipment. Despite its relatively small population and rural setting, it is apparent that the County needs to be watchful of the environmental effects of its petroleum use before applicable standards are actually violated.

PROPANE

Propane is a gaseous hydrocarbon found in natural gas and refinery gas streams. It is categorized in the Energy Element separately from petroleum products because of its distinct set of distributors and consumers.

Sources and Distribution

Propane is supplied in the County separately but similarly to petroleum products. Bulk supplies are shipped by rail and truck from refineries in California and Washington to local distributors, who, in turn, deliver propane by truck to local customers. Customers are served by four distributors in local communities and others located in adjacent counties.

A notable exception to typical propane distribution is the pipeline network serving downtown Yreka and adjacent residential neighborhoods. Built in the 1930's, this system reportedly serves several hundred commercial and residential customers via a buried distribution pipeline network that is supplied from a central storage facility currently operated by Suburban Propane of Yreka. It may be one of the few retail propane pipeline networks of its kind on the West Coast.

Current Consumption

As with petroleum products, propane consumption is difficult to quantify because of multiple sources, distributors, and end-uses. The 1990 federal census reported that about 8% of the County's homes use propane as their primary space heating source (including customers of the Yreka distribution network). Based on this data, it is estimated that approximately five million gallons of propane are consumed annually in the County. The end-uses of this fuel are addressed in the next section of the Energy Element.

PROPANE
Continued

Current Costs

Propane costs fluctuate in the same manner as petroleum products, and customer rates are also set in part by the quantity being purchased. Recent prices observed in the County have been in the $1.15-1.25 per gallon range for truck-delivered propane; and approximately $1.50 per gallon for customers of the Yreka pipeline system. On a Countywide basis, these prices equate to a total of approximately $6 million of consumption annually.

Environmental Issues

Propane is a relatively clean-burning fuel, but its combustion does release carbon dioxide, nitrogen oxide, methane, and hydrocarbons. When used for space heating and cooking, it is important that residences and appliances be properly ventilated to avoid health problems that can be caused by these emissions.

FIREWOOD

Biomass in the form of firewood is presently the second most-used renewable energy resource in the County after hydro. Its importance derives from a dependence on wood heating as the primary residential space heating method for an estimated 45% of the homes in the County (ref. 21). Almost all other homes are believed to use firewood as a secondary or back-up heating source. Many small businesses in rural areas also rely on some amount of wood heating.

Sources

Firewood is cut and collected throughout the County from federal, state, and private timberlands, which in combination account for roughly 85% of the County's total land area. Most of the firewood is pine, with lesser amounts of fir, hemlock, spruce, and juniper. The largest quantity of firewood is taken from the Klamath National Forest, which occupies about 36% of the County's total land area. Firewood is cut and collected primarily by end-users themselves, and to a lesser extent by small firewood businesses that deliver to consumers.

In addition to firewood, wood pellets are shipped into the County from pellet manufacturers in Oregon and Idaho, and retailed through outlets in local communities.

Wood supplies are discussed further in the Element's renewable resource section on biomass.

Current Consumption

As with other energy sources, estimation of firewood consumption is complicated by the multiple sources and end-uses involved, and a lack of uniform record keeping. In particular, the Klamath National Forest does not presently have data that accurately quantifies firewood removed from its lands every year. Based on PP&L customer data, approximately 45% of the County's 17,000 occupied

FIREWOOD
Continued

dwelling units use wood as their primary heating fuel, and it is assumed that at least 80% of the remaining households use wood as their secondary heating fuel (ref. 21). Additionally, based on local interviews, it is assumed that about 5% of the County's commercial establishments use some amount of back-up wood heating. In total, these estimates of firewood market share equate to roughly 50,000-60,000 cords per year. This estimate should be reexamined if and when more accurate data becomes available from the Klamath National Forest.

Wood pellet consumption is also difficult to estimate with certainty. Based on local interviews, there may be as many as 300-400 pellet stoves in the County. If these individually burn an average of three to four tons of pellets per year, a rough estimate of total Countywide consumption would be 900 to 1,600 tons annually.

Identifying trends in firewood supplies and consumption is difficult because of the lack of reliable, historic data and any systematic supply forecasting by responsible agencies. Local interviews give an impression of relatively stable supplies and demands in recent years, with some concern expressed over the continuing availability of firewood in view of increasing environmental constraints and reduced logging on forest lands.

Current Costs

Firewood costs vary depending on whether wood is cut personally or is purchased from commercial woodcutters. Cords of pine delivered in local communities are presently in the $60-70 range. Personal woodcutting expenses include equipment, transportation, and a nominal permit fee. Depending on an individual's investment in equipment and transportation, the cost of a cord can conceivably range from as low as $20 to as high as $70.

FIREWOOD
Continued

Wood pellets are presently available at local outlets in 40 pound bags at $3 to $6 for pine and fir, respectively, and also in bulk by the ton.

Based on these costs, Countywide firewood consumption is estimated to be worth about $2.9 million annually.

Environmental Issues

Firewood cutting and wood combustion can impact forest ecosystems and air quality, respectively. Firewood cutting can reduce biomass nutrients needed by forest ecosystems, and indirectly degrade soils, wildlife habitat, and other forest resources. Alternatively, if properly managed, firewood cutting can have beneficial effects, such as when oak removal improves conifer growth. Significant forest impacts have not occurred in the County because of its large and widely dispersed wood resource base and limited population (ref. 15). Wood combustion in stoves and other appliances releases particulate matter, carbon monoxide, hydrocarbons, and other pollutants. State air quality standards for particulate matter are occasionally being exceeded by wood smoke in Yreka, and perhaps in other low-lying communities. Thus, as with petroleum, there are indications that the County's use of biomass is beginning to threaten applicable environmental standards, at least in some population centers if not in the forests. These issues are discussed further in the Element's renewable resources section on biomass.

SOLAR & GEOTHERMAL

In addition to hydro and biomass, two other local renewables that are making energy supply contributions are solar and geothermal.

Based on interviews with local designers and equipment vendors, solar energy is believed to be operating as many as 100 small photovoltaic (PV) systems and 300 direct thermal installations, in both cases primarily on residences. The PV systems are producing an estimated 37 MWh of electricity annually (for on-site consumption only), and the direct thermal systems are producing an estimated 1,500 MMBtu every year (primarily for domestic hot water heating). Several dozen homes throughout the County are also reported to have been designed expressly for passive solar use.

Geothermal energy is presently being supplied only in the low temperature regime, where groundwater is used in water source heat pumps to produce thermal energy at temperatures suitable for space and domestic hot water heating. According to vendor interviews, there are believed to be as many as 20 such systems in the County, most of them residential, with an estimated total of 250 MMBtu/yr being produced. It should be noted that in most cases these installations are not water consumptive: either heat pumps have been added to previously established groundwater uses, or the groundwater is being injected back into the producing aquifer after passing through the heat pump (the latter method is used in a geothermal heat pump system that serves the County Courthouse and new Jail).

Both solar and geothermal are addressed further in the renewable resources chapter of the Energy Element.

NATURAL GAS

Natural gas is an energy source not available in the County, nor is there likelihood of natural gas service in the future because of the area's small, low-density population (excepting for the Yreka propane system that delivers propane approximating natural gas standards).

However, the West Coast's major Canada-to-California natural gas transmission pipeline passes east of the County near Tulelake and through the southeastern corner of the County near Pondosa. This pipeline, which is owned and operated by Pacific Gas Transmission, is presently being expanded to carry additional natural gas supplies to mid and southern California consumers.

The presence of the interstate pipeline near Tulelake is noteworthy because of the implied potential for future large-scale (non-retail) natural gas utilization in that area. Although retail customer service would be infeasible in an area as small as Tulelake, it is conceivable that natural gas could be diverted from the interstate pipeline for fueling a power plant or industrial application such as agricultural crop processing (or a combination of the two using a cogeneration plant that produces both electricity and steam heat).

In 1990, an independent southern California power generation company informally proposed an 80 MW power plant near Tulelake that would have been co-fired by pipeline natural gas and rail-supplied coal (the exact location near Tulelake or Newell in Modoc County was never finalized). Although not successful in obtaining a power sales agreement, this proposal or variations of it may reoccur in the future because of the convergence of the natural gas pipeline with two major rail lines in the vicinity of northeastern Siskiyou County.

NATURAL GAS
Continued

The County should consider addressing this possibility with policies for power plants that set out general guidelines on desired facility siting and performance. The existence of such policies will help power developers understand the County's expectations of energy facilities, and encourage proposals that are compliant with local standards and therefore less controversial.

This is also another case where coordination with Modoc County will be important, since Newell and Tulelake essentially share the same basis for such power development.

ENERGY SUPPLY COMPARISON

In concluding this chapter of the Element, a comparison is given in Table 1 of the energy supplies currently available and used in the County according to their energy values, typical conversion efficiencies, and current costs.

Including conversion efficiency in the cost of fuel is important in order to calculate the true cost of available beneficial energy. Where appropriate, a range of conversion efficiencies is shown for some fuels to illustrate the sensitivity of costs to efficiency, and the importance of selecting and maintaining equipment at maximum efficiency.

This comparison is also understandably sensitive to fuel cost changes, and must be revised as costs change over time. Fuel and power suppliers should be contacted directly to obtain exact unit costs for a specific customer's type of consumption.

Table 1

Energy Supply Comparison

Energy Source	Unit	Approx. Cost ($/Unit)	Energy Content Per Unit (Btu)	Cost Without Efficiency ($/MMBtu)	Assumed Conversion Efficiency (%)	Cost With Efficiency ($/MMBtu)
Electricity (PP&L)	kWh	0.07	3,412	20.52	100	20.52
Gasoline	gal	1.15	125,000	9.20	40	23.00
Diesel	gal	1.10	130,000	8.46	40	21.15
Fuel oil (No. 1)	gal	1.20	139,000	8.63	60	14.39
Fuel oil (No. 1)	gal	1.20	139,000	8.63	80	10.79
Propane	gal	1.20	90,000	13.33	60	22.22
Propane	gal	1.20	90,000	13.33	80	16.67
Wood (pine)	cord	50.00	20,000,000	2.50	40	6.25
Wood (pine)	cord	50.00	20,000,000	2.50	70	3.57
Wood (oak)	cord	50.00	28,000,000	1.79	40	4.48
Wood (oak)	cord	50.00	28,000,000	1.79	70	2.57
Pellets (pine)	ton	150.00	16,000,000	9.38	60	15.63
Pellets (pine)	ton	150.00	16,000,000	9.38	70	13.39
Geothermal (heat pump)[1]	Btu	- - -	1	10.25	100	10.25
Solar (active thermal)[1]	Btu	- - -	1	15.99	80	20.00

[1] Estimates for typical local systems.

Source: Fuel suppliers and Criterion

AFFECTED COUNTY RESPONSIBILITIES

It is also appropriate to conclude this chapter of the Element with a review of the inventoried energy sources according to the County government responsibilities which they affect. The matrix shown in Table 2 is the first step in identifying significant local energy issues that may warrant attention through County policies or standards.

Table 2

County Responsibilities Affected by Energy Sources

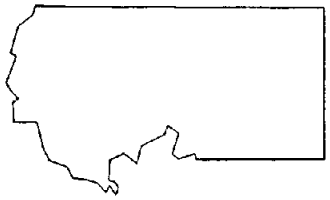
	County Responsibilities				
Energy Source	**Land-Use**	**CEQA & CCAA[1]**	**Bldg. Code**	**County Facilities/ Vehicles**	**County Power Generation[2]**
Electricity	Potential power plant and transmission line siting; and opportunities to coordinate land development with least cost electric grid.	Potential power plant and transmission line impacts.	Title 24 and equipment code enforcement.	Savings potentials in County-owned buildings.	Potential for additional County-owned generation projects.
Petroleum products	Land-use decisions affect transportation demands.	Air quality implications of petroleum dependence.	Heating equipment code enforcement.	Savings potentials in County vehicles and buildings.	N/A
Propane	N/A	N/A	Heating equipment code enforcement.	Savings potentials in County buildings.	N/A
Biomass (firewood)	Forest Service dominated policy area.	Air quality and wildlife habitat implications of widespread use.	Heating equipment code enforcement.	N/A	N/A
Solar	Zoning site design standards affect resource accessibility and utilization.	Potential PV land-use and environmental impacts.	Title 24 and equipment code enforcement.	Utilization potentials in County buildings.	Potential for County-owned PV generation.
Geothermal	Zoning standards affect resource accessibility, utilization, and compatibility with surrounding uses.	Potential for comprehensive impacts depending upon resource type.	Heating equipment code enforcement.	Utilization potentials in County buildings.	Potential for County-owned generation.

[1] California Environmental Quality Act & California Clean Air Act.
[2] Optional authority

Source: Criterion

ENERGY USE

- Transportation
- Residential
- Commercial
- Industrial
- Agricultural
- Community Services

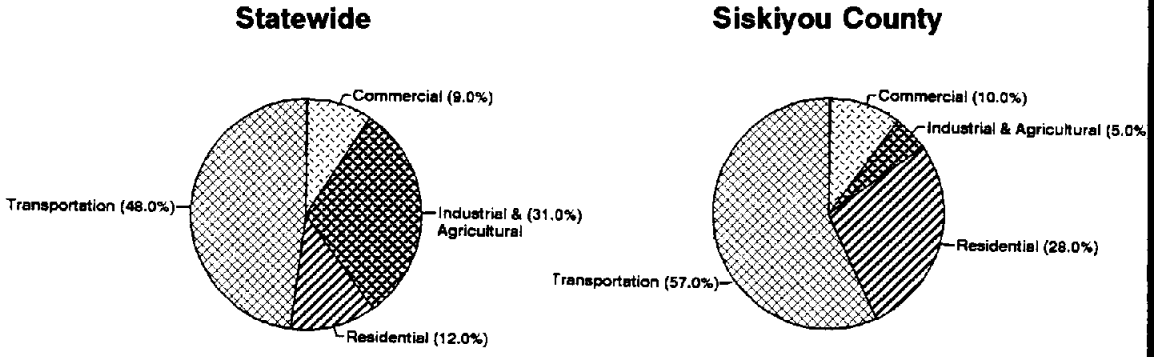


OVERVIEW

Having identified the sources of the County's energy supplies, this chapter of the Element describes the ***uses*** of those supplies. Current energy use is shown by end-use sector in Figure 9 on a statewide and Countywide basis (ref. 7, 20, 21).

Figure 9

Energy Uses (1990)



Present and future energy needs are influenced by the ways in which communities use their energy, and it is the use or demand-side over which local governments have the greatest influence (versus the supply-side which is dominated by state and federal oversight). Generally, energy use is influenced by:

- Population and economic conditions, including growth, employment, construction, and purchases of goods and services. A growing population and healthy economy needs more energy than an economically-lagging or depopulating area.
- Petroleum prices which significantly affect the pocketbooks of residents, businesses, and agencies because of the transportation sector's large needs and complete dependency on gasoline and diesel to meet them. Higher prices discourage petroleum use.
- Climatic conditions, particularly mild versus severe winter months, which can create significant demand changes for

OVERVIEW
Continued

electricity, fuel oil, propane, and firewood. An especially cold winter will significantly affect people's pocketbooks.

- The physical arrangement of land-use patterns and transportation systems, which significantly affect living and business costs, air quality, and the feasibility of alternative transportation modes.

Not surprisingly, the biggest portion, or approximately 57%, of Siskiyou's usage occurs in the transportation sector due to local reliance on autos and trucks, and the relatively long distances that must be traveled in a rural setting. Residences also account for a significant 28% of the total usage due to the area's cold winter climate, and many older inefficient buildings and their resulting high space heating demands.

Two important considerations for the County in terms of energy use are how it can use its land-use planning and transportation powers to shape an efficient physical framework, and how to then use energy within that framework in the most environmentally and economically sustainable manner. The economic effects of energy use are particularly important since the County has a choice on spending its energy dollars importing out-of-County supplies versus local job creation via efficiency improvements and renewable development. The following information on current energy use creates a baseline for identifying local economic development opportunities through efficiency improvements and renewable utilization.

TRANSPORTATION

Siskiyou County's single biggest energy use is transportation. Most of that energy is consumed by autos and trucks travelling over a 2,300 mile network of local roads and state highways. The other energy-consuming components of Siskiyou's transportation sector include local and interstate bus service; rail passenger and freight service; and private aviation and recreational boating.

Auto & Truck Fuel

Vehicle fuel needs are influenced by four factors: the number of autos and trucks used by local citizens; the amount of driving or mileage put on the vehicles; the fuel efficiency of the vehicles; and the availability of alternatives to single-occupancy vehicles. In the first instance, Siskiyou residents are driving an increasing number of vehicles: the number of registered autos and trucks per capita increased about 11% from 0.87 vehicles/person in 1980 to 0.97 in 1990. Total Countywide registrations are now 25,000 autos and 18,000 trucks (ref. 24). This is consistent with state and national trends during the 1980's when the relatively low costs of owning and operating a vehicle contributed to more auto usage generally.

On average, Siskiyou drivers are estimated to put about 13,000 miles on their vehicles every year (versus the statewide average of 11,000 miles per year). When summed in Countywide vehicle miles traveled (VMT), including non-resident through traffic, 1990 total VMT was 760 million versus a 1980 total of 501 million (ref. 23-25). On a per capita basis, this represents a significant 30% increase in miles traveled, but again this is consistent with state and national trends that have seen more driving in recent years because of relatively low gasoline costs. In Siskiyou's case, the increase is heightened because of the through-traffic effect of Interstate 5 and Highway 97 mentioned earlier.

The third factor controlling vehicle energy use is the fuel efficiency of models being manufactured or purchased by local residents.

TRANSPORTATION
Continued

Although the federal government is the principal decision-maker on fuel efficiency standards, California is one of the most aggressive states in efforts to improve these standards. The statewide average for all vehicles is presently about 18 miles per gallon (mpg), but it is assumed that Siskiyou's average is in the 16 mpg range due to a disproportionately large number of light and medium-duty trucks among locally-registered vehicles.

The fourth factor influencing vehicle fuel needs is the availability of alternatives to single-occupancy vehicles (SOV). Presently, SOVs account for a large majority of vehicle trips and VMT in the County.

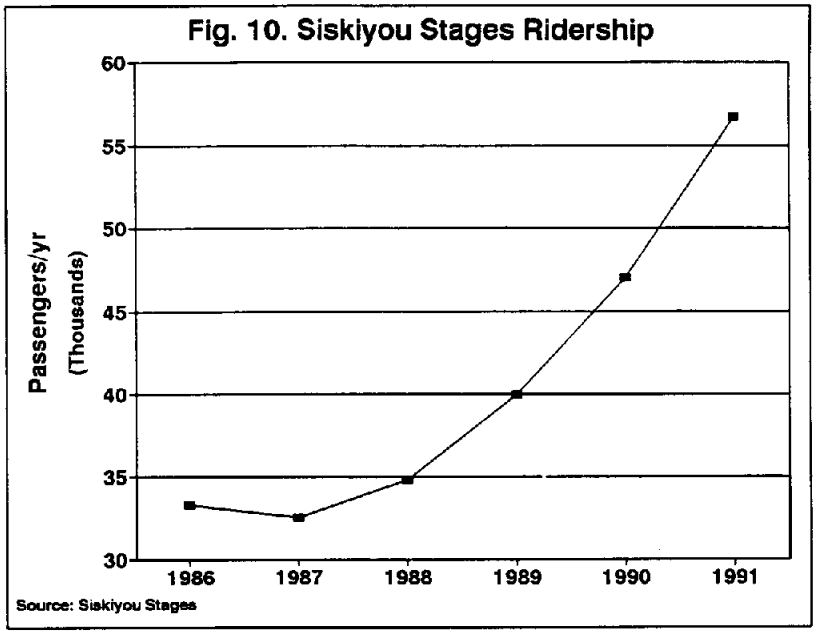
Public Transit Fuel

The County's local transit needs are met by one publically-operated bus system, Siskiyou Stages (interstate passenger service is also provided by Greyhound and Amtrak). Siskiyou Stages operates 11 buses that carried 56,000 passengers in 1991. Figure 10 illustrates significant ridership increases in recent years, which the Siskiyou Stages staff attributes to service expansions. The system now serves a dozen communities in Scott and Shasta Valleys, and along the Klamath River and Interstate 5 corridor (route maps are currently out of print). Total fuel consumption for the buses is estimated at 30,000 gallons annually, which is less than one-third of the fuel that would be required if bus riders had used their own vehicles for their trips.

Future transit fuel needs will be determined by levels of service that can be maintained, which are in turn dependent upon ridership. Although no formal long-term projections are made by Siskiyou

TRANSPORTATION
Continued

Stages, the staff believes that continued growth in ridership is possible if the community recognizes and supports the goals of public transit. From an energy planning perspective, future transit fuel needs are relatively insignificant in comparison to the savings in auto and truck fuel created by bus riders.



The remaining public transit fuel components, Greyhound and Amtrak, cannot be readily quantified because of those organizations' fueling procedures not being documented on a county level. Based on the limited schedules of both Greyhound and Amtrak, it is believed that their diesel consumption is a few million gallons annually, most of it used by Amtrak at above average consumption rates because of Siskiyou County's mountainous terrain. As with the local bus system, the importance of Greyhound and Amtrak is not their fuel requirements, but rather the savings in auto trips and gasoline consumption enabled by having such mode diversity available. These are valuable components of a balanced transportation system, and the County should seek to maintain and expand them whenever possible.

TRANSPORTATION
Continued

Aviation Fuel

There are an estimated 75 small, private airplanes registered in the County (there is no scheduled commercial service). Assuming 100 hours of operation annually per aircraft, and an average fuel efficien cy of 20 gallons per hour of flight time, total aviation fuel use is about 150,000 gallons per year. This level of consumption is expected to grow modestly at a slightly lower rate than population growth.

Marine Fuel

There are approximately 3,200 boats registered in the County, most of which are motorized. Assuming 40 hours of operation annually per boat, and an average fuel efficiency of 5 gallons per hour of operation, total marine fuel consumption is about 640,000 gallons per year. County boat registrations have increased roughly in parallel with population increases, and a similar growth rate in marine fuel demands should be expected.

Present & Future Transportation Fuel Needs

Based on the foregoing, current Countywide total transportation fuel consumption of all types is estimated at approximately 40 million gallons annually (excluding interstate bus and train consumption). At current prices, the County's consumption equates to about $45 million each year. Transportation fuel use and costs will vary from year to year based on economic conditions (employment-related travel), the affordability of fuels (higher prices discouraging travel), and the amount of ridership carried by alternatives like ride-sharing and Siskiyou Stages.

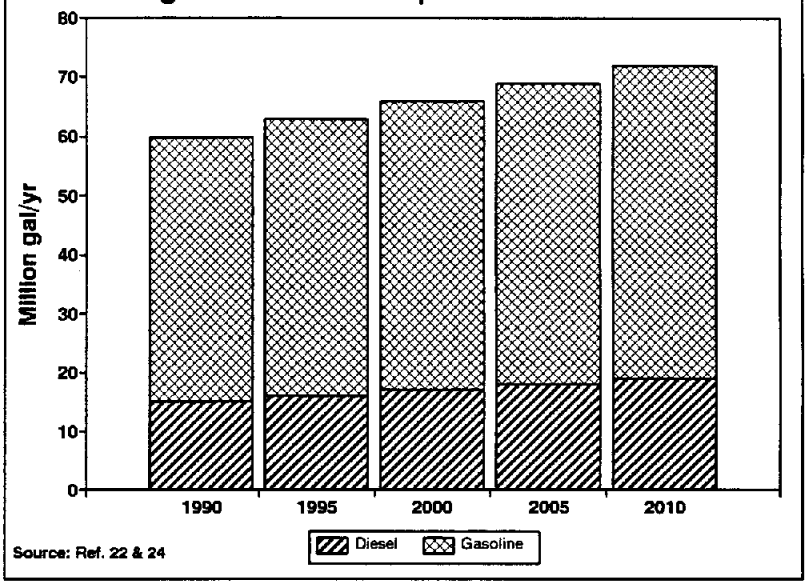
Figure 11 describes the County's projected gasoline and diesel needs to 2010 based on population forecasts and per capita fuel use. This

TRANSPORTATION
Continued

projection is understandably sensitive to the rate of population growth, per capita VMT, and average vehicle fuel efficiencies. In the latter two cases, land-use and vehicle efficiency improvements should be able to reduce per capita consumption over the long-term through fewer auto trips, less annual VMT, and use of higher efficiency vehicles. The County's land-use planning, in particular, can encourage fewer auto trips and less VMT by seeking more compact development patterns and favorable access to alternative modes such as transit, bicycling, and walking.

By the second half of the Energy Element's planning horizon, the County may also begin to see meaningful market penetration of alternative fuel, e.g. methanol, and electric-powered vehicles.

Fig. 11. Future Transportation Fuel Needs



RESIDENTIAL

Siskiyou County's second largest energy end-use sector after transportation is residential. Usage in this sector is driven by the number, types, and occupancy levels of residences in the County; the age and condition of the housing stock; energy-consuming household lifestyles; and climatic conditions. A family's annual electric and heating bill will depend on how much television is watched, how well door and window leaks are plugged, and whether innovations such as solar water heating are used. The largest energy end-uses within Siskiyou homes are space heating and domestic hot water heating, which together usually account for over 60% of a typical residence's annual energy requirements.

The following Countywide housing profile has been assembled from federal census data (ref. 12, 16):

	1980	1990	% Change
Total housing units	17,504	21,267	+21
Single-family units	11,660	14,421	+24
Multi-family units	2,574	3,050	+18
Mobile home units	2,662	3,794	+43
Vacancy rate (%)	11	15	+36
Persons per household	2.6	2.5	-4
Average unit age (yrs)	27	25	-7
% owner occupied	73	67	-8

This data describes a residential sector composed of predominantly older, single-family, owner-occupied units. Nearly one-quarter of all units were built before 1940, and the most recent housing condition survey found 19% of the units needed rehabilitation and 11% needed replacement (ref. 16). These conditions create additional energy demands and extra costs for households living in poorly insulated or non-weatherized dwellings. For example, the annual energy bill for a new Siskiyou County home built to current energy efficiency standards

RESIDENTIAL
Continued

is approximately $1,000, whereas a 50-year old house without any weatherization can cost up to $2,300 to heat and light ever year. Various weatherization programs administered by utilities and public agencies over the past 15 years have reportedly reached only a few hundred of those units in need of retrofitting.

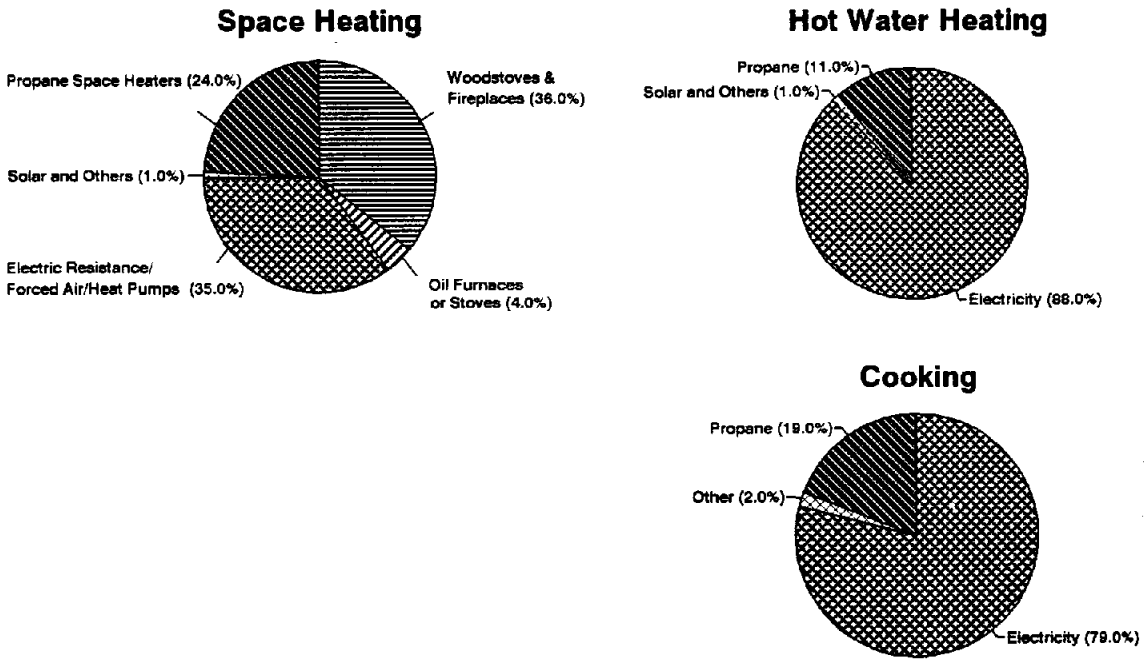
Another housing characteristic with energy implications is the growing number of manufactured homes in the County. Because these units have remained affordable, and their quality and public acceptance have also increased, they now represent approximately 17% of all dwellings in the County, and in 1991 they accounted for nearly half of all new residential building permits (ref. 26). Although mobile home purchasers are reportedly opting for energy efficient features, a majority of the existing manufactured units in the County is believed to be older units falling below current energy efficiency standards. Part of this is due to federal regulation of mobile home energy standards at levels below California's standards for site-built housing. However, efforts are underway to improve manufactured unit efficiency, and Siskiyou residents should monitor utility and agency incentive programs that promote efficient model purchases.

Figure 12 describes the Countywide breakdown of fuels by residential end-use based on federal census and PP&L information (ref. 16, 21). These data describe a residential sector that is understandably electric-dependent because of the low-density, dispersed character of housing Countywide, and the absence of natural gas competition in the space heating market. Also, the significant dependence on wood heat is not surprising given the County's environmental setting.

RESIDENTIAL
Continued

Figure 12

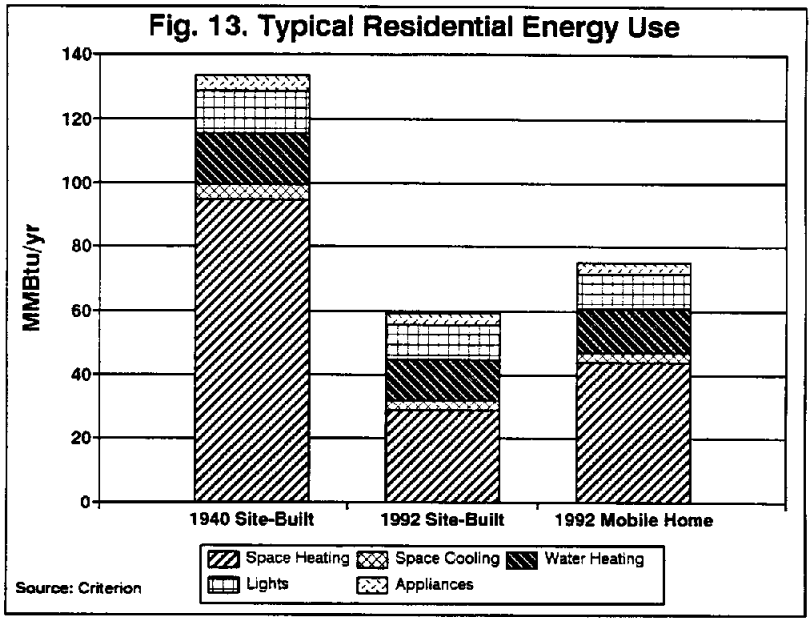
Residential End-Uses by Fuel Type (1990)



Using available data and computer modeling, energy consumption estimates have been prepared in Figure 13 for three 1,200 sq.ft. prototypical County residences: a site-built house constructed circa 1940 without any energy conservation features; a site-built house constructed in 1992 according to California Title 24 energy standards; and a manufactured home purchased in 1992 that exceeds minimum federal energy standards by 10%. The basis for the Figure 13 estimates is given in Appendix B. It should be remembered that these are generalized estimates, and energy consumption in specific residences will vary based on dwelling type and size, age and physical condition, type of energy equipment, and occupancy characteristics. However, it is clearly apparent from Figure 13 that

RESIDENTIAL
Continued

energy efficiency measures can substantially reduce Siskiyou homeowners' energy needs and costs: from left to right, the annual energy costs for these dwellings are $2,364, $1,055, and $1,199.



Several sources of technical information and financial assistance are available to homeowners interested in making energy efficiency improvements; a list of assistance programs is given in Appendix C.

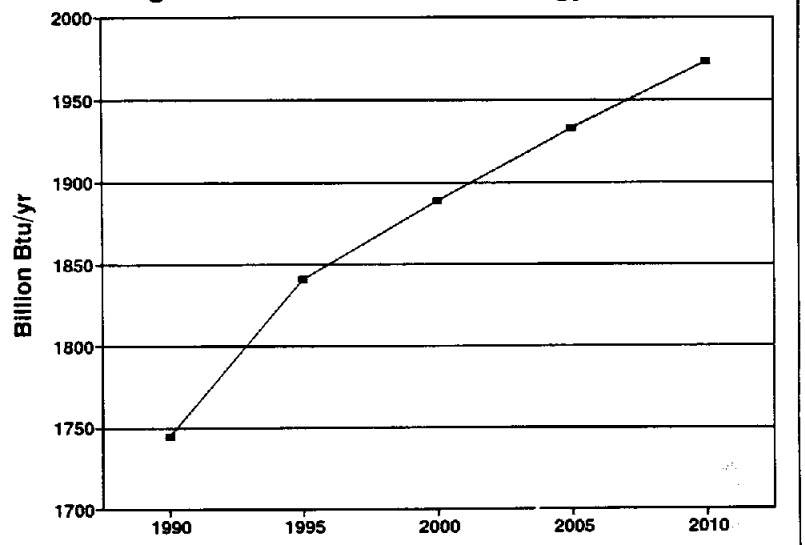
Present & Future Residential Needs

Combining the foregoing estimates for all dwelling units, Countywide residential energy demands presently total about 1,745 billion Btu/yr. Using a projection of 1990 per capita residential use, Figure 14 describes this sector's energy needs to 2010. This projection is again understandably sensitive to the rate of population growth and per capita usage levels. In the latter case, efficiency improvements should be able to reduce per capita consumption over the long-term through

RESIDENTIAL
Continued

more emphasis on energy-efficient construction practices and appliance purchases. The next chapter of the Element discusses efficiency improvement opportunities in more detail.

Fig. 14. Future Residential Energy Needs



Source: Criterion

COMMERCIAL

Commercial sector energy use is driven by the number of businesses in the County; the type, age and condition of existing buildings and equipment; prevalent design and construction practices for new commercial structures; and local economic conditions affecting such variables as employment levels and hours of operation.

Based on federal census data, there are an estimated 375 retail establishments and 300 service businesses in the County (ref. 27, 28, 30). After allowing for census under-reporting and multiple buildings for some businesses, it is estimated that there are roughly 1,000 commercial buildings in the County. Although no public database exists to describe them with certainty, the County's commercial buildings are believed to be predominantly older structures built before energy conservation standards were in effect. Most of these are single-story wood or masonry structures of less than 20,000 square feet. No detailed Countywide data exists to describe fuel market shares either, but according to local interviews, commercial space heating is primarily accomplished with fuel oil or propane-fired systems, sometimes with wood heat as a back-up in smaller businesses. There is also a notable amount of electric-driven space cooling in the commercial sector.

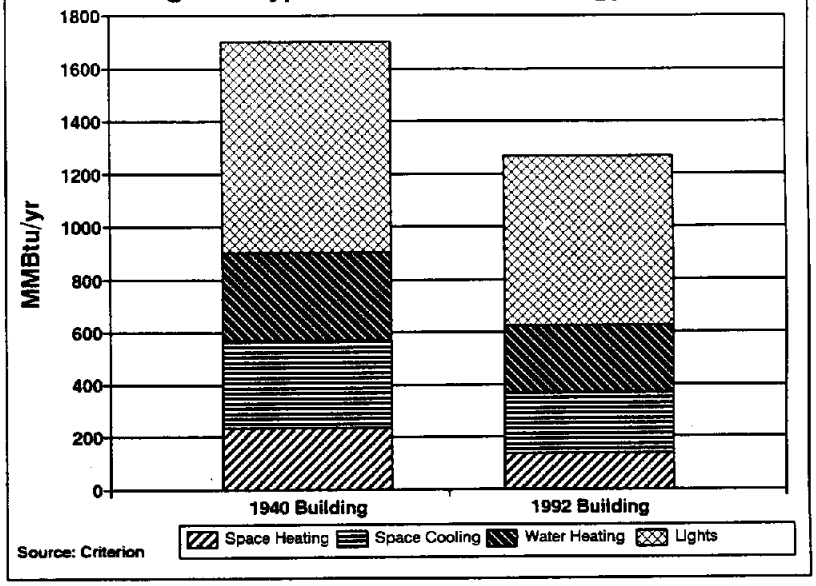
Despite the absence of detailed statistics, it is reasonable to conclude from observations and interviews that much of the County's commercial building stock would benefit from weatherization and other efficiency measures that could cost-effectively reduce energy costs and improve business competitiveness.

Using the foregoing estimates and computer modeling, Figure 15 presents end-use estimates for two 15,000 sq.ft. prototypical retail buildings in the County: one built circa 1940 without any energy efficiency features; and a second constructed in 1992 according to California Title 24 energy standards for nonresidential buildings (these estimates are detailed in Appendix B). As with residences, actual

COMMERCIAL
Continued

usage will vary depending on type of building use, its age and physical condition, type of energy equipment (heating, cooling, lighting, controls), and occupancy patterns. Figure 15 reinforces what was shown in the residential sector: energy efficiency measures can make a substantial difference in lowering energy demands and costs, which is particularly relevant for Siskiyou's retail and service businesses. As with homeowners, business establishments can also obtain technical and financial assistance for energy efficiency improvements from the sources listed in Appendix C.

Fig. 15. Typical Commercial Energy Use

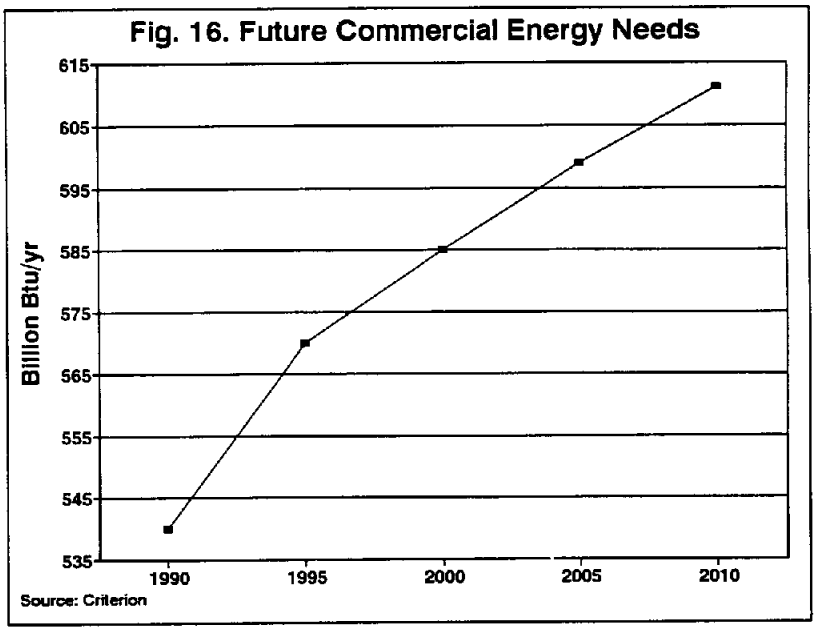


Present & Future Commercial Needs

Using the foregoing building-specific demand estimates, and an assumed total of 10 million square feet of commercial buildings in the County, the present commercial sector needs total about 540 billion Btu/yr. Using a projection of 1990 per capita commercial energy use, Figure 16 describes the potential growth of this sector's needs to

COMMERCIAL
Continued

2010. Again, this forecast is understandably sensitive to the local economy's health and general population growth, as well as the potential effects of energy efficiency improvements discussed above.



INDUSTRIAL

According to the Siskiyou County Economic Development Council, the local industrial sector is presently composed of the following eight major firms (ref. 11):

Company	Product	Employees
P & M Consumer Products	Cedar wood products	150
Roseburg Forest Products	Lumber	130
Nor-Cal Manufacturing	Hi-tech vacuum parts	106
High Ridge Lumber	Lumber	73
Timber Products	Veneer	54
Timberline Technologies	Switches	30
JDM Designs	Printing	30
J. H. Baxter	Treated lumber	25

Another estimated one-dozen smaller firms are engaged in miscellaneous light industrial activities. Energy used in this sector includes process steam, electricity for lights and equipment, and space and water heating. Much of the process steam in the largest sector, wood manufacturing, is generated by on-site combustion of waste wood. Exact amounts of energy consumption are considered proprietary by the firms for business reasons, and therefore usage quantities are unavailable beyond the total 60,000 MWh of annual industrial electricity sales presently reported by PP&L on a Countywide basis. Based on typical energy consumption patterns for these types of industries and California Energy Commission (CEC) data, a conservative estimate of total industrial consumption would be the equivalent of 75,000 MWh annually or 256 billion Btu/yr (ref. 20, 21).

As with other end-use sectors, industrial energy consumption will vary according to economic conditions. Since wood manufacturing dominates the local industrial sector, and it is this industry which is in

INDUSTRIAL
Continued

the greatest flux because of uncertain timber supplies, any projection of future industrial energy needs is difficult to substantiate at this time. For purposes of the Energy Element, it is assumed that industrial sector needs will remain constant during the planning horizon. This scenario assumes no industrial energy demand growth relative to population growth, but rather a potential shifting of current wood manufacturing energy consumption to new industries recruited through local economic diversification efforts. It should be noted that such new industries may also represent favorable opportunities for demonstrating energy efficiency and/or renewable resource utilization.

Industrial energy planning assumptions should be re-examined after the Klamath National Forest's Land and Resource Management Plan is finalized, since that will directly influence local wood manufacturing levels.

AGRICULTURE

Based on federal census data, there are approximately 765 farms and ranches in the County averaging about 875 acres in size (ref. 29). Energy is used on these farms and ranches to heat homes, fuel tractors, and power irrigation pumps and other electrical equipment. Energy used in vehicles and dwellings has been included in the foregoing transportation and residential sector estimates. The remaining major agricultural energy demands are tractor and agricultural equipment fuel, and irrigation electricity.

Of these, irrigation pumping is the most significant. Over 148,000 acres of land are irrigated in the County, much of it by pumping deep groundwater wells. The average size of an irrigation pump in the County is reportedly in the 75 hp range, which can consume as much as 100,000 kWh in a typical year. PP&L's annual customer usage is for irrigation pumping Countywide is roughly 28 million kWh or 85 billion Btu/yr. Irrigation energy costs have risen in recent years, making irrigation system efficiency even more important. Local farmers and ranchers can obtain technical and financial assistance for such efforts from the sources given in Appendix C.

In terms of equipment fuel, federal census data indicates there are approximately 2,200 tractors and agricultural implements in the County fueled by gasoline and diesel (ref. 29). Assuming 90% of these travel 1,000 miles annually at an average fuel efficiency of 10 mpg, agricultural equipment fuel consumption is estimated to be roughly 200,000 gallons or 25 billion Btu/yr.

Combining equipment fuel and irrigation electricity results in a Countywide agricultural sector demand of approximately 110 billion Btu/yr. In terms of future needs, the federal census reveals that the amount of mechanized equipment and irrigated acreage in the County is declining slightly (due to rising costs, financial failures during the 1980's, etc.), suggesting that a forecast which holds agricultural energy demands at their current levels provides a reasonable off-setting allowance for any modest increase in future agricultural activities.

COMMUNITY SERVICES

In addition to their personal and business needs, Siskiyou citizens use of energy for the following community services:

- Public vehicles.
- Public buildings.
- Streetlights and traffic lights.
- Water supply and wastewater treatment systems.

These energy uses are important because of the example they set for all local energy consumption, and because of their tax-supported nature and the consequent need to use local government budgets as effectively as possible.

Public Vehicles

Gasoline and diesel for police cars, school buses, and road repair equipment are major energy expenses for local agencies. There are an estimated 500 regularly-operated vehicles owned by local agencies and schools Countywide, consuming an estimated 500,000 gallons or 63 billion Btu of gasoline and diesel per year. This consumption has been included in the previous transportation sector estimate, as has the annual cost of roughly $500,000 (bulk purchases enable prices of $1 or less per gallon).

Public Buildings

Public building energy consumption is similar to the commercial sector in terms of end-uses and quantities consumed per unit of floor area. There are an estimated 100 public buildings in the County, including schools and general purpose local government facilities, consuming about 63 billion Btu/yr. As with the commercial sector, public building space and domestic hot water heating is reportedly accomplished most often with fuel oil.

COMMUNITY SERVICES *Continued*

In terms of County-owned facilities, Table 3 summarizes energy consumption and costs presently occurring at major County-owned buildings. Table 3 data are taken from a 1992 assessment of the facilities conducted as part of the Energy Element project, and provided in Appendix D. This examination, which followed a more extensive 1990 CEC-sponsored study, found that most County buildings are performing relatively efficiently, except for the Courthouse, its Annex, and the Public and Mental Health building (ref. 47). Both 1990 and 1992 surveys contain recommendations for cost-effective energy efficiency improvements in almost all County buildings, and the sources of assistance given in Appendix C are again applicable.

Further, Table 3 reveals that the County is spending nearly $250,000 annually on energy for its buildings. When combined with the buildings of nine municipalities and 29 school districts, the annual energy cost of all public buildings in the County is estimated to approach $600,000.

Community Infrastructure

Energy-consuming public infrastructure in the County includes:

- Water supply and distribution pumps.
- Wastewater collection pumps and treatment systems.
- Street lights and traffic lights.

Countywide infrastructure consumption data is only available for street lights, which use approximately 1,400 MWh annually according to PP&L (ref. 21). Water supply and wastewater pumping is roughly estimated to consume another 10,000 MWh. In terms of total energy, these end-uses may not be especially large because of limited urbanization in the County, but they nonetheless warrant

Table 3

County-Owned Facilities Energy Use Summary
(1991)

Facility	Year(s) Constructed/ Renovated	Sq.Ft.	Approx. Energy Cost/Yr ($)	Approx. Energy Use Index (Btu/sq.ft./yr.)
Courthouse/Annex/New Jail	1890's/53/86	64,000	167,000	189,000
Sheriffs Department/Old Jail	1906/62	10,675	13,300	52,000
Library	1969	9,700	13,400	64,000
Agriculture Building	1975	4,858	13,400	61,000
Public Works Building	1963/78	7,114	9,200	60,900
Public and Mental Health	1930's/40's	12,136	12,300	120,100
Probation Department/Juvenile Detention	1965/68/75/82/86	7,617	N/A	N/A
Museum	1948	8,571	3,400	30,000
		124,671	232,000	

Source: Criterion (Appendix C) and ref. 47. The Courthouse/Annex/New Jail are consolidated due to a common central heating plant. Because of its recent construction, the new Jail would have a substantially lower EUI if separated from the Courthouse and Annex. An EUI of less than 80,000 Btu/sq.ft./yr. generally implies an energy efficient building.

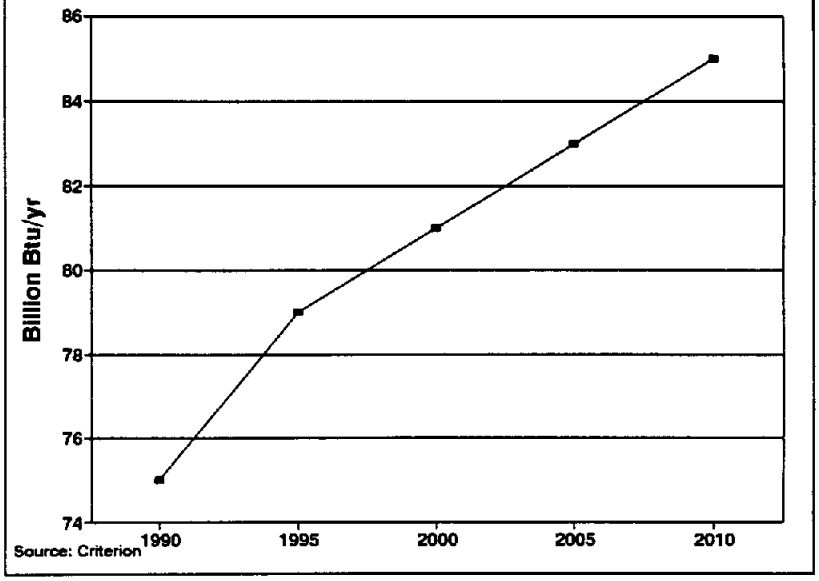
COMMUNITY SERVICES *Continued*

consideration because of their public costs in a time of serious local government budget constraints. Energy-consuming infrastructure is also eligible under certain technical and financial assistance programs listed in Appendix C.

Present & Future Community Service Energy Needs

After allowing for the inclusion of public vehicle fuel in the transportation sector, the remaining community service energy needs presently total about 75 billion Btu/yr. Using a projection of 1990 per capita community service energy use, Figure 17 describes the potential growth of this sector's needs to 2010. This forecast is not only sensitive to population growth, but also the urban versus rural location of that growth. Although more urban than rural growth would increase urban service energy demands, these should be more than offset by transportation energy savings from a denser population base. The forecast is also sensitive to changes in the efficiency of energy use that may occur as a result of technological advances, e.g. high-efficiency municipal water pumps.

Fig. 17. Future Community Services Energy Needs



ENERGY EXPENDITURES IN THE LOCAL ECONOMY

Having examined energy demands Countywide, it is useful to put expenditures for these demands into the context of the local economy. Based on federal census data, the local economy generated the following gross product sales values in 1990 (ref. 27-30):

	Million $
Agricultural crops and livestock	152
Timber	78
Retail outlets	205
Service businesses	647
	482

Thus, the County's total annual energy expenditure of approximately $80 million in 1990 equated to about 16% of annual local economic output. Given relatively low timber receipts in 1990, energy expenditures could range down to 12% of annual local economic output in a timber year. In either case, these are relatively high percentages for energy, which is due to Siskiyou's heavy reliance on single-occupant auto travel over relatively long distances; a cold winter climate that imposes a heavy space heating burden on buildings; and the large percentage of older buildings in the County, few of which have been weatherized or retrofitted with energy efficiency measures.

Another economic aspect of the County's energy demands are the local jobs created by such usage. The number of "energy jobs" in the County are estimated at approximately 250, including positions in gasoline sales; electricity generation and distribution; heating, cooling, and lighting equipment sales and service; and wood cutting. However, these energy jobs constitute less than 3% of total average employment in the County (ref. 2).

Thus, while a significant amount of money is being spent on energy every year, a relatively small amount of local employment is being sustained by those expenditures. This disparity can be addressed over time by increasing energy efficiency and renewable resource

ENERGY EXPENDITURES IN THE LOCAL ECONOMY *Continued*

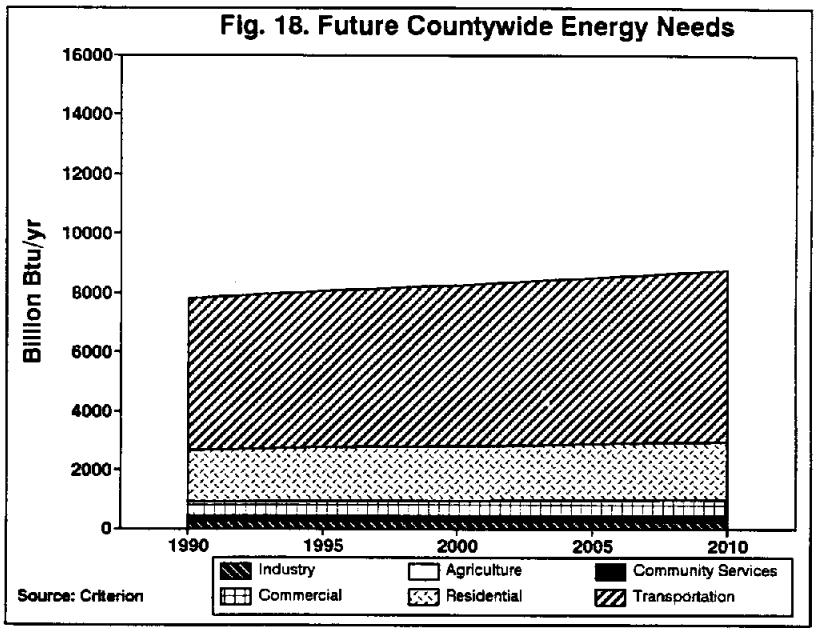
efforts that employ more local residents while simultaneously reducing expenditures for imported energy supplies.

In fact, research has demonstrated that local investments in energy efficiency will create substantially more economic benefit than continued purchases of conventional energy supplies. This is due to supply expenditures quickly flowing out of the area's economy with minimal local spin-off or multiplier effects, versus energy efficiency expenditures that tend to circulate longer in the local economy rather than flow out of it because of the greater labor intensity and reliance on local goods and services associated with efficiency investments. Research has shown that every dollar spent on energy efficiency can generate as much as a dollar more in spin-off economic benefits compared to a dollar spent on conventional fuel supplies (ref. 52). An example for Siskiyou County would be $100 spent on imported out-of-County heating fuel versus that same $100 employing a local carpenter who weatherizes the building in question.

Clearly, a significant issue for Siskiyou County is the relatively large amount of money being spent on energy, and the limited amount of local employment and economic multiplier effects that are resulting from current expenditures.

FUTURE ENERGY NEEDS

Figure 18 is a composite projection of the County's future energy needs based on the foregoing sector estimates, and an assumption of no major changes in usage patterns. This shows that roughly an additional one trillion Btu/yr will be needed by 2010 to accommodate projected population growth. These additional supplies will cost another $10 million annually in today's dollars, or about a 12% increase over today's Countywide annual energy bill.



The principal issue for County consideration at this point is how this increased energy demand can best be met. The main options are efficiency improvements (which avoid the need for additional energy supplies); development of local renewable resources (direct application and power generation which avoid the need for imported supplies); or importation of additional conventional supplies from outside the County. The following chapters of the Element review the County's efficiency and renewable potentials to determine their possible contribution towards the additional one trillion Btu/yr in future needs.

AFFECTED COUNTY RESPONSIBILITIES

This chapter of the Element again concludes with a review of affected County responsibilities, in this case by energy end-use sectors. Table 4 should be used to further help identify significant issues warranting attention through County policies or standards.

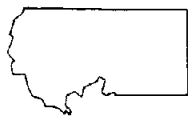
Table 4
County Responsibilities Affected by Energy End-Use Sectors

End-Use Sector	County Responsibilities: Land-Use	CEQA & CCAA	Bldg. Code	County Facilities/ Vehicles	County Power Generation
Transportation	Opportunities to reduce transportation energy consumption via compact growth.	Air quality implications of continued petroleum dependence.	N/A	Savings potentials through more efficient County vehicles.	N/A
Residential	Opportunities to promote energy-efficient siting close to related uses.	Indoor air quality implications of tighter construction.	Title 24 enforcement.	N/A	N/A
Commercial/ Industrial	Opportunities to promote energy-efficient siting close to related uses.	Indoor air quality implications of tighter construction.	Title 24 enforcement.	N/A	N/A
Agriculture	N/A	N/A	N/A	N/A	N/A
Community Services	Opportunities to promote energy-efficient siting close to related uses.	Indoor air quality implications of tighter building construction.	Title 24 enforcement in public buildings.	Savings potentials from County buildings efficiency improvements.	Potential for on-site renewable power at County facilities.

Source: Criterion

ENERGY EFFICIENCY POTENTIALS

- *Transportation*
- *Buildings*
- *Commerce & Agriculture*
- *Community Service*
- *Appliances*
- *Recycling*



OVERVIEW

One of the most effective tools that Siskiyou County can use to accommodate future energy needs is the ***efficiency*** of energy use. In contrast to the many energy supply decisions made outside of the County, the efficient use of energy is something that can be locally prioritized and implemented.

Improvements in energy efficiency are often the easiest, least expensive, and most environmentally benign actions available to help meet future energy needs. The net effects of efficiency improvements in communities include:

- Less imported supplies.
- Less use of non-renewable supplies and fewer adverse environmental impacts from nonrenewables.
- Direct energy cost savings for households, businesses, and local governments.
- Greater local employment and economic multiplier effects from energy expenditures.

Siskiyou County has ample opportunities for efficiency improvements because the County's energy use since 1980 has actually become somewhat more inefficient. For example, electricity use per person grew by almost 1%, and transportation fuel consumption jumped 13% per person. The County cannot afford such growing inefficiencies in its current economic condition, let alone competitively support the growth projected over the next 20 years. In fact, allowing energy inefficiencies to continue unabated will handicap the County's ability to achieve its growth and economic diversification objectives. This chapter of the Element surveys the major end-use sectors to identify efficiency opportunities and their potential contributions towards the future need of an additional one trillion Btu/yr by 2010.

TRANSPORTATION

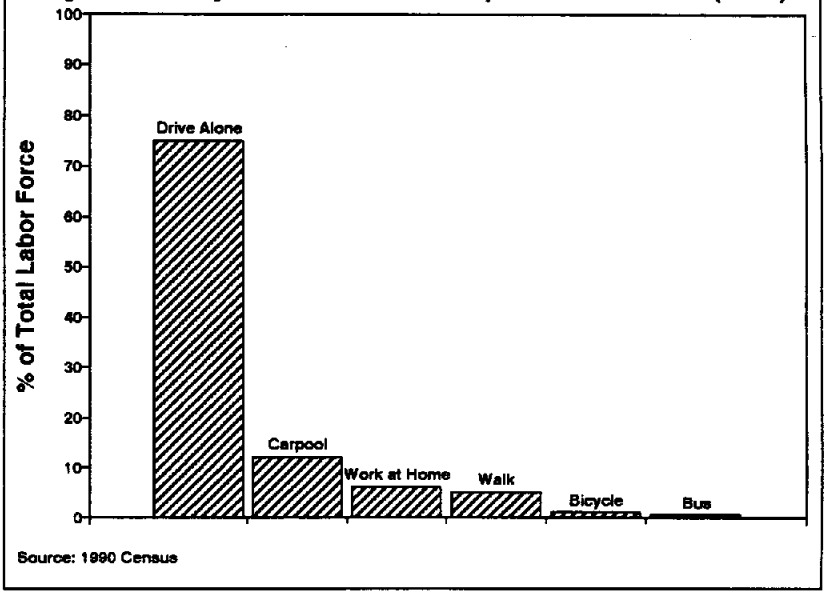
As the largest end-use sector, transportation belongs at the top of the County's list of efficiency improvement goals. The County's virtual 100% reliance on non-renewable, imported petroleum for this sector's needs is a case of adverse dependence on fossil fuels that are vulnerable to supply fluctuations, whose use is environmentally harmful, and whose consumer costs have low multiplier effects within the local economy.

Opportunities for improving transportation energy efficiencies occur in three major areas:

- ❑ Decreasing vehicle trips and miles traveled.
- ❑ Increasing the efficiency of transportation fuel use.
- ❑ Shifting to cost-effective alternative fuels.

Figure 19 illustrates the County's over reliance on single-occupant autos and trucks, and the need to pursue all three of the above approaches in order to decrease petroleum dependency and maintain cost-effective mobility for citizens and businesses over the long-term.

Fig. 19. Countywide Means of Transportation to Work (1990)



Source: 1990 Census

TRANSPORTATION
Continued

Table 5 contains representative efficiency measures that could be implemented in the transportation sector. Measures with particular applicability to Siskiyou County's conditions include:

- Purchase and proper maintenance of vehicles that are fuel efficient, and use of fuel efficient driving techniques.
- Ridesharing and carpooling.
- Use of diverse modes, including public transit, bicycling, and walking.
- Commercialization of alternative fueled/powered vehicles.
- Land-use planning that favors compact development patterns and access to alternative transportation modes.

Additional information on transportation efficiency measures is available in references 48-51, and 54.

Countywide Savings Potential

For purposes of the Energy Element's 2010 planning horizon, it is reasonable to conclude from Table 5 that at least 10% of current transportation energy use can be saved through cost-effective efficiency improvements. This equates to 500 billion Btu/yr with a value of about $4 million/yr in 1992 dollars. Thus, local residents and businesses would have an additional $4 million in disposable income and profits, respectively, for reinvestment in the local economy. On a family level, this could mean as much as $200/yr in new disposable income.

Efficiency improvements in this sector are likely to take several years to reach high market penetration levels because of entrenched driving habits; therefore, a majority of the savings should be expected in the second half of the planning horizon.

Table 5

Potential Transportation Efficiency Measures
(1990-2010)

Measure	Savings Potential (% 1990 total sector demand)	Implementation/ Ongoing Costs	Payback Range
Public education: auto fuel efficiency	4-5	Low	Short
Organized van/carpool services	3-4	Moderate	Short
Park and ride facilities	3-4	Moderate	Moderate
Transit-oriented land-use planning	1-4	N/A	Immediate
Transit ridership incentives	3-4	Low-Moderate	Short
Telecommuting	1-2	Low-Moderate	Short
Alternative fueled/powered vehicles	1-2	High	Long
Bicycle improvements	1-2	Low	Moderate
Pedestrian improvements	1-2	Low	Moderate

Source: Ref. 51, 54. Due to interactions among them, measure savings are not necessarily additive.

BUILDINGS

Residential
&
Nonresidential

Virtually all buildings in the County, regardless of type or age, can benefit from some type of energy efficiency improvements. In the case of new construction, energy efficiency can be designed into the building from the outset. In some new construction it can even be cost-effective to exceed minimum state energy standards because of possible significant additional savings over the life of the building if the code is exceeded.

In the case of older buildings, most renovation can also usually include energy efficiency upgrades. Given the County's predominately older building stock and limited amount of new construction, the largest potential for energy efficiency improvements is weatherization and retrofitting of older structures.

Opportunities for improving the energy efficiency of buildings occur in the following areas:

- Siting. New buildings should be sited for maximum access to winter sun and maximum protection from winter winds.
- Landscaping. Buildings should be landscaped to help buffer them from winter winds and to provide shade from the summer sun.
- Building shell or envelope. Insulation is one of the most effective efficiency measures for both new and existing buildings, and weatherstripping or caulking can further reduce air infiltration in older buildings.
- Windows. Heat loss through windows can be reduced with double pane or storm units, and with insulated shades.
- Heating and cooling equipment. Furnaces, boilers, and stoves should be selected and maintained to achieve performance efficiencies that are as high as possible. The same is true for air-conditioning equipment.
- Lighting. Buildings should be designed to maximize the use of natural daylight, employ high efficiency fixtures, and energy efficient controls such as occupancy sensors.

BUILDINGS
Continued

- Domestic hot water (DHW) heating. Hot water temperatures and flow rates should be reduced where possible, and equipment selected and maintained for maximum efficiency, including insulation of older systems. Solar-assisted DHW may also be favorable in many cases.

Table 6 lists representative building energy efficiency measures and savings estimates. This is not an exhaustive list, and interested persons should consult references 36, 37, 40, 41, and 53 for additional information.

Of the available measures, particular attention should be given to passive solar use, envelope insulation, and efficient glazing and lighting. Many buildings can reduce their energy consumption by 10-20% with these types of measures, often with paybacks for some measures as short as 2-5 years. Appendix C lists sources of technical and financial assistance for such efforts.

Countywide Savings Potential

For purposes of the Energy Element's 2010 horizon, it is reasonable to conclude from Table 6 that 10% of current building energy use can be saved through cost-effective efficiency improvements over the next 18 years. This equates to 175 billion Btu/yr with a value of about $1.5 million/yr in 1992 dollars. As in the transportation sector, these savings would be available for reinvestment in the local economy. A typical Siskiyou family could have as much as another $200/yr available from home efficiency improvements, in addition to savings described earlier from family transportation efficiency.

Based on other communities' experience, the rate of implementation for these measures can be relatively rapid if an aggressive outreach effort is made.

Table 6

Potential Building Energy Efficiency Measures
(1990-2010)

Measure	Savings Potential (% 1990 total sector demand)	Implementation/ Ongoing Costs	Payback Range
Public education: building efficiency	4-5	Low	Short
Automatic equipment controls	0.5-1.0	Moderate	Moderate
Energy efficient water heating	0.2-0.5	Low	Short
Minimum insulation/weatherization	0.2-0.5	Low	Short
Maximum insulation/weatherization	0.5-1.0	Moderate	Short
Efficient space heating equipment	0.1-0.2	Low	Short
Efficient space cooling equipment	0.1-0.2	Low	Short
Energy efficient lighting	0.1-0.2	Low	Short
Passive solar design (orientation only)	0.06-0.10	N/A	Immediate
Passive solar design (sunspace and storage)	0.08-0.15	Moderate	Moderate

Source: Ref. 36-49. Due to interactions among them, measure savings are not necessarily additive.

COMMERCE & AGRICULTURE

Energy availability and costs are an important part of doing business in Siskiyou County. And now, more than ever, Siskiyou businesses need the competitive advantages that come from energy efficiency. Energy costs in businesses can account for up to 10% of their total operating budget, and since profits typically range from 3-10%, even reducing energy costs by a small percentage can have a major impact on profitability (ref. 7).

Opportunities for business and agricultural energy efficiency improvements occur in the following areas:

- Building and facility siting/design construction/remodeling.
- Industrial process design/engineering.
- Equipment control technologies.
- Fuel efficient agricultural equipment.
- High efficiency irrigation and farming practices.

Table 7 lists representative business and agricultural efficiency measures and their potential savings. Most of these measures are eligible for assistance under the technical and financial programs listed in Appendix C. Again, Table 7 is not an exhaustive listing of efficiency opportunities, and interested persons should consult references 44 through 46 for additional information.

Countywide Savings Potentials

Based on Table 7, it is believed that business and agricultural energy savings of 10% can be reasonably achieved through cost-effective measures over the next 18-20 years. This savings would equate to 34 billion Btu/yr with a value of about $250,000/yr in 1992 dollars. This is a purposely conservative savings estimate because of the long-range wood products uncertainties and the resulting unknown industrial circumstances generally.

Table 7

Potential Commerce & Agriculture Efficiency Measures
(1990-2010)

Measure	Savings Potential (% 1990 total sector demand	Implementation/ Ongoing Costs	Payback Range
Public education/business outreach	3-4	Low	Short
Group load cooperatives	0.5-1.0	Low	Short
Efficient motors and drives	0.5-1.0	Low-Moderate	Short-Moderate
Efficient lighting	0.5-0.7	Low	Short
Process heat recover	0.2-0.4	Moderate	Moderate
Cogeneration	2-3	Moderate	Moderate
Irrigation pump efficiency repairs/improvements	1-2	Low	Short
Computerized irrigation scheduling	1.0-1.5	High	Moderate-Long
Alternative irrigation/farming methods	0.5-0.7	High	Long
Irrigation load management strategies	0.5-0.7	Low-Moderate	Short-Moderate

Source: Ref. 39, 46. Due to interactions among them, measure savings are not necessarily additive.

COMMUNITY SERVICES

In addition to homes and businesses, significant efficiency opportunities exist for energy-consuming community services including:

- Public buildings and grounds
- Vehicle fleets
- Streetlights and traffic lights
- Water supply systems
- Wastewater collection and treatment systems

Many of the measures listed previously in Tables 5 and 6 also apply to public vehicles and buildings. Agencies can organize effective efficiency improvement campaigns using the following techniques:

- Clearly designate overall energy responsibilities to a management-level employee.
- Regularly coordinate activities among agency departments to improve information sharing and problem solving.
- Educate employees about efficiency goals and benefits.
- Systematically implement low cost and no cost efficiency measures (as itemized for County-owned facilities in Appendix D).
- Systematically implement cost-effective efficiency measures requiring capital investments (using sources of financial assistance given in Appendix C).
- Include energy efficiency as a selection criteria in all equipment purchases.
- Establish energy equipment maintenance programs that keep equipment operating at high efficiencies.
- Establish monitoring and record-keeping procedures that track agency energy costs and efficiency accomplishments.
- Keep governing bodies and local media informed about efficiency projects and savings, so as to maintain support for, and increase awareness of, efficiency efforts.

COMMUNITY SERVICES
Continued

Countywide Savings Potential

The 10% savings estimate used in previous sectors is not only applicable here, but is probably conservative. Energy conservation studies often find cost-effective savings of 10-20% in public sector facilities and fleets. For the sake of conservatism, however, a 10% savings will be assumed, which equates to 7 billion Btu/yr with a value of about $100,000/yr in 1992 dollars. If an aggressive efficiency campaign is focused on community services, these savings should be obtainable largely in the first half of the Element's planning horizon.

APPLIANCES

Part of each building's energy consumption is attributable to appliances, and their energy use and costs can be notably reduced by using high-efficiency models. These may be slightly more expensive to buy than comparable models with lower or average efficiencies, but the extra first cost for a more efficient appliance is paid back through reduced energy bills long before the product wears out.

Appliances and related devices that are now manufactured under federal and state energy efficiency standards include:

- Refrigerators
- Freezers
- Clothes washers and dryers
- Stand-alone space heaters
- Plumbing fittings (shower heads and faucets)
- Gas-fired cooking appliances

These appliances are available in a wide range of efficiencies, and consumers should shop carefully for the most appropriate models. In addition to the purchase price, a consumer is committing to pay the cost of running the appliance for as long as it functions. The sum of the purchase price and the energy cost of running an appliance over its lifetime is called its life-cycle cost. As an example, running a refrigerator/freezer for 15-20 years typically costs three times as much as the initial purchase price. Therefore, although energy efficient appliances may cost more to buy, their greater efficiency typically results in lower life-cycle costs.

In addition to information available through local appliance dealers, electric utilities, and fuel dealers, interested persons should consult references 33, 37, 42, and 53 for further information on appliance efficiencies.

RECYCLING

Recycling is now an established waste management practice that produces valuable environmental benefits, economic development opportunities, and energy efficiencies. Energy that would normally be required to manufacture materials can be saved when recycled materials are available. Opportunities for achieving recycling-related energy savings include:

- Consumer recycling of paper, glass, aluminum, etc.
- Reduced use of excessive materials, such as packaging.
- Purchase of products made from recycled materials.

Siskiyou County encourages recycling as part of its integrated solid waste management program, along with the independent efforts of local citizens and private businesses who are promoting recycling. Approximately 25% of the County's waste stream is composed of recyclable materials. Although the viability of recycling is constrained by the County's relatively small, low-density population and non-metropolitan location, it is likely to increase over time as recycling methods become more fully integrated into normal household and business activities.

In terms of energy planning issues, the County will want to insure that recycling businesses and facilities can be sited in ways that encourage their use.

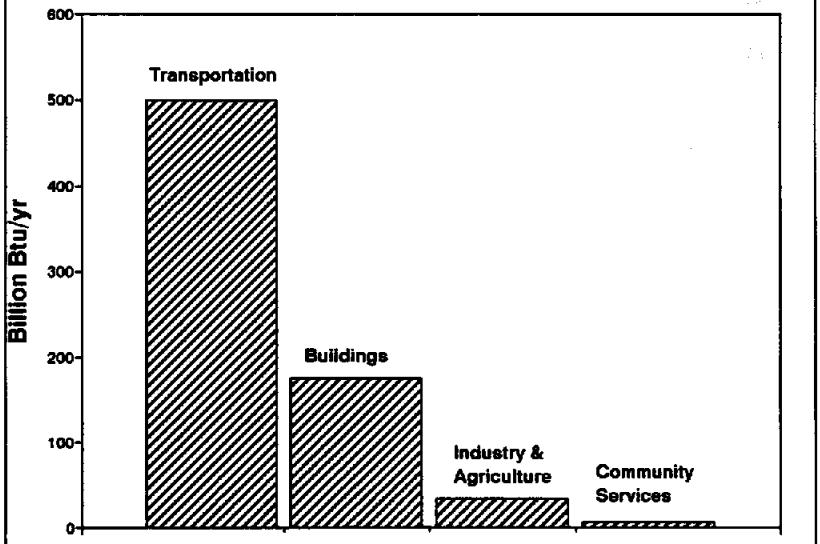
Persons desiring more information on local recycling efforts should obtain a copy of the County's Waste Management Plan from the County Public Works Department.

SUMMARY OF POTENTIAL EFFICIENCIES

Figure 20 summarizes the energy efficiency potentials identified in this portion of the Element. These estimates represent a mix of efficiency measures that should be achievable within the Element's 2010 planning horizon at investment and maintenance levels considered to be cost-effective by today's standards. When fully implemented, these efficiency improvements can save a total of about 720 billion Btu/yr which equates to approximately $5.75 million/yr in 1992 dollars.

Thus, almost 75% of the County's future growth in energy demands can be met through efficiency improvements if a sufficiently aggressive commitment is made to this approach. Moreover, when all end-use sectors are totalled at least $11.5 million/yr of direct and indirect economic benefit could be created for local residents and businesses through efficiency improvements, thereby increasing disposable income, business profits, and local economic health generally.

Fig. 20. Energy Efficiency Potentials by End-Use (1990-2010)



Source: Criterion

AFFECTED COUNTY RESPONSIBILITIES

As shown in Table 8, this chapter of the Element again concludes with the County responsibility matrix used throughout the Element to identify energy issues that may warrant attention through County policies or standards.

Table 8

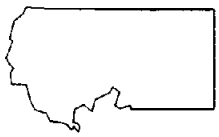
County Responsibilities Affected by Energy Efficiency Potentials

Energy Efficiency Potentials	County Responsibilities: Land-Use	CEQA & CCAA	Bldg. Code	County Facilities/ Vehicles	County Power Generation
Transportation	Opportunities to reduce energy consumption through compact growth and mode diversity (pedestrian, bicycle).	Opportunities to reduce petroleum air pollutants.	N/A	Savings potentials through more efficient County vehicles.	N/A
Buildings	Opportunities to reduce energy consumption through higher density, mixed-use projects, and solar access.	Indoor air quality implications of tighter construction.	Title 24 enforcement.	Savings potentials through County building retrofits.	N/A
Commerce & Agriculture	Opportunities for energy efficient siting.	N/A	Title 24 enforcement.	N/A	N/A
Community Services	Opportunities for energy efficient siting.	N/A	Title 24 enforcement.	Savings potentials in local government infrastructure.	N/A
Recycling	Opportunities to increase recycling through proximate/convenient facility siting.	Solid waste management and local economic benefits.	N/A	Recycling potentials at County facilities.	N/A
Appliances	N/A	N/A	N/A	Savings potentials in County facilities.	N/A

Source: Criterion

RENEWABLE RESOURCE POTENTIALS

- *Solar*
- *Biomass*
- *Hydro*
- *Wind*
- *Geothermal*



OVERVIEW

After efficiency improvements, the County's next best means of meeting future energy needs self-sufficiently is further development of its local renewable energy resources, including:

- Solar
- Biomass
- Geothermal
- Wind
- Hydro

As discussed earlier, there is an established history of renewable energy use in the County, including hydropower, biomass in the form of firewood, and limited solar and geothermal. However, these historical uses represent only a small portion of the County's total theoretical potential for renewable energy development. Increasing renewable use can reduce the amount of non-renewable energy imported into the County; can create opportunities for exporting renewable power output; and in the process, create new jobs, more locally-purchased goods and services, and higher tax revenues for local communities.

Achievement of these potentials will hinge on several factors: the amount of resources available for development in the County; the technical and economic feasibility of utilizing the resources; the land-use compatibilities and environmental effects of resource development; and regulatory requirements governing such development. These planning issues are summarized in Table 9 and further outlined below.

Resource Inventories & Technologies

Each renewable resource is described in this chapter of the Element according to an inventory of its occurrence in the County, its development viabilities and typical technologies for utilizing the

Table 9
Renewable Energy Planning Overview

Resources & Applications	Siskiyou County Theoretical Resource Base	Extent of Technology Commercialization	Amount of Existing Siskiyou County Use	Proposed Near-Term Development	Long-Term Development Potential	Potential Environmental Impacts	Potential 2010 Siskiyou County Supplies	Regulatory Responsibilities		
								Federal	State	Siskiyou County
Solar										
Direct use	■	■	❑	❑	■	❑	■	❑	❑	◘
PV power	■	◘	❑	❑	■	❑	■	❑	❑	◘
Thermal power	◘	❑	None	None	❑	◘	?	◘	■	■
Biomass										
Collection/processing	■	◘	■	None	■	◘	?	■	◘	❑
Direct use	■	■	■	None	■	◘	■	❑	■	❑
Power generation	◘	■	None	None	❑	◘	?	■	■	■
Geothermal										
Direct use	■	■	❑	❑	■	◘	■	❑	◘	◘
Power generation	■	■	None	?	■	■	■	■	■	■
Wind										
Power generation	◘	■	None	None	?	❑	?	❑	❑	■
Hydro										
Power generation	◘	■	◘	None	◘	■	❑	■	◘	◘
Transmission facilities										
Power lines	N/A	■	◘	None	◘	◘	N/A	◘	■	◘
Pipelines	N/A	■	❑	None	❑	❑	N/A	◘	◘	◘

■ Major ◘ Moderate ❑ Minor ? Questionable

Source: Criterion

OVERVIEW
Continued

resource. The large amount of inventory data available for resources cannot be reproduced entirely in the Energy Element, so data is summarized and interested persons are referred to original data sources for detailed information. Similarly, the wide diversity and complexity of energy technologies and their development impacts cannot be exhaustively addressed in the Element, so relevant technologies are summarized according to the CEC's latest determination of commercial availability and key deployment issues (ref. 70). An important energy planning issue for the County over time will be updating resource inventories with new data, and tracking advancements in relevant utilization technologies.

Environmental & Land-Use Issues

In addition to technology considerations, the development of renewable resources has environmental and land-use effects which must be considered, and potential incompatibilities or adverse impacts which must be either avoided or adequately mitigated. Virtually all commercial-scale renewable energy development in the County will be subject to CEQA and/or National Environmental Policy Act (NEPA) review depending on project type and location. Similarly, renewable projects must be consistent with County or federal land-use plans depending on project location. Projects on federal lands must also consider County policies and standards in an advisory manner.

The Energy Element addresses environmental and land-use issues at a general level, and is not intended to address the site-specific setting and impacts of individual renewable energy projects. This general approach is necessary because definitive resource location data is not available for all renewables, nor is the kind of qualitative information that is needed for assessing site-specific resource impacts. However, a key objective of the Element is establishment of County policies that provide a framework of programmatic measures for avoiding or mitigating the potentially adverse environmental and land-use effects

OVERVIEW
Continued

of renewable projects. Formulation of detailed site-specific mitigation measures can then occur on a case-by-case basis as individual projects are reviewed for use permits.

To create a framework for subsequent individual project reviews, the Energy Element approaches environmental and land-use issues by identifying conflicts that may occur at resource sites; summarizing the consequences of those potential conflicts; and recommending policies and/or standards that seek to balance energy resource production against competing natural resource values.

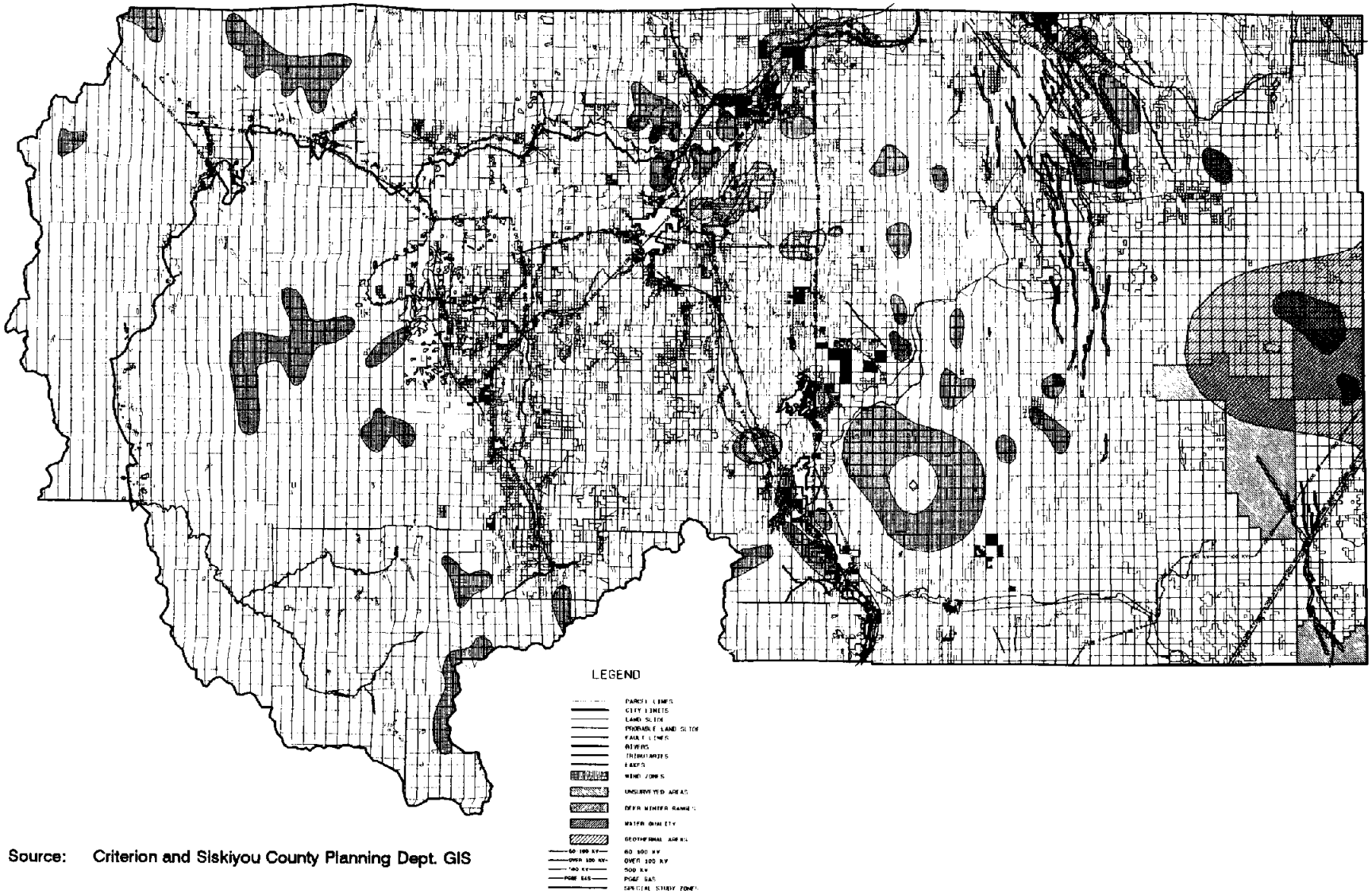
Figure 21 presents an initial composite illustration of this constraints analysis, including all inventoried energy resource sites (except solar which is not site-specific) and major environmental constraints (geologic hazards, sensitive wildlife habitat, endangered water quality, intensive land-use parcelization). This initial compatibility assessment suggests that projects on non-federal lands in Butte Valley may be constrained by seismic hazards, critical deer winter range, water supply and quality limitations, and intensive agricultural land-use. Similar constraints, except for seismic hazards, may apply to Shasta and Scott Valleys. Figure 21 is a product of the County Planning Department's geographic information system (GIS), whose energy database can be expanded with increasingly site-specific environmental information to aid in renewable project reviews over time.

The resource site conflict discussions in each of the following renewable sections are organized as follows:

- Land-use and environmental conflicts are identified in a two-way manner: uses or resources which may negatively impact the renewable energy resource in question, versus uses or resources which may be negatively impacted by development of renewable energy.

Figure 21

Renewable Energy Resource Sites & Constraints



Source: Criterion and Siskiyou County Planning Dept. GIS

OVERVIEW
Continued

- The consequences of identified conflicts are assessed in economic, social, environmental, and energy terms according to the same two-way analysis: negative consequences to the energy resource in question, versus negative consequences to surrounding uses or resources.

This land-use and environmental compatibility analysis also provides an important internal consistency check with other elements of the General Plan that govern uses and resources impacted by renewable energy development.

Regulatory Issues

Development of renewable energy resources also involves the regulatory approvals that are required from local, state, and/or federal agencies depending on project type, size, and location. Another key objective of the Energy Element is establishment of a policy framework for the County's regulatory approach to energy projects for which it is either a "lead" or "responsible" agency under CEQA (or "affected" agency under NEPA). Although the Element's focus is renewable projects, this policy framework and its implementation measures are purposely defined broadly enough to encompass non-renewable energy facilities in the event they occur in the County.

The following sections on each resource include a discussion of regulatory requirements applicable to that resource, and Appendix E further details regulatory processes according to resource type, activity, and location. Additional regulatory information is also available in the California Office of Planning and Research Permit Handbook.

Resource Emphasis

Each renewable resource is addressed in the Element in proportion to the perceived likelihood of resource development in the foreseeable

OVERVIEW
Continued

future. For example, geothermal receives the most attention because it is believed to have the greatest potential for near-term development at Medicine Lake. Alternatively, wind is addressed briefly because it is believed to have very limited development potential. The amount of consideration given to each renewable resource in this initial Element should not necessarily imply a static condition for any given resource. The amount of consideration given to each renewable will change over time as new resource data becomes available, technology advancements occur, and economics change.

SOLAR

Resource Inventory

Solar energy is the radiated energy produced by the sun. The most frequently recorded measurement of solar energy is global radiation, or the amount of diffuse radiation which comes from the sky after the atmosphere has scattered incoming solar rays. Global radiation is usually measured according to the amount of energy recoverable per unit of surface area in a given time period, such as Btu/sq.ft./hr.

For purposes of statewide resource planning, California has been divided into 15 "solar zones" based not on climate, but rather topography and atmospheric conditions related to solar radiation, particularly cloud cover (ref. 59, 69). Siskiyou County is located in Zones 1, 7 and 9, which are illustrated in Figure 22 and have the following estimated values of global radiation:

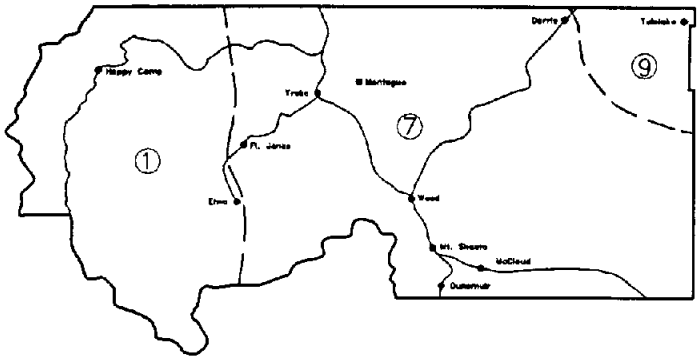
	Btu/sq.ft.		
	Zone 1 (West County)	Zone 7 (Mid County)	Zone 9 (East County)
Average daily radiation	1,100	1,220	1,400
Average annual radiation	390,200	460,500	525,000

Although these radiation values are only 60-70% of southern California or Arizona levels, they are nonetheless sizable values, making solar energy one of the County's most important renewable resources, particularly considering its availability throughout the County and relative ease of use. Exact amounts of radiation available at specific locations will vary within the zones described above, making site-specific calculation of radiation levels a necessary prerequisite to any solar system design.

SOLAR
Continued

Figure 22

Solar Radiation Data Zones



Operating & Proposed Solar Facilities

According to local interviews, there are as many as 300 direct thermal solar installations and 100 small photovoltaic (PV) systems operating in the County, in both cases primarily on residences. The direct thermal systems are estimated to total about 1,500 MMBtu/yr of capacity (primarily for domestic hot water heating), and the PV systems are believed to produce about 37 MWh of electricity annually (for personal, on-site consumption only). Also, several dozen homes throughout the County are reported to have been designed expressly for passive solar use. In terms of operating solar facilities causing problems or nuisances, the County has no record of any complaints stemming from installed solar equipment.

Local interviews and agency inquiries revealed no known plans for new solar facilities in the County, except for a continuing, modest amount of passive design, and direct thermal and PV systems being installed on residences and at remote agricultural locations.

SOLAR
Continued

Utilization Technologies

Solar energy is used for heating and generating electricity according to the following application categories:

Direct Thermal

- Passive space heating. This can be accomplished through direct gain into a building with a large south-facing wall and south-facing windows; a south-facing thermal storage wall containing masonry material or water; and/or a south-facing attached sun space such as a greenhouse or enclosed porch.

- Active space and/or water heating systems. This type of system includes a solar radiation collector with associated heat-transport fluid, a heat-storage medium, and a distribution system composed of pumps and/or blowers. These are usually roof-mounted systems, of which there are reportedly several hundred throughout the County, primarily on residences.

Electric Generation

- Photovoltaic systems. PVs are semiconductors that transform light directly into electricity by freeing electrons and thus generating current. PV cells, usually made of silicone, generate direct current, which can be used as such, stored as electrical energy, or converted into alternating current for on-site use or sale into the local electric utility grid. There are reportedly about one hundred PV installations in the County being used for remote on-site residential and agricultural electric needs.

- Thermal systems. These are usually large-scale installations where solar energy is collected for heating a working fluid (gas, water, or other volatile liquid), with the resulting heat energy then converted into mechanical energy in a turbine, and finally into electricity by means of a conventional generator coupled to the turbine. Commercial installations of this type are limited to a small number of pilot plants in southern California.

All of these technologies are theoretically applicable to Siskiyou County conditions, but their actual development feasibilities are

SOLAR
Continued

strongly influenced by climate, economic, and market factors described below. Additional information on solar technologies is available in references 56, 70, and 75.

Viability of Resource Use in Siskiyou County

The viability of solar use in the County is considered to be favorable for small-scale applications and less than favorable for large-scale facilities. Large-scale solar power generation is not considered probable in the foreseeable future because of the County's severe winter weather conditions (e.g. snow) and lower radiation levels in comparison to competing southwestern resource sites. Large-scale solar power is further hampered in the early portion of the Element's planning horizon by higher generating costs than competing renewables, e.g. geothermal; coupled with Siskiyou County's considerable transmission distance to large power markets. Development probabilities for large-scale solar power should be revisited during the Element's first major update in five years (see Implementation Measures chapter).

Direct thermal and small PV uses of solar energy in the County are technically viable, with economic viability ranging from excellent to modest. Table 10 summarizes four residential solar options for a typical single-family home in Siskiyou County, indicating favorable passive solar economics, marginal domestic hot water economics, and PV economics dependent upon distance from existing electric lines. As with any set of illustrative costs, it should be remembered that site-specific values may vary, particularly the economic components of a specific consumer's payback calculation. Public policy can also significantly alter economic viability using techniques such as solar investment tax credits. Although not presently available, future federal and state solar policy should be monitored for such incentives.

Table 10

Residential Solar Options

Solar Option	Solar Share of Annual Energy Demand	Approximate Installed Cost	Estimated Savings	Simple Payback
Passive space heating (orientation only)	10% of space heating demand	None	$75/yr	Immediate
Passive space heating (sunspace)	30% of space heating demand	$2,000	$200/yr	10 years
Active domestic hot water heating	70% of hot water heating demand	$3,600	$200/yr	18 years
Photovoltaic electric generation	100% of lights and appliances (no space or water heating)	$10,000	Break-even at 3/8 mile distance from electric line	Immediate at 3/8 mile or greater

Estimated for a new 1,200 sq.ft. single-family residence built in Siskiyou County in compliance with Title 24 energy standards and displacing 7¢/kWh electricity.

Source: Criterion and PP&L.

SOLAR
Continued

Of the energy technologies to be monitored in general, solar should be one of the County's tracking priorities since both technology and economics are expected to improve within the Energy Element's planning horizon, particularly as small-scale technologies become more widely commercialized.

Environmental & Land-Use Issues

The solar uses considered viable in the County, direct thermal and small PV systems, do not generally raise significant environmental or land-use issues in a rural setting like Siskiyou County.

Direct thermal and PV systems are normally integrated into, or directly attached to, conventional building designs. Solar equipment can range from several hundred square feet of direct thermal collector panels down to a few square feet of PV panels. Both applications require unobstructed solar access which may occasionally create land-use compatibility problems if adjacent buildings or vegetation encroach upon an installation's solar envelope. Additionally, the aesthetic impact of solar panels and potential glare from solar equipment should be considered when siting any type of solar facility. These problems can be mitigated by solar access protection in combination with aesthetic screening measures that do not degrade access.

Regulatory Setting

The regulation of solar energy use is essentially divided into access protection and siting of power generation facilities. The County administers two state laws designed to protect solar access: the Solar Shade Control Act which prohibits vegetative blocking of previously installed solar collectors, and the Solar Rights Act which legalizes solar access easements and requires subdivision mapping of them.

SOLAR
Continued

There is no specific citation of "solar" facilities in the current County Zoning Ordinance; instead, energy facilities are defined broadly enough as "utility" uses to encompass solar equipment. This current zoning approach is interpreted as follows:

	Zones																
	RR	R1	R2	R3	R4	CR	CU	CC	CH	ML	MM	MH	AG1	AG2	TPZ	O	PD
Solar Facilities																	
Direct thermal	2	2	2	2	2	2	2	3	3	3	2	2	3	2	2	3	2
Power generation	2	2	2	2	2	2	2	3	3	3	2	2	3	2	2	3	2

1	Permitted use	R3	Mixed residential	MM	Light industrial
2	Conditional use	R4	Multi residential	MH	Heavy industrial
3	Prohibited use	CR	Neighborhood commercial	AG1	Prime agricultural
4	Not addressed	CU	Neighborhood commercial	AG2	Non-prime agricultural
RR	Rural residential	CC	Town center	TPZ	Timberland
R1	Single family residential	CH	Highway commercial	O	Open space
R2	Multi family residential	ML	Limited industrial	PD	Planned development

The lack of solar specificity in the Zoning Ordinance and the ambiguity it creates may be a deterrent to future solar development. Potential end-users and their lending institutions are less likely to take an action if the regulatory setting (and potential for controversy) is uncertain. Consideration should be given to clarifying the definition of solar systems and where they are to be allowed (and encouraged). Recommended zoning amendments are given in the Element's Implementation chapter.

Solar thermal power generation facilities on private or state lands would encounter state regulation by the CEC if they have 50 MW or more of installed generating capacity. Below that capacity the County would be the lead agency for siting. Solar facilities of any type or size on federal lands in the County would require a use permit and/or lease from the responsible federal land management agency, e.g. Forest Service or Bureau of Land Management (BLM).

SOLAR
Continued

Development Compatibilities at Resource Sites

As explained at the outset of this chapter, one of the Energy Element's objectives is identification of potential conflicts between renewable resources, and surrounding land-uses and natural resources. Having identified such conflicts, the intent is to assess the consequences to both the energy resource and conflicting uses, and then formulate measures to balance the competing values of renewable energy against surrounding environmental qualities.

Since solar energy occurs throughout the County, all land-uses and virtually all natural resources are potentially affected by solar use. As explained above, the only potential land-use conflict with solar technologies that are viable in the County involve obstruction or shading of a solar system's collector surfaces, and possible glare from collector surfaces. The consequence of solar access encroachment could be a reduction or elimination of recoverable solar radiation, thereby diminishing solar's economic, environmental, and energy benefits. Although solar access conflicts have not occurred previously in the County, this may be an issue that warrants attention before problems begin to occur, particularly in consideration of other land-use and transportation goals that are encouraging higher density development in the future.

The potential solar conflict from collector surface glare is a nuisance problem that could have adverse consequences in terms of neighborhood acceptance of solar equipment, ultimately diminishing the resource's benefits to the community. This too may be an issue that warrants attention before problems begin to occur by encouraging equipment installation that does not visually intrude on neighbors.

SOLAR
Continued

Need for County Solar Facility Standards

Solar facility siting can involve either small direct thermal and/or PV equipment in conjunction with a conventional land-use; or large-scale, grid-connected power generation facilities.

In the case of the former, because of the energy and environmental benefits of direct thermal and small PV applications, the County should encourage solar access and orientation that promotes and protects these types of uses. To date, the County's predominately low-density, rural character has not impeded solar access; but as the value of this resource increases over time, consideration should be given to minimum access protection guidelines and perhaps incentives for optimum subdivision and building orientation. Non-intrusive equipment installation practices should also be encouraged.

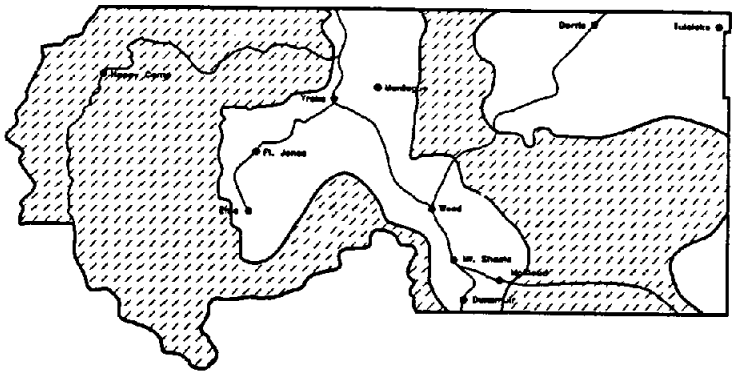
Alternatively, since large-scale, solar power generation in the County is believed to be improbable in the foreseeable future, the need for solar-specific facility standards is not apparent. Instead, a basic set of policies for power plants generally, regardless of fuel type, should suffice in the unlikely event that a large solar power plant is proposed in the County (particularly since site-specific conditions can be formulated at the time of project evaluation, and attached to any use permit). This determination of lack of need for large-scale solar facility standards should be revisited in five years during the Element's first major update.

BIOMASS

Resource Inventory: Firewood

Biomass fuels include firewood, logging and mill residues, agricultural residues, and municipal solid wastes. Of these, firewood is the most significant biomass resource in the County because of heavy reliance on it for residential space heating. Firewood is cut and collected from State, federal, and private timberlands located throughout the County as shown in Figure 23.

Figure 23
Generalized Forest Lands



The largest source is the Klamath National Forest, which occupies approximately 36% of the County's total land area. As of this writing, however, the Forest Service had neither current firewood inventory data nor projections of future supplies. Present Countywide firewood usage has been estimated at 50,000 to 60,000 cords annually based on PP&L customer data and local interviews. Firewood species include, in unknown proportions, western juniper, lodgepole pine, ponderosa pine, and lesser amounts of fir, oak, mahogany, and cedar. The future availability of firewood is largely dependent upon the

BIOMASS
Continued

upcoming Land and Resource Management Plan for the Klamath National Forest, which is expected to be finalized in 1993 (ref. 14). This portion of the Energy Element should be reexamined after the Forest Plan is finalized to insure consistency with the Forest Service's intended management of firewood.

Other Biomass Resources

The second largest category of local biomass resources, logging and mill residues, is in even greater flux because of the uncertainties surrounding Forest Service resource planning. It is believed that lands available for timber harvesting will be substantially reduced in the upcoming Klamath National Forest Plan, with consequent reductions in logging and mill residues that may be available for biomass uses. As with firewood, these biomass resources should be revisited after the Forest Service's final management decisions are made public.

Other biomass resources, including agricultural residues and municipal solid wastes, are not generated in sufficient quantities in the County to make their collection and utilization economically feasible for energy generation purposes in the foreseeable future.

Operating & Proposed Biomass Facilities

There are an estimated 8,000 wood stoves and similar wood-burning appliances operating in the County. This number is believed to be growing modestly consistent with general population growth. Such a large amount of wood burning raises energy efficiency and air quality issues. Inefficient wood stoves will consume the resource base at a higher rate than would otherwise be the case with efficient equipment. Equipment efficiency also relates to the major nuisance associated with wood burning in low-lying communities, where wood smoke pollution increases under temperature inversion conditions.

BIOMASS
Continued

There are no biomass-fired power generation facilities either operating or proposed in the County. As noted above, the decline of the local wood industry has significantly reduced the basis for biomass-fired power generation. There remains, however, the possibility that wood could be collected and processed on forest lands in Siskiyou County, and then trucked to biomass-fired power facilities in adjoining counties, e.g. the 11 MW wood-fired plant at Westwood in Lassen County. Local interviews and agency inquiries, however, revealed no known plans to use Siskiyou wood as feedstock for a plant in another County reportedly because of the long (and therefore uneconomic) distances involved.

Utilization Technologies

When used for space heating, wood is burned in the following devices at the indicated efficiency levels (ref. 34):

	Approx. Efficiency (%)
Fireplace	-10 to 30
Fireplace insert	35 to 50
Antique stove	20 to 40
Airtight stove	40 to 50
Certified stoves/inserts/fireplaces	60 to 80

Certified equipment is that which meets federal standards for higher efficiencies and less air pollution using one of three designs: catalytic combustors, secondary combustion chambers, or pellet fuel.

A variety of technologies can be used to generate electricity from biomass. Most applications involve a fuel collection and preparation step, followed by combustion in a thermal-electric generating plant. Fuel preparation may be simple chipping of forest residue, or complex chemical or biological processes that convert solid biomass into gaseous or liquid fuels. At present, solid wood fuels must be burned in direct-fired steam-electric plants of low to moderate efficiency. However, pressurized fluidized-bed power plants under development

BIOMASS
Continued

may eventually allow solid biomass to be used directly in high-efficiency combined-cycle plants. Additional information on biomass-fired power generation is given in references 67, 70, and 75.

Biomass can also be used in other than direct combustion applications, such as conversion via gasification or fermentation to produce heating or transportation fuels. Several pilot gasification plants have been built around the nation, but more research and development work is needed to fully commercialize such technologies (ref. 70).

Viability of Resource Use in Siskiyou County

The only viable biomass resource in the County at present is wood, as the others (agricultural residue, municipal solid waste) do not occur in sufficient quantities to be widely or significantly used. Wood collection is viable for local space heating, and potentially for wood-fired power generation (either in a small local power plant or as feedstock for an out-of-County plant). The maximum cost effective trucking distance for wood power feedstock is presently considered to be in the range of 50 miles (ref. 14), so even a feedstock scenario will be questionable in the near-term.

The technical viability of using wood in direct combustion applications for space heating is thoroughly proven, and cost effective in comparison to competing Siskiyou energy prices (particularly when used in certified equipment). The technology of wood-fired power generation is similarly well proven, but not likely to occur in the County soon for the reasons described above. In terms of biomass utilization issues, the County's near-term focus should be the prevalent end-use: small wood-burning space heating equipment.

BIOMASS
Continued

Environmental & Land-Use Issues

Given the viability of Siskiyou's wood resources as biomass feedstock for direct combustion space heating, and possibly power generation, relevant environmental and land-use issues include:

- Use of land for timber harvesting/wood cutting. An issue fundamental to the County's biomass production is which lands are to be logged and/or made available for firewood cutting. In Siskiyou County, these are land and resource management decisions made largely by the U.S. Forest Service. Also, private timberlands are subject to state forestry policies and regulations. Federal and state oversight of forest lands is based on resource analyses that determine or guide land-use and harvest allocations after considering relevant environmental issues. In recent years, these agencies' planning processes have resulted in reduced allowable timber harvests, but essentially unchanged allowable firewood cutting. Each forestry agency's land plan should be consulted for detailed information on land-use allocations and management directives relevant to firewood and biomass supplies generally and firewood specifically.

- Firewood collection impacts on forest ecology. The cutting and collection of firewood does not usually cause significant adverse effects on forest ecosystems. However, if firewood gathering is concentrated or performed continuously in certain areas, it is possible that cleared land can experience increased soil erosion, and that sensitive fish and wildlife habitat may be degraded. These potential impacts can be mitigated by erosion control practices and avoidance of sensitive habitat areas, as well as by rotation of cutting areas. Again, forestry agencies' plans are the primary determinants in this issue area.

- Air quality impacts of wood heating. Some relatively mild and short-lived local air pollution episodes can occur from wood heating, particularly in low-lying towns. During some winter days, climatic conditions known as temperature inversions prevail where the air close to the ground is cooler than air several hundred feet above the ground. Wood smoke and other pollutants are trapped in the stagnant cold air near the ground, and levels of unburned carbon and ash known collectively as "particulates" can build up. In 1990, particulate concentrations at the Yreka monitoring station of the Siskiyou County Air Pollution Control District exceeded the daily state standard on six occasions, due primarily to wood smoke and

BIOMASS
Continued

temperature inversions. The annual average particulate levels in Yreka are slightly below the annual state standard. Winter air quality problems in Yreka and other low-lying communities are typically an early morning phenomenon; wood stoves started in the early morning burn more cleanly in the late morning and afternoon as they reach operating temperature, and the inversion layer typically breaks up in the late morning, taking the wood smoke with it. Mitigation measures for wood smoke pollution problems can include increased use of certified equipment, and limitations on use of equipment during temperature inversion episodes.

Regulatory Setting

The regulatory setting for use of the County's biomass resources is composed of: 1) timber harvesting and wood cutting regulations administered by state and federal forestry agencies; 2) state building code and air quality standards for wood burning equipment administered by the County Building Inspector and Air Pollution Control District; and 3) siting of wood-fired power generation facilities by local, state, and/or federal agencies depending on project size and location.

As with solar facilities, the County Zoning Ordinance does not presently specify "biomass" systems in its treatment of energy facilities. Instead, energy facilities are again defined broadly enough to encompass biomass. This current zoning is interpreted as follows:

	Zones																
	RR	R1	R2	R3	R4	CR	CU	CC	CH	ML	MM	MH	AG1	AG2	TPZ	O	PD
Biomass Facilities																	
Collection/processing	4	4	4	4	4	4	4	4	4	4	4	4	4	4	1	4	4
Power generation	2	2	2	2	2	2	2	3	3	3	2	2	3	2	2	3	2

1 Permitted use
2 Conditional use
3 Prohibited use
4 Not addressed

BIOMASS
Continued

The Zoning Ordinance's current ambiguous treatment of biomass facilities could be an impediment to biomass utilization. Consideration should be given to clarifying biomass definitions and permissible activities in each zone.

If a 50 MW or larger biomass power plant were ever proposed on private or state lands, it would require CEC (and possibly State Lands Commission) approval; beneath that capacity the County would be the lead siting agency (or again, State Lands Commission). Any biomass activity on federal lands would require a use permit from the responsible federal land management agency.

Development Compatibilities at Resource Sites

The term "development" as used here refers to the collection, processing, transportation, and consumption of biomass in either direct thermal or power generation applications. Biomass resources will be negatively impacted by any activity that degrades the resource or impedes its utilization. Such conflicts will generally be situations where surrounding uses or activities impede access to biomass resources, or limit the flexibility necessary for biomass operations, such as collection, processing, and transportation. Alternatively, uses which may be negatively impacted by biomass development will be those that suffer adversely from the "industrialization" of an area where biomass is collected and/or processed by heavy equipment, e.g. wildlife habitat near a chipping site; or sites where it is ultimately consumed, e.g. land-uses near a lumber mill with a wood-fired power plant.

These conflicts are summarized in Table 11. The consequences of these conflicts can be expressed in economic, social, environmental, and energy terms. As with conflicts, the evaluation of consequences is necessarily a two-way analysis of impacts to both biomass resources and surrounding uses or resources.

Table 11

Potential Conflicts at Biomass Resource Sites

Uses Which May Negatively Impact Biomass Development	Nature of Conflict
Residential	Parcelization and construction impedes access to the biomass resource, and limits flexibility in biomass resource operations.
Commercial	Parcelization and construction impedes access to the resource, and limits flexibility in resource operations.
Resort/Recreation	Parcelization and construction impedes access to the resource, and limits flexibility in resource operations.
Mining/Quarrying	Parcelization and mining/quarrying activities impede access to the biomass resource, and limits flexibility in resource operations.

Uses Which May be Negatively Impacted by Biomass Development	
Residential	Industrialization of area.
Commercial	Industrialization of area.
Resort/recreation	Industrialization of area.
Mining/quarrying	Lost or impeded access to mineral deposits.
Fish & wildlife areas	Displacement/disturbance of species in an industrialized area.
Scenic views/sites	Loss/degradation of scenic qualities in an industrialized area.
Water resources	Consumption/degradation of water in an industrialized area.
Historic/cultural areas	Loss/disturbance of historic/cultural qualities in an industrialized area.

This table is intended to illustrate a range of generalized potentials, but not necessarily the probability of such conflicts occurring. Each development proposal must be examined on a case-by-case basis to gauge specific conflicts.

Source: Criterion

BIOMASS
Continued

The economic consequences of biomass conflicts should usually be moderate to minor in terms of negative impacts to surrounding uses, e.g. less tourist use of a campground near a biomass chipping site. In the case of negative impacts to biomass resources, the consequences may be greater in terms of the lost potential economic benefits to the County from more efficient utilization of logging and mill residues. If biomass utilization is impeded, the County stands to lose the additional employment and revenues that would be otherwise generated by full biomass utilization.

The social consequences of biomass conflicts should be negligible, if any, in either the case of surrounding uses or biomass resources themselves. Of much greater potential consequence could be environmental impacts, primarily to surrounding uses and resources if biomass utilization is allowed to degrade forest ecosystems or community air quality. If environmental consequences become significant, social impacts would increase as the community's livability decreases.

In terms of energy consequences, there should be no substantive negative impacts to surrounding uses. In the case of negative impacts to biomass resources, if biomass availability is reduced or impeded there would be moderate energy consequences in terms of that much less biomass being available for energy production.

Need for County Biomass Facility Standards

Most of the County's biomass use does not involve facility siting because it is simply firewood consumption in conjunction with conventional land-uses. Facility siting issues would only arise in the case of a wood-fired power plant, which is considered improbable in the foreseeable future because of the timber industry conditions explained above. As with large-scale solar power, a general set of power facility policies (and site-specific use permit conditions) should suffice in the unlikely event of a biomass facility being proposed. As with the solar determination, the lack of need for biomass-specific standards should be reexamined in five years during the Element's first major update.

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Resource Inventory

Geothermal energy is the heat of the earth that can be extracted from subsurface water or steam. Geothermal resources can be categorized geologically, as shown in Table 12, or by end-use: low-temperature heat pump applications, moderate-temperature direct utilization, and high-temperature power generation. Geologic and end-use categories are not absolute, and resource characteristics and feasible end-uses will be highly site-specific.

Of the resource types shown in Table 12, liquid dominated hydrothermal resources are expected to be the type most commonly found in Siskiyou County (ref. 76-77). According to state and federal studies, the heat source is probably molten rock or rock that has recently solidified, lying at a depth of two to six miles. Heat rises from these depths via convection, contacting groundwater that has circulated downward in open fractures, thereby creating a means of removing the heat from the deep, hot rocks. In some places, boiling may occur and a two-phase region containing both water and steam may exist, but the pressure is controlled by water. Surface manifestations include hot springs, geysers, chemically altered rocks, or in some cases, no surface manifestation at all.

Studies of hydrothermal fluids show that the bulk of the water and steam is usually derived from meteoric water, e.g. rain or snow (ref. 76). As the fluids move through the geothermal reservoir rocks, the compositions of both the fluids and the rocks are modified by the dissolution of primary minerals and the precipitation of secondary minerals. Table 13 gives typical chemical analyses for hydrothermal fluids.

Table 12

Geological Classification of Geothermal Resources

Resource Type	Generalized Temperature Range (°F)
Convective hydrothermal resources	
Vapor dominated	450+
Liquid dominated	80 to 650
Other hydrothermal resources	
Sedimentary basin/regional aquifers (hot fluid in sedimentary rocks)	80 to 300
Geopressured (hot fluid under pressure that is greater than hydrostatic)	190 to 400
Radiogenic (heat generated by radioactive decay)	80 to 300
Hot rock resources	
Part still molten (magma)	1,100+
Solidified (hot, dry rock)	200 to 1,200

Source: Ref. 77.

Table 13

Representative Chemical Analyses of Geothermal Fluids

Resource Areas	Temperature (F°)	pH	Parts per Million (ppm)											
			SiO_2	Ca	Mg	Na	K	Li	HCO_3	So_4	C1	F	B	As
Monroe, UT	108	7.8	58	264	39	578	58	0.5	394	932	652	2.6	3.0	3.8
Steamboat, NV	192	7.9	293	5.0	0.8	653	71	0.7	305	100	865	1.8	4.9	2.7
Wairakei, NZ	490	8.5	690	17	0.03	1,320	225	14.2	21	36	2,260	8.3	---	4.8
Roosevelt Hot Springs, UT	> 500	7.0	563	8	<2	2,320	461	25.3	232	72	3,860	6.8	23	4.3
Salton Sea, CA	600	4.5	400	28,000	54	50,400	17,500	215	7,150	5	155,000	15	390	12
Surprise Valley, CA														
Phipps No. 2	N/A	10	131	7	N/A	330	34	N/A	47	263	246	5.8	4.6	0.6
Parman No. 1	N/A	6.7	486	21	N/A	309	21	N/A	198	309	194	6.6	5.4	N/A
Alturas, CA														
Modoc H.S.	150 +	8.7	83	22	< 0.1	433	4	0.06	20	264	460	0.7	12	0.01
Al-1	150	9.3	0.8	34	0.1	407	5.2	N/A	5.9	270	419	0.6	10	0.01

SiO_2	Silica	K	Potassium	C1	Chloride
Ca	Calcium	Li	Lithium	F	Fluoride
Mg	Magnesium	HCO_3	Bicarbonate	B	Boron
Na	Sodium	So_4	Sulphate	As	Arsenic

Source: Ref. 79 and Trans-Pacific Geothermal Corp. and TransPacific Geothermal Corp.

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Continued

Inventoried geothermal resource sites in the County are shown in Figure 24. Based on federal, state, and local studies, major resources occur in the following two areas (ref. 55, 76, 77):

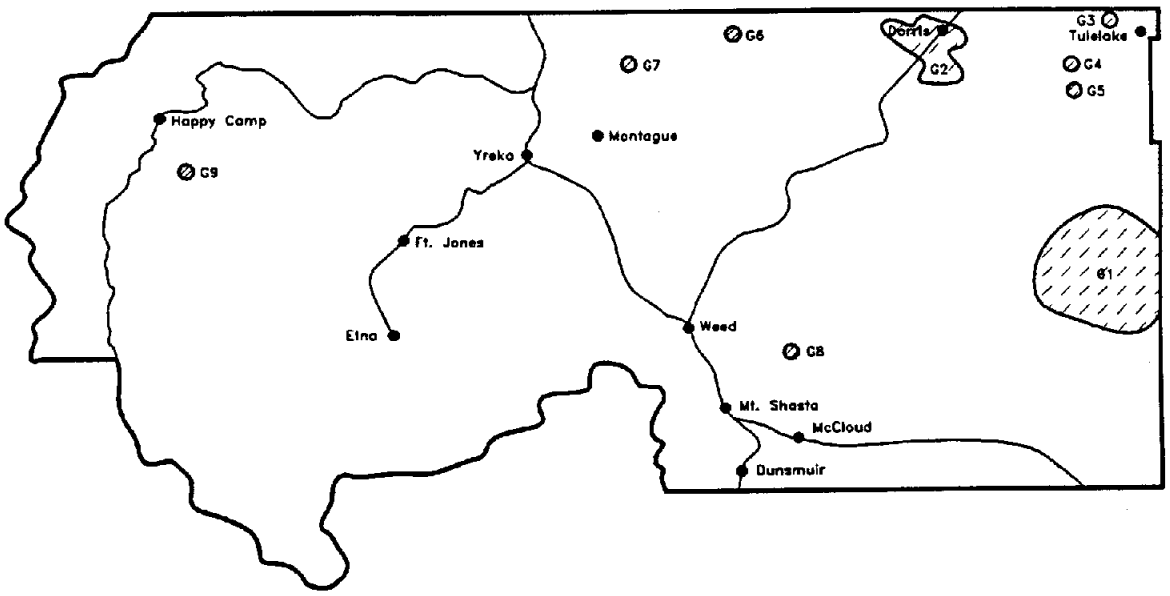
- Medicine Lake/Glass Mountain. This is the County's only significant high-temperature resource area, possessing an estimated 500 MW of installed power generating potential. This is a theoretical potential, and the technically-buildable capacity may be less. Successful exploratory drilling during the 1970's and 1980's has lead to recent informal proposals for one or more power plants in the 10-50 MW range in an initial development phase. However, as of this writing, no formal development plans have been submitted to the Forest Service or BLM. A majority of the federal geothermal leasehold has recently been sold by Unocal to the California Energy Company, with no specific development plans or time frame being announced by the new potential developer. The resource area is largely timberlands with high biological, recreation, and scenic values. Although the area does not contain major environmental constraints as inventoried in Figure 21, Forest Service officials indicate that any resource development will require thorough consideration of biological, recreation, and scenic impacts.

- Butte Valley. This is a low and moderate-temperature resource area near Dorris. The area is primarily private agricultural lands, except for the community of Dorris. Both exploration and utilization to date have been very limited because of the small population and relatively deep drilling requirements that increase utilization costs. Utilization potentials are primarily residential space and domestic water heating, and agricultural process heating. As shown in Figure 21, any major development may be constrained by groundwater concerns, critical deer winter range, and an above-average level of seismic hazards.

Additionally, low-temperature resources in the form of groundwater suitable for heat pumps occur throughout the valley areas of the County. These have received limited utilization to date, with only about 20 water source heat pumps reportedly in operation (location data is unavailable for these systems). Since comprehensive mapping of Countywide groundwater resources was beyond the scope of this initial Energy Element, priority was given to mapping of critical supply/quality areas as shown in Figure 21. Additional groundwater

Figure 24

Generalized Geothermal Resource Locations



Site No.	Site Name
G1	Medicine Lake/Glass Mountain
G2	Butte Valley
G3	Tulelake
G4	Unnamed Well
G5	Unnamed Well
G6	Klamath Hot Springs
G7	Bogus Soda Springs
G8	Unnamed Springs
G9	Sulfur Springs

Source: Ref. 55, 76, 77. Additional resource mapping is available at the County Planning Department.

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mapping will occur as the Planning Department expands its GIS database.

Operating & Proposed Geothermal Facilities

Operating geothermal facilities in the County are presently limited to the low-temperature heat pump installations described above. Most of these are reportedly residential installations, with a few commercial buildings also being served. Interviews with local equipment vendors indicate that most of the heat pumps have been installed on existing groundwater wells. None of the vendors or local agencies have received reports of operational problems or nuisances from these systems.

Local interviews and agency inquiries revealed no plans for new geothermal facilities, other than the power development which has been informally proposed near Medicine Lake on federal lands. The timing of development at this site is uncertain, however, because of the recent decision by Unocal, the lead developer, to sell its geothermal leases.

Utilization Technologies

Low-temperature geothermal resources (50-80°F) are used in conjunction with water source heat pumps that boost the temperature of a secondary working fluid to space and/or water heating levels, i.e. greater than 120°F. Moderate-temperature resources (100-200°F) are used directly for space and water heating, and certain industrial and agricultural processes. These types of geothermal applications can usually use simple, off-the-shelf equipment that operates at relatively high efficiencies.

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Several technologies that have been developed for power generation using the high-temperature, liquid-dominated resources expected in Siskiyou County are single-flash systems, double-flash systems, and binary-cycle systems:

- Single-flash systems. In a single flash system, fluid is allowed to boil at the surface in a one-stage production separation. Depending on the resource temperature, a fraction of the hot water "flashes" to steam when exposed to the lower pressure within the separator. The steam is then passed through a turbine to generate power. Typically, the liquid fraction is then injected back into the reservoir.

- Double-flash systems. Double-flash technology imposes a second-stage separator onto a single-flash system. The liquid remaining after the first-stage separation is flashed once more. Double-flash technology is 10 to 20% more efficient than single-flash technology.

- Binary cycle systems. Binary cycle technology incorporates two distinct closed fluid loops to generate electricity. The first loop passes hot water from the reservoir to a heat exchanger. A second loop moves a cold liquid phase working fluid (e.g. isobutane or some other hydrocarbon matched to the reservoir temperature) to the heat exchanger. Upon heating, the working fluid rapidly reaches its boiling point. The vaporized working fluid then rotates a turbine. It is condensed using either cool surface or ground water, or air. After condensing, the working fluid is returned to the heat exchanger. The geothermal fluid is kept in a closed piping system under sufficient pressure to prevent boiling.

Additional information on geothermal power generation technologies is given in references 70 and 76. The results of resource exploration near Medicine Lake are proprietary at this stage, making it difficult to predict which type of generation technology might be used in future development. If and when formal development plans are submitted to the responsible federal agencies, some proprietary resource data will be publically released, and a clearer picture of candidate technologies will emerge. This should be another tracking issue for the County.

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Viability of Resource Use In Siskiyou County

The technical viability of low-temperature resource use has been proven in the County for several years. The economic viability of this type of resource use is highly site-specific, due primarily to varying groundwater development costs. The technical viability of moderate-temperature resource use has been widely proven outside of Siskiyou County, but not yet demonstrated at a local site. Again, economics are highly site-specific as a function of resource depth and consequent drilling costs. Based on available information for the Butte Valley resource area, direct uses should be cost effective for moderate-sized applications such as commercial greenhousing or aquaculture.

The viability of high-temperature power generation remains technically and economically speculative in the County. Insufficient exploration drilling and resource testing have occurred to date to definitively confirm sustainable flows of commercial-grade resources at any location in the County, including Medicine Lake. Additional resource testing must also occur before the most appropriate kind of generation technology can be identified and economically evaluated.

Environmental & Land-Use Issues

Environmental and land-use issues associated with geothermal development can be addressed according to two categories: typical low and moderate-temperature considerations, and common high-temperature issues. It is difficult, however, to draw an absolute distinction between these two categories since even low-temperature resource development can potentially create significant environmental effects in some cases.

The use of low and moderate-temperature resources does not usually raise significant issues because of the similarity to normal

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groundwater use, the presumption that groundwater is not being wasted or degraded, and the presumption that the geothermal heat is being used in a permitted land-use. A question of land-use compatibility might arise in cases where overlying zoning does not allow the type of end-use best suited to underlying geothermal resources (e.g. a moderate-temperature resource suitable for aquaculture or greenhousing, but zoned for residential), in which case a rezoning proceeding would be required to determine the most appropriate land-use.

Table 14 presents a summary of environmental and land-use issues affected by the various phases of geothermal development. This is intended to be a general indicator for all geothermal projects, with power projects usually having greater potential for significant impacts. These issues are discussed below in further detail, again primarily in relation to potential impacts from high-temperature power generation:

- Air Quality. Although air quality impacts which could result from a single geothermal project would usually be minimal on a regional basis, local effects may be significant because of site-specific factors. The complex geochemistry of geothermal resources is exemplified by variations in concentrations of noncondensible gases from field to field, as well as variations from wells tapping the same aquifer. The constituents of such gases typically include carbon dioxide, ammonia, methane, hydrogen sulfide, mercury, radon, boron, and trace metals. Noncondensible gases escape from geothermal facilities by condenser gas ejection, cooling tower exhaust, power plant venting to the atmosphere during shut down, and well venting. Mitigation measures include atmospheric modeling for assessment purposes, air quality monitoring, and collection and treatment of noncondensible gases.

- Water Supply. Geothermal power production usually requires large amounts of water for cooling purposes. The use of groundwater can seriously deplete groundwater aquifers, and the use of surface water can present problems in maintaining in-stream flows for aquatic biological resources as well as other beneficial uses of such water. The use of dry cooling

Table 14

Generalized Geothermal Environmental Issues by Development Phase

	Development Phases				
	Exploration	**Production Drilling & Testing**	**Field Development**	**Facility Construction**	**Full-Scale Operations**
Development Activities	Mapping/field studies. Drill pad construction. Test drilling (shallow small diameter). Temporary roads/traffic. Equipment operation.	Well drilling. Accidental blowouts. Well testing/venting /reinjection.	Land clearing and roads/vehicular traffic. Gathering systems. Equipment activities. Water, sewage, temporary electricity and other supporting services.	Structures and improvements. Vehicular traffic/equipment. Special construction activities (e.g. blasting). Electric transmission systems. Supporting services (e.g. water, electricity, fire, schools).	Venting. Well head bleeding. Reinjection, stimulation, and redrilling. Cooling towers. Corrosion and scale control. Gaseous, liquid, and solid wastes. Abandonment, reclamation.
Environmental Issues					
Air quality	Minor/Major	Minor/Major	Minor	Minor	Minor/Major
Water resources	Minor/Moderate	Minor/Major	Minor/Moderate	Minor	Minor/Major
Wildlife & vegetation	Minor	Minor/Moderate	Minor/Moderate	Minor/Major	Minor/Moderate
Geology & soils	Minor	Minor/Moderate	Minor/Moderate	Minor/Moderate	Minor
Noise	Major	Moderate/Major	Moderate	Moderate	Minor/Moderate
Social, economic, & cultural	Minor	Minor/Moderate	Minor/Major	Minor/Major	Minor/Major
Health & safety	Minor	Moderate	Minor	Minor	Minor/Major
Land-use	Minor	Minor	Minor/Major	Minor/Major	Minor/Major

Major High potential impacts; long-term and/or significant intensity.
Moderate Moderate potential impacts.
Minor Negligible, short-term impacts

Source: Ref. 73-76, Criterion.

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towers which require very little water may provide a potential solution to the problem of water availability for cooling, but dry cooling is not suited for all resource sites.

- Water Quality. Water pollution can occur during any stage of geothermal development whether it be field exploration or power plant operation. Muds used for drilling containing petroleum-based additives may be harmful to water quality if they are allowed to enter either surface waters or groundwater aquifers. To prevent contamination of surface waters, these substances, together with rock dust and the water used in the drilling operation, must be isolated from surface and groundwaters. As required by the Division of Oil & Gas (DOG), wells must be cased through potable groundwater horizons to prevent mixing of drilling fluids with groundwater. Blowouts can also pollute water, and blowout protection equipment may be required during the drilling of any geothermal well. Sumps with an impermeable lining or steel tanks should be used to store drilling fluids and cuttings during drilling operation to ensure that these materials do not contaminate surface water. Erosion and sedimentation associated with construction of drilling pads, roads, transmission lines, and power plants can effect the quality of nearby surface water, but can be mitigated by careful site selection and engineering design, and the adoption of runoff prevention control measures. The most serious potential for water pollution problems, however, usually are associated with power production and the management of spent hydrothermal fluids. Liquid-dominated systems of the type expected in Siskiyou County often pose more difficult water pollution problems than vapor-dominated ones because wastewater from testing and production is far more abundant. Several methods of disposing of the spent fluids have been tested and used, including release to surface water, evaporation, and injection to the producing aquifer or another suitable deep aquifer. Of the various methods, injection to the geothermal reservoir is considered to be the most advantageous because if the injection is properly done, no pollutants will come into contact with surface or shallow groundwater, and injection may help to maintain the long-term production of the geothermal resource.

- Vegetation and Wildlife. The effects of geothermal development on biological resources can involve direct loss of habitat, vegetation damage from airborne pollutants, and habitat disturbances from noise and human intrusion. Direct loss of habitat will result from the construction of facilities such as roads, drilling pads, pipelines, power plants, and transmission lines. Loss of habitat would be most significant if it involves rare, threatened, or endangered species or if it disrupts big game and waterfowl migration routes. Loss of

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fish habitat can result from erosion and increase in the amounts of sediments in stream beds. Damage to aquatic life can occur from the discharge or spill of geothermal or drilling fluids containing such potentially hazardous substances. Airborne pollutants, such as boron and hydrogen sulfide, can damage or stress native trees, as well as cultivated shrubs and grasses, if not collected and abated. Human intrusion, and accompanying noise and disturbances which are necessarily the result of geothermal exploration and development activities, can adversely affect wildlife use of adjacent habitat. Species such as nesting raptors and some predators may be particularly sensitive to these factors. Mitigations include avoidance of sensitive areas, use of buffer zones, and possibly off-site replacement of lost or degraded habitat.

- Noise. A number of significant noise sources are associated with the development and utilization of geothermal resources. These include: heavy construction machinery, stationary diesel-powered engines and compressors used during well drilling, compressed air releases, power plant turbines, gas ejection, and cooling towers at power plants. Noise levels from drilling can reach approximately 90 decibels, and 80 decibels is common from a cooling tower. If sensitive receptors such as homes, schools, hospitals, or outdoor recreation areas are located close to a geothermal site, noise may lead to public annoyance and complaints. Noise shielding by terrain, vegetation, or equipment blankets can be used to reduce noise levels.

- Seismicity & Subsidence. Many geothermal resource areas are located in regions with a high frequency of naturally occurring seismic events. An issue is whether the withdrawal and/or injection of geothermal fluids may enhance the rate of seismic events or trigger a major earth movement. Experience with fluid injection in a number of nongeothermal situations has demonstrated that induced seismicity can be minimized or prevented by regulating injection pressures. The removal of large quantities of geothermal fluid from a geologic formation may result in land surface subsidence. Permanent and non-recoverable subsidence results from slow and long-term removal of fluids and from the compression of clay, silty materials, or shale above or below a geothermal reservoir. Subsidence problems can often be mitigated through the injection of spent geothermal fluids which serve to maintain the pressures within a reservoir.

- Land-Use. Land-use in the vicinity of high temperature geothermal developments will most likely be changed by the construction of roads, ponds, drill sites, wells, above ground pipelines, power plants, and power lines. Such changes in

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land-use can be most critical if they result in the loss or degradation of wildlife habitat. Land-use changes can be expected to have a minimum effect upon agricultural and forest production as normally less than 20% of a typical resource area is actually taken out of production by development activities. Mitigating measures include the use of buffers around critical habitats or adjoining uses, restriction of geothermal activities to noncritical time periods, avoidance of critical areas, project design or construction modifications, and compensatory replacement of lost or degraded habitat.

- Scenic Quality. A major source of visual impact will be drilling rigs, pipelines, generating facilities, cooling towers, and transmission lines. The effect of such facilities can be substantial in Siskiyou County where lands 10 to 20 miles distant are often visible, and where such facilities will often be viewed against a backdrop of scenic mountains and valleys. These effects can be mitigated with careful site planning that uses natural land forms and existing vegetation for screening, along with the design and painting of facilities to blend with the natural landscape as much as possible.

- Cultural Resources. Archaeologic and historic sites frequently are found either on or in the vicinity of many geothermal areas because of use of thermal and mineral spring sites by both Indians and early settlers. Where such sites have not been adequately surveyed, and where it is determined that there is a high probability that archaeologic or historic resources exist, it is important that an inventory be conducted before site development begins. If a potential archaeologic or historic site is found, geothermal work must stop and the significance of the site determined. If initial studies confirm that the site is important, it should be avoided. If avoidance is impossible, the site should be fully explored, documented, and possibly excavated and curated.

- Solid Waste. The principal geothermal solid wastes are drilling muds and rock cuttings from drilling operations; precipitated solids from spent geothermal fluids; removed scale from heat exchangers, flash tanks and piping; and sludge from cooling towers and any H_2S abatement process. The safe disposal of solid wastes is important due to potential toxicity and the large volumes of wastes which may be produced as development proceeds. Solid wastes which contain hazardous substances should be contained and isolated from possible leaching to ground or surface water, or the leachate may be treated in order to remove hazardous elements and materials.

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Of the issues summarized above, it appears that the County should give particular consideration to groundwater protection during low and moderate-temperature geothermal development; and that high-temperature priority concerns should be air emissions, water needs and quality impacts, noise, visual impacts, and effects on fish and wildlife habitat.

In considering high-temperature environmental and land-use issues, it should be remembered that such resource development is currently speculative. Insufficient exploration and testing have occurred to definitively characterize either geothermal resources or their potential impacts at any resource site in the County. Thus, a County priority must be monitoring and interpretation of geothermal prospects as they evolve, so as to focus on environmental and land-use issues that are genuinely relevant to the resources that are ultimately confirmed.

Regulatory Setting

The regulation of geothermal energy is primarily comprised of: 1) Division of Oil & Gas (DOG) oversight of all drilling of wells producing fluids above 86°F; 2) building and plumbing code regulations affecting heat pumps and direct-use installations; 3) siting of power plants and associated facilities; and 4) environmental quality regulations protecting groundwater, waste management, and other geothermal-impacted resources.

The County's primary geothermal regulatory instrument is the Zoning Ordinance, which again does not define "geothermal" as a specific energy activity. Current zoning is interpreted as follows:

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	Zones																
	RR	R1	R2	R3	R4	CR	CU	CC	CH	ML	MM	MH	AG1	AG2	TPZ	O	PD
Geothermal Facilities																	
Exploration	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Direct use	2	2	2	2	2	2	2	3	3	3	2	2	3	2	2	3	2
Power generation	2	2	2	2	2	2	2	3	3	3	2	2	3	2	2	3	2

1 Permitted use
2 Conditional use
3 Prohibited use
4 Not addressed

The Zoning Ordinance should be amended to insure that desired geothermal end-uses are not being inadvertently deterred, and to allow high-impact facilities only where deemed appropriate.

State regulation on private and State-owned lands occurs primarily through DOG standards for well drilling and resource conservation, and CEC siting of power plants with capacities of 50 MW or larger. The County would again be the lead agency for plants under 50 MW on private or State lands. Involvement of the State Lands Commission must also be considered when State-owned lands are affected (this involvement could be either as lead agency and/or responsible land owner).

Any geothermal activity on federal lands, regardless of type or size, requires a use permit and/or lease from the responsible federal land management agency and BLM (which is responsible for all federal minerals development regardless of overlying land management responsibilities).

Development Compatibilities at Resource Sites

Geothermal "development" refers to exploration and production of geothermal resources, and conversion of heat into either electricity or

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thermal energy. Geothermal resources will be negatively impacted by any activity that degrades the resource or impedes its utilization, such as an activity that causes a decline in temperature, flow rate, or subsurface static level. In addition to conflicts with the resource in its natural state, there is also the potential for conflicts during utilization for either power generation or direct-use purposes. This type of conflict would be one which inhibits or impedes the efficient and economical operation of equipment such as drill rigs, pipelines, generators, and other facilities needed for resource utilization.

Potential conflicts related to high-temperature drilling will fall into two categories: those that impair the ability to drill for the resource; and those that are caused by the drilling itself. The former would be a case where existing uses impede rig access and drilling operations, e.g. residences and/or businesses built over a resource site. Given the remote location of potential high-temperature resources in the County, it is believed that there is limited potential for such conflicts. Alternatively, the second category of conflicts includes temporary negative impacts to surrounding uses such as increased traffic, visual changes, wildlife disturbance, and noise.

The potential for power plant conflicts fall into the same categories as those for drilling: negative impacts to the plant from surrounding uses; and negative impacts to the surrounding uses from the plant. As with drilling, the former category relates to those uses which would impede or inhibit the construction and operation of a power plant. Examples include residential, commercial, resort and mining activities. The presence of these uses on or near a resource site would substantially limit the flexibility and efficiency of commercial-scale power generation.

Alternatively, a power plant could negatively impact all of these uses, along with agricultural, forestry, and other natural resources. The "industrialization" of a resource site with a power plant could adversely

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affect such uses in terms of air and water emissions, noise, visual changes, traffic, and other environmental consequences.

High-temperature drilling and power plant conflicts are summarized in Table 15. It is important to note that this is a broad summary of potential conflicts, and inasmuch as the nature and occurrence of geothermal resources are extremely site-specific, it will be necessary to evaluate development proposals in the future on a case by case basis to confirm and closely gauge such conflicts.

The potential conflicts associated with low and moderate-temperature development can be organized in the two categories used earlier for high-temperature resources: uses which impede or inhibit the development of low and moderate-temperature resources; and uses which may be adversely affected by such resource development. In both instances the conflict potential is substantially reduced from that associated with high-temperature resources. This is due to the predominant occurrence of the County's lower temperature resources outside of environmentally-sensitive areas; the similarity of resource production to conventional ground water well drilling and use; and the relatively small-scale and conventional type of equipment used in low-temperature applications.

These potential conflicts are summarized in Table 16. It is important to note that, as with high-temperature resources, low and moderate-temperature resource characteristics are site-specific, and consequently development proposals in the future must be evaluated on a case by case basis to confirm and gauge potential conflicts.

The economic consequences of geothermal conflicts will vary depending upon the type of resource, its location, and the extent or magnitude of conflicts. In the case of high-temperature resources the economic trade-offs of development conflicts could include:

Table 15

Potential Conflicts at High-Temperature Geothermal Resource Sites

Uses Which May Negatively Impact Geothermal Development	Nature of Conflict
Residential	Parcelization and construction impedes access to the geothermal resource, and limits flexibility in geothermal resource operations.
Commercial	Parcelization and construction impedes access to the resource, and limits flexibility in resource operations.
Resort/recreation	Parcelization and construction impedes access to the resource, and limits flexibility in resource operations.
Mining/quarrying	Parcelization and mining/quarrying impede access to the resource, and limits flexibility in resource operations.
Uses Which May be Negatively Impacted by Geothermal Development	
Residential	Industrialization of area.
Commercial	Industrialization of area.
Resort/recreation	Industrialization of area.
Mining/quarrying	Lost or impeded access to mineral deposits.
Agriculture	Lost or impede access to agricultural lands and industrialization of area.
Forestry	Lost or impeded access to timber and industrialization of area.
Open space	Loss of open space and industrialization of area.
Fish & wildlife areas	Displacement/disturbance of species in an industrialized area.
Scenic views/sites	Loss/degradation of scenic qualities in an industrialized area.
Water resources	Consumption/degradation of water in an industrialized area.
Historic/cultural areas	Loss/disturbance of historic/cultural qualities in an industrialized area.

This table is intended to illustrate a range of generalized potentials, but not necessarily the probability of such conflicts occurring. Each development proposal must be examined on a case-by-case basis to gauge specific conflicts.

Source: Criterion

Table 16

Potential Conflicts at Low and Moderate-Temperature Geothermal Resource Sites

Uses Which May Negatively Impact Geothermal Development	Nature of Conflict
Mining/quarrying	Lost/impeded access to geothermal area.
Uses Which May be Negatively Impacted by Geothermal Development	
Residential	Introduction of non-residential uses for geothermal utilization.
Commercial	Introduction of non-commercial uses for geothermal utilization.
Resort/recreation	Introduction of non-recreation uses for geothermal utilization.
Mining/quarrying	Lost or impeded access to mineral deposits.
Agriculture	Lost or impeded access to agricultural lands from introduction of non-agricultural use.
Forestry	Lost or impeded access to timber from introduction of non-forestry use.
Open space	Loss of open space from introduction of geothermal use.
Fish & wildlife areas	Displacement/disturbance of species from introduction of geothermal use.
Scenic views/sites	Loss/degradation of scenic qualities from introduction of geothermal use.
Water resources	Consumption/degradation of water from geothermal use.
Historic areas	Loss/disturbance of historic qualities from introduction of geothermal use.
Cultural areas	Loss/degradation of cultural values from introduction of geothermal use.

This table is intended to illustrate a range of generalized potentials, but not necessarily the probability of such conflicts occurring. Each development proposal must be examined on a case-by-case basis to gauge specific conflicts.

Source: Criterion

GEOTHERMAL
Continued

- Additional employment and payroll from drilling and power plant activities, depending on local versus out-of-County hiring. These gains could be offset, however, by reduced tourism and recreation in resource areas which have become industrialized, or by the timber or agricultural production lost from lands converted to geothermal uses.

- Increases in the local property tax base from installed geothermal facilities, and possible reductions in the tax rate. These could be offset, however, by increased demands for certain public services in resource areas, such as road maintenance and public safety.

Given the lack of geothermal development details currently available for County resource sites, it is difficult to accurately quantify these trade-offs. In general, however, the economic gains derived from geothermal development should be relatively small in comparison to the County's total economy, given the small number of persons likely to be permanently engaged in geothermal work. Alternatively, a reduction in tourism in industrialized resource areas could have a broad impact, depending upon the area in question and its number of visitors. In the case of Medicine Lake recreational visitation, there is a small fraction of the Countywide total. In terms of fiscal impacts to local governments, again geothermal development should have a relatively small positive effect on taxes.

In the case of low and moderate-temperature resources, the installed value of facilities may range from several thousand to several million dollars depending upon the end-use to which the resource is being applied. In many cases this type of resource may be replacing conventional fossil fuel, and therefore the County would see no substantive change in assessed valuation or tax rate. Similarly, a business that switches from conventional fuel to low-temperature geothermal will not create new or expanded demands on public services.

The work force required for low and moderate-temperature projects will be even smaller than that required for power generation; but,

GEOTHERMAL
Continued

unlike power projects, a majority of the necessary low-temperature labor skills already exist in the County such that these projects could employ more local residents than high-temperature projects.

The social consequences of geothermal development conflicts could include loss or degradation of recreational opportunities in geothermal areas that have become industrialized; and stress on community services and housing in resource areas from geothermal construction-related employment. The latter consequence is not considered highly probable given the relatively small size of the expected geothermal work force, and the negligible impact that such persons would have on local housing and community services. An exception might be a case where large numbers of construction workers temporarily burden lodging accommodations in the immediate vicinity of a resource site. In the case of Medicine Lake, many workers would use truck campers and trailers.

The more significant consequence stems from negative impacts to recreational opportunities near resource areas, where social activities such as camping, hiking, fishing, and hunting may be disrupted or degraded by the industrialization that accompanies high-temperature development. Again, these activities near Medicine Lake are relatively minor in volume.

As with economics, the scope and magnitude of social consequences are expected to be much smaller for low and moderate-temperature development. It is arguable that the limited type of conflicts associated with low and moderate-temperature resources will have negligible, if any, social consequences.

The environmental trade-offs of high-temperature geothermal development conflicts will center on site-specific negative impacts to surrounding uses, versus negative impacts to the region in general from continued use of fossil fuels, with their attendant environmental

GEOTHERMAL
Continued

problems, to meet the region's energy needs. Environmental consequences will vary considerably from site to site depending on resource characteristics and end-use. Typical issues were summarized in a previous subsection, indicating significant consequences if conflicts are not avoided or mitigated.

The environmental consequences of not developing geothermal resources would be manifested in the continued use of fossil fuels which have their own set of adverse environmental impacts. In terms of direct impacts to the County, however, it is doubtful that the generation of geothermal power in the County would cause a significant decline in fossil fuel emissions in local communities as a result of people switching to electricity. A more likely trade-off would be a scenario where a fossil-fueled power plant is not built at some other location in the region because of geothermal power coming on-line in the County.

The energy consequences of geothermal conflicts will revolve around the availability of geothermal resources to meet energy needs, versus use of efficiency improvements and other renewables or non-renewables to meet such needs. If conflicts are severe enough to prevent or seriously impede geothermal utilization, the end result will be greater reliance on other forms of energy and/or the implementation of additional energy efficiency improvements. The consequences of such reliance are generally judged in terms of the ability to reduce demand and the adequacy of other supplies and their cost-effectiveness (including environmental externalities).

In the case of low-temperature utilization, there appears to be potential for displacing conventional fuels presently used in the County at a savings over some present fuel costs. If development conflicts impede or prevent low-temperature utilization, it appears that the consequences will be localized in the immediate resource areas, such that consumers in those areas would be forced to continue their

GEOTHERMAL
Continued

reliance on more expensive and possibly non-renewable forms of energy.

Need for County Geothermal Facility Standards

Low and moderate-temperature resource applications normally occur in conjunction with typical residential, commercial, institutional, and agricultural uses. In many cases, low and moderate-temperature installations are simply heating systems roughly equivalent to conventional systems that would otherwise be installed in homes or businesses. This has been the experience to date with the buildings in the County that have low-temperature geothermal heating systems. Nonetheless, these resources are closely linked with the County's groundwater supplies, and they occur most commonly in populated areas having the greatest intensity of land-uses. These circumstances suggest that County geothermal standards should address low-temperature potentials beyond the DOG drilling regulations already in place.

High-temperature resource utilization involves the siting of not only power plants, but often also large numbers of wells, collection pipelines, and possibly electric transmission lines. Given that geothermal power generation is possible in the future near Medicine Lake, the County should consider formulating standards which would be used in two ways: 1) as advisory input to federal agencies during their environmental review and permitting processes; and 2) to apply on state and private lands that are interspersed with federal lands in the vicinity of Medicine Lake, and which may be crossed by geothermal-related facilities. Recognizing that the specifics of high-temperature geothermal development are still speculative, initial County standards should be relatively broad, with future amendments to the standards becoming more specific as resource characteristics and development parameters become better known.

WIND

Resource Inventory

Wind is a well-known means of generating electricity and mechanical shaft power. In recent years, interest in wind power has increased because of its environmental attributes and decreasing technology costs. Because of its relatively high elevations and mountainous terrain, Siskiyou County has been surveyed by both the CEC and PP&L for wind power sites. The resulting composite inventory is shown in Figure 25.

Unfortunately, most of the County has average annual wind speeds of less than 10 mph, which is generally considered to be the threshold for feasible wind power development (interviews with BPA and PP&L wind specialists confirmed 10 mph as an appropriate threshold for the near-term; this should be reexamined during the Element's first major update in five years). Within the entire County, only 34 sites have been found to exceed an annual average of 10 mph, and another two sites exceed 14 mph, which is considered to be a threshold for "excellent" power potential. Of the 34 "good" sites, less than a half dozen occur near populated areas; the balance are situated in remote areas of the Klamath and Shasta-Trinity National Forests. The two "excellent" sites, Mt. Eddy and Mt. Shasta, are located in federal wilderness and Natural Landmark areas, respectively, and are therefore off-limits to development.

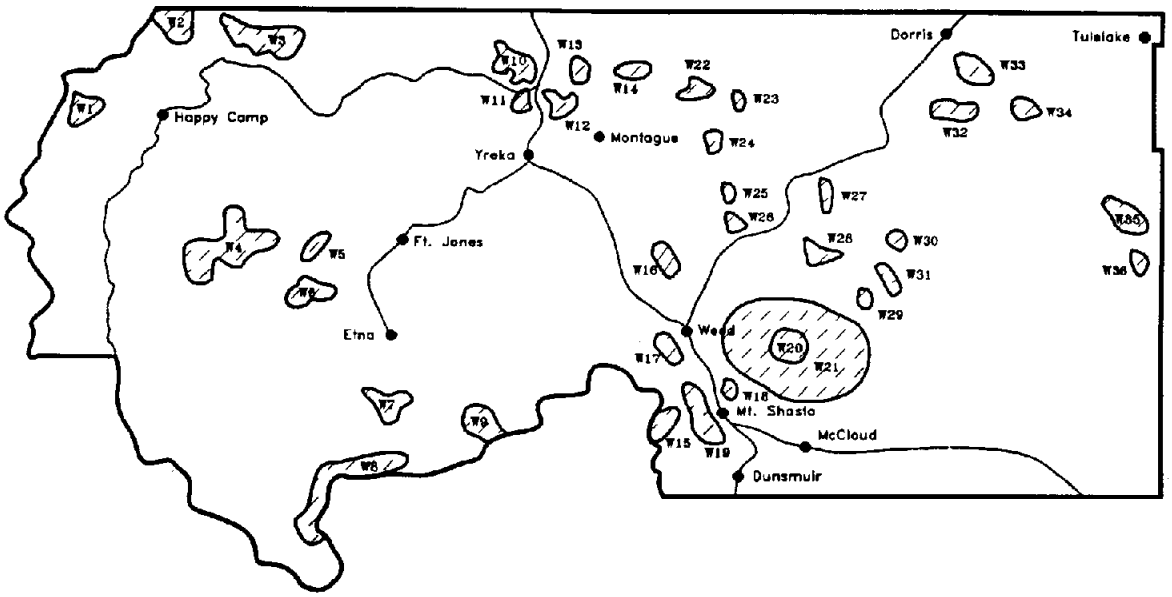
The CEC's Wind Atlas concludes that none of the Siskiyou sites has major development potential (ref. 65), and PP&L's studies reached the same determination (ref. 57). Also, the Klamath National Forest draft land management plan and the Shasta-Trinity plan does not designate any of the resource sites on the Forests as suitable for wind development (ref. 14).

Operating & Proposed Wind Facilities

Local interviews and agency inquiries were unable to reveal any operating wind power turbines in the County. There may be a very small number of units that are not widely known about, but it is

Figure 25

Generalized Wind Resource Locations



Site No.	Name	Site No.	Name	Site No.	Name
W1	Preston Peak	W13	Black Mountain	W25	Herd Peak
W2	Indian Creek	W14	Ager	W26	Cougar
W3	Red Butte	W15	Mt. Eddy	W27	Unnamed
W4	Medicine Mountain	W16	Dwinnell Reservoir	W28	The Whaleback
W5	Shackleford Creek	W17	Weed	W29	Ash Creek Butte
W6	Bear Peak	W18	Black Butte	W30	Haight Mountain
W7	Russian Peak	W19	Unnamed	W31	Unnamed
W8	Packers Peak	W20	Upper Mt. Shasta	W32	Sheet Mountain
W9	Craggy Peak	W21	Lower Mt. Shasta	W33	Unnamed
W10	Shaft Rock	W22	Willow Creek Mountain	W34	Mt. Dome
W11	Hawkensville	W23	Unnamed	W35	Mt. Hoffman
W12	NortheastHawkensville	W24	Goosenest	W36	Black Mountain

Source: Ref. 57, 61, 64-66. Additional resource mapping is available at the County Planning Department.

WIND
Continued

apparent that wind power generation, if any, is negligible in the County. The same interviews and inquiries revealed no knowledge of any planned wind facilities.

The absence of any operating or proposed wind facilities is not, however, necessarily a sufficient reason to completely dismiss the resource. Despite the unfavorable resource inventory above, there are a small number of wind sites on non-federal lands near population centers that might conceivably be developable in the future, particularly if technological advancements allow minimum wind speed thresholds to decrease.

Utilization Technologies

Wind power generation requires a tower-mounted set of blades that mechanically operate a turbine generator set. Wind turbine generators are available in capacities up to 4,000 kW, with the most common machines being sized at less than 400 kW. Utilization can occur using a single unit, or in a "wind farm" configuration of up to several hundred machines. Advances in equipment efficiency are continuing to occur, and over time wind turbines should be able to effectively operate at the lower speeds that characterize Siskiyou County's wind resources. Additional information on wind utilization technologies is given in references 66, 70, and 75.

Viability of Resource Use in Siskiyou County

The viability of wind power in the County is questionable, at least in terms of making significant contributions to the area's energy supplies in the foreseeable future. The lack of power generation-level wind speeds throughout most of the County undermines this resource's technical and economic merits in comparison to other renewables. The few areas with favorable wind speeds are significantly constrained by their isolated locations, environmental sensitivities, and federal ownership.

WIND
Continued

This is not to say that the resource should be totally discounted, as there may be limited instances where small wind turbines may be appropriate for a remote and limited electrical need. Also, technology monitoring applies here, in that minimum acceptable wind speeds for power generation are decreasing over time, and more County sites may reach the threshold of viability over the long term.

Environmental & Land-Use Issues

Most small-scale uses of individual wind turbines will have no significant environmental or land-use effects. However, collections of numerous wind turbines in "wind farms" may have impacts on biological and visual resources, land-uses, and noise levels.

The only potentially significant effect of wind generators on biological resources are bird kills resulting from collisions with wind turbines and their guy wires, and electrocutions. Visual landscapes are altered by the presence of numerous wind turbines, particularly if sited in open, higher elevation areas that are visually prominent. Land-use compatibility questions may arise if wind farms displace wildlife habitat or agricultural land, or if adjoining uses perceive the wind installations as detrimental to property values. Noise produced from wind farms may exceed ambient noise conditions, but research has shown no significant adverse effects on surrounding wildlife or residents. The need for programmatically mitigating these potential impacts in Siskiyou County, however, is not apparent because of the lack of resource potential described above.

Regulatory Setting

Wind turbines are probably the least-regulated of all renewable energy facilities. The only County regulation of wind facilities is through the following current zoning provisions (again generic, not specific to "wind" systems):

WIND
Continued

	Zones																
	RR	R1	R2	R3	R4	CR	CU	CC	CH	ML	MM	MH	AG1	AG2	TPZ	O	PD
Wind Facilities																	
Power generation	2	2	2	2	2	2	3	3	3	3	2	2	3	2	2	2	2

1 Permitted use
2 Conditional use
3 Prohibited use
4 Not addressed

Although large-scale wind development prospects are considered poor in the County, the Zoning Ordinance's treatment of such facilities should be clarified so as to not deter any future small-scale installations. Recommendations are given in the Element's Implementation chapter.

There is no state regulation of wind facilities, other than construction and safety standards that apply to all power generation facilities. An exception would be State Lands Commission involvement because of State-owned land involvement. Any wind facility on federal land would require a use permit and/or lease from the responsible land management agency.

Development Compatibilities at Resource Sites

The conflicts that may arise with wind development will depend on the size and scale of wind systems in question, e.g. a single small turbine installed for use at a single residence versus a wind farm of several hundred turbine machines covering several hundred acres of land. The potential for conflicts to occur, and the severity of such conflicts is substantially less in the former case than the latter.

WIND
Continued

The wind resource itself would be negatively impacted by any uses that could disrupt natural wind patterns, and thereby degrade the energy potential of the wind. Also, such surrounding uses could make it difficult to assemble large enough tracts of land needed for wind farm development, and impede normal operations of a wind farm facility in terms of traffic and human occupancy.

Alternatively, the uses which may be negatively impacted by wind development would be those that characterize the natural open space setting most often found in wind resource areas. In particular, the installation of wind turbines will create a sharp visual contrast to open spaces and scenic areas that do not generally contain large mechanical apparatus.

The economic consequences of these conflicts will be similar to those discussed previously for the other renewable resources. In the case of negative impacts to wind resources the economic consequences will center on lost employment and revenue that would otherwise have derived from wind development. Alternatively, in the case of negative impacts to surrounding uses, the economic consequences could be manifested in terms of reduced recreation in areas that had scenic or other related natural qualities diminished by the introduction of wind machines.

In terms of social consequences, the instances of negative impacts to wind resources should have negligible, if any, social implications. In the case of negative impacts to surrounding uses, the social consequences should be relatively limited, and centered on the diminished recreational opportunities eluded to in the foregoing paragraph. On the other hand, areas that have had wind facilities installed have discovered that these facilities, in some cases, actually attract new visitors seeking the social experience of observing such a unique energy system.

WIND
Continued

The environmental consequences of wind conflicts should be relatively limited. In cases of negative impacts to wind resources there should be not substantive environmental consequences. In cases of potential negative impacts to surrounding uses, the environmental consequences should be limited to the bird kills, noise, and potential land-use impacts described above, all of which should be mitigable.

In terms of energy consequences from these conflicts, wind development will be similar to the renewable resources previously discussed in that the energy value of the wind, if diminished or degraded by conflicts, might necessarily be replaced by continued reliance on conventional energy forms. There should be no substantive energy consequences in instances of negative impacts to surrounding uses.

Need for County Wind Facility Standards

Because the County's wind resources are considered to have poor development potential, there is no apparent need for wind-specific standards at this time. As with solar and biomass, a basic set of power generation policies should suffice in the unlikely event of a wind power proposal (which could then be supplemented with site-specific use permit conditions). This determination should be reexamined along with solar and biomass siting needs in five years during the Element's first major update.

HYDRO

Resource Inventory: Operating Facilities & Potential Facility Sites

Hydro resources are inventoried according to rivers and streams that have sufficient flow and hydraulic head to support electric generation, and existing reservoirs or diversion structures which could be retrofitted with generating equipment. Siskiyou County has a long-standing history of hydro utilization, with some of the region's first hydroelectric plants operating on local rivers since the early 1900's.

At present, operating hydro facilities include four moderate-sized installations totalling 70 MW of capacity; and an estimated 100 small and micro-sized installations ranging from one MW down to 20 watts of installed capacity each (for which there is no location data). The larger facilities are owned and operated by PP&L, while most of the smaller installations are used by residents for personal electric needs. Siskiyou County itself owns a 5 MW hydro plant at Box Canyon, the output of which is sold to PP&L. Agency inquiries reveal no record of the operating facilities causing major problems or nuisances.

Table 17 lists the operating hydro plants along with resource potentials at existing hydraulic facilities and undeveloped locations. Resource sites listed in Table 17 include only those reported by the Federal Energy Regulatory Commission (FERC) and California water agencies; other small and micro sites occur at many stream and creek locations throughout the County. Table 17's listing of FERC site numbers does not indicate an active project, but rather the theoretical hydro-generation potential reflected in hydro applications submitted to FERC to date. Interested persons should contact the California Department of Water Resources and the County Planning Department for additional surface water data.

Table 17

Hydro Resource Locations

Operating Facilities

Facility	FERC No.	Capacity (MW)	Location	Power Purchaser/ Owner
Copco #1	2082D	20.00	Copco Reservoir	PPL
Copco #2	2082C	27.00	Copco Reservoir	PPL
Cornwell	2987A	0.01	5 mi. W. of Somes Bar	PG&E/H. W. Cornwell
Fall Creek	2082B	2.20	Near Hornbrook	PPL
Irongate	2082A	18.00	Near Hornbrook	PPL
Lake Siskiyou	2796A	5.00	Near Dunsmuir	PPL/County
Lower Cold Springs	7059A	0.10	S.E. of Hornbrook	PPL/H. E. Foster
Prather Ranch	6634A	0.10	S. of Meiss Lake	PG&E/TKO Power
Shasta River	7400A	0.10	Near Yreka	PG&E/C. S. Difani
Upper Cold Springs	8726A	0.06	Upper Cold Springs	PPL/H. E. Foster

Potential at Existing Hydraulic Facilities

Facility	Capacity (MW)	Location	Owner
Shasta River	0.20	Lake Shastina	Montague WCD
Canal	0.07	Lower Pumping Station	Montague WCD

Potential at Undeveloped Locations

Facility	Previous/Current Proponent	FERC No.	Capacity (kW)
Irving Creek	Walker, Duane M.D.	5335X	1300
Rock Creek	Golden Wheel Hydro Ltd.	8586X	4600
Mill Creek	Ames, David	8648X	100
Little Salmon	Silver Wheel Hydro Ltd.	8587X	3890
Little Jackson Creek	Rust Hydro Gen Co.	4812X	900

Table 17

Hydro Resource Locations
Continued

Facility	Previous/Current Proponent	FERC No.	Capacity (kW)
Squaw Valley Creek	McCloud Community Service District	6257X	700
Upper McCloud 3	Santa Clara, City of	7556X	4500
Upper McCloud 2	Santa Clara, City of	7556X	7500
Upper McCloud 1	Santa Clara, City of	7556X	2080
M Fk Sacramento	Consolidated Hydro Inc.	4121X	3975
North Fork	Consolidated Hydro Inc.	4393X	1500
Little Castle Creek	Castle Creek Hydro	7928X	1500
Big Canyon	Williamson, Richard V.	7290X	100
Seiad Creek	Ames, David	8859X	200
Tomkins Creek	Rust Hydro Gen Co.	5139X	900
Kelsey Creek	Rust Hydro Gen Co.	5143X	900
Quartz Valley	Quartz Valley Hydro Ltd.	8592X	3150
Canyon Creek (3)	Consolidated Hydro Inc.	4086X	4620
Duzel Creek	Rust Hydro Gen Co.	5134X	900
Kidder Creek	Rust Hydro Gen Co	4811X	1000
Shackleford Creek	North State Hydro Inc.	4722X	3800
Drager-Jones-Timmons	Drager, Tery et al	9291A	25
Horse Range Creek	Rust Hydro Gen Co.	5135X	1100
French Creek	Rust Hydro Gen Co.	5131X	1400
Seiad Creek	Consolidated Hydro Inc.	4364X	1350
Dillon Creek	Consolidated Hydro Inc.	4377X	4600
Ukonum Creek (2)	Siskiyou Co. FC & WCD	5235X	7200
Copper & Twin Valley	Consolidated Hydro Inc.	4904X	2030
Sugar Creek	Rust Hydro Gen Co.	5133X	900
S. Fk Indian Creek	Consolidated Hydro Inc.	4368X	2200
East Fork Indian Creek	Consolidated Hydro Inc.	4075X	4700

Table 17

Hydro Resource Locations
Continued

Facility	Previous/Current Proponent	FERC No.	Capacity (kW)
W. Branch Indian Creek	Ames, David	8647X	200
Thompson Creek	Polk, Charles H.	9128X	400
Portuguese Creek	Consolidated Hydro Inc.	4391X	2270
Walker Creek	Seiad Valley Assoc.	7581X	1900
Grider Creek	North Valley Land Corp.	4493X	2200
L. Grider Creek	Consolidated Hydro Inc.	4327X	1370
Boulder Creek	Rust Hydro Gen Co.	5138X	900
Squaw Valley Creek 1	Sierra Powerquip Assoc. Inc.	5742X	260
Luckey	Luckey, Haward Paul	7279A	50
Horse Creek	Tift, Robert R.	5227X	1200
Hillside	Foster, John N. et al	9631X	100
Shasta River	Smith, Dewey B.	8835A	480
McKinney	Siskiyou Co. FC & WCD	4795X	3500
Dale Creek	Bennetts, Rick K.	7119X	400
Eddy Creek	Consolidated Hydro Inc.	4398X	1950
Little Shasta River	Townsend, Danie L. B. & Norma E.	4868X	2400
Parks Creek	Bennetts, Rick K.	7278X	1000

Source: Ref. 58, 60, 71, 72.

HYDRO
Continued

Utilization Technologies

Hydroelectric plants extract energy from falling or moving water. This requires vertical drop ("head") and water flow. Water from a higher level is delivered to a turbine, where the energy of the flowing water is converted into mechanical energy as the turbine rotates. Electricity is then generated by connecting the turbine to an electrical generator.

For in-stream projects, power is generated as stream flows allow or by using a dam to impound and store water so power can be generated as needed. Diversion projects divert water from a stream to a downstream powerhouse via canal or conduit. Hydro installations can range from very large facilities of several hundred MW down to very small units, known as micro-hydro, with installed capacities in the tens of kilowatts. Small or micro-hydro projects are normally constructed for remote residential or agricultural needs, and often have minimal, if any, impoundment or structural requirements. Additional information on hydro generation technologies is given in references 62 and 70.

Viability of Resource Use in Siskiyou County

The viability of hydroelectric generation has been thoroughly proven in Siskiyou County for decades using small and moderate-sized facilities. In terms of future viability, most knowledgeable sources agree that large projects, e.g. 5 MW or greater, will be difficult to site because of a lack of undeveloped large resource sites, and increasing environmental constraints that protect fish and wildlife habitat, water quality, and watershed hydrology at the expense of hydroelectric economic feasibility. In contrast, small and micro-scale facilities should continue to be viable because of their limited head requirements and typically negligible environmental impacts.

HYDRO
Continued

Environmental & Land-Use Issues

During construction and throughout the operating life of hydro projects, varying environmental and land-use effects can be expected, based on project location, type, size, and mode of operation. Principal issues include:

- Hydrology. Possible changes in the hydrologic regime resulting from hydro development include converting a portion of a free-flowing stream into backwater, diverting water from its natural course, and altering the natural groundwater recharge pattern. These effects can be mitigated by proper siting and maintenance of nearby aquifer levels.

- Water quality. Chemical, biological or thermal impacts on water quality may result from the construction and operation of hydro facilities. These impacts may be experienced downstream of the project or in the backwater caused by the project. Primary water quality concerns are thermal changes, nitrogen supersaturation, turbidity, and oxygen depletion. Potential mitigation could include periodic releases of reservoir water.

- Erosion and sedimentation. These problems may occur during hydro construction and continue after the project is operating. In general, sediment will settle in a reservoir because of the reduction and flow velocities, and as a result, increased sedimentation occurs in the backwater formed by the reservoir. Consequently, the water released from the reservoir has a reduced sediment load, and because the released water can carry a greater sediment load, channel scour may occur downstream of a hydro dam, which can have a significant impact on aquatic life and channel stability. Erosion control practices should be used to mitigate these effects.

- Fish and wildlife. Some hydro projects can present migration barriers to the passage of upstream and downstream anadromous fish. Operation of hydro facilities to meet peak energy demands may cause fluctuations of water levels in both impoundments and the stream below. Fluctuating water levels may preclude development of shoreline vegetation, reduce shoreline use by riparian species of wildlife, and lower the reproductive success of fish species that spawn near the impoundment. Mitigation measures can include siting studies, hydro facility size limitations, monitoring and flow adjustment programs, or off-site habitat replacement.

HYDRO
Continued

- Recreation, Cultural & Scenic Resources. Major hydro projects, especially those that create large reservoirs, may conflict with established recreation like fishing and rafting; may endanger cultural resource sites; and significantly alter the visual qualities of an area. Mitigation of these effects can be achieved through avoidance of recreation/cultural areas, and siting and design of facilities to blend with the natural landscape.

- Land-use. The amount of land required for a hydro project depends on the type and size of the development. For a large storage project, a large amount of acreage may be required; alternatively, the amount of land required for a micro-scale, run-of-river plant may be less than an acre. The industrial character of large hydro facilities may not be compatible with scenic or recreation areas, whereas micro-scale facilities should be compatible with virtually any land-use.

- Cumulative Effects. In addition to individual project impacts, the ability to install several facilities in a single watershed can lead to significant cumulative effects, particularly regarding water quality, hydrology, and fish and wildlife as described above.

It should be noted again that the foregoing issues generally relate to larger hydro projects, and small or micro-sized installations are often more benign. However, even multiple small projects in the same watershed can have cumulative effects which may warrant analysis and monitoring.

Regulatory Setting

The regulatory setting for hydro facilities is dominated by the Federal Energy Regulatory Commission (FERC), which has licensing authority for all hydro power plants regardless of size or location. A project located on federal lands would also require a use permit and/or lease from the responsible land management agency.

At the state level, the State Lands Commission has jurisdiction over all naturally navigable waterways and a Water Resources Control Board

HYDRO
Continued

water right permit is required, except in certain cases where the hydro developer is the riparian landowner. Also, any hydro project involving a dam will require Department of Water Resources approval.

At the County level, hydro facilities are regulated through the following current Zoning Ordinance provisions (again generic, not specific to "hydro"):

	Zones																
	RR	R1	R2	R3	R4	CR	CU	CC	CH	ML	MM	MH	AG1	AG2	TPZ	O	PD
Hydro Facilities																	
Power generation	2	2	2	2	2	2	3	3	3	3	2	2	3	2	2	2	2

1 Permitted use
2 Conditional use
3 Prohibited use
4 Not addressed

As with other renewables, consideration should be given to clarifying the Zoning Ordinance's definition of hydro facilities and specification of zones in which they are to be allowed.

Development Compatibilities at Resource Sites

The land-use and environmental compatibility of hydro development is discussed below for moderate to large-scale development scenarios. Small and micro-scale development should experience fewer or less intense conflicts, and the consequences of those conflicts should be less severe than described below for moderate to large-scale development.

The conflicts that could accompany hydro development are summarized in Table 18, indicating that there should be relatively limited potential for surrounding uses to negatively impact hydro resources. The only cases where the resource could be notably harmed by surrounding uses is expected to be either residential or

Table 18

Potential Conflicts at Hydro Resource Sites

Uses Which May Negatively Impact Hydro Development[a]	Nature of Conflict
Residential	Parcelization and construction impedes access to the hydro resource, and limits flexibility in hydro resource operations.
Resort/recreation	Parcelization and construction impedes access to the resource, and limits flexibility in resource operations.
Uses Which May Be Negatively Impacted by Hydro Development[a]	
Residential	Industrialization of area.
Resort/recreation	Industrialization of area.
Fish & wildlife areas	Displacement/disturbance of species surrounding a facility.
Scenic views/sites	Loss/degradation of scenic qualities in an industrialized area.
Water resources	Alteration of water flow surrounding a facility.
Historic/cultural areas	Loss/disturbance of historic/cultural qualities in an industrialized area.

[a] Moderate to large-scale hydro, e.g. 5 MW or larger. Smaller projects should experience fewer or less intense conflicts. This table is intended to illustrate a range of generalized potentially, but not necessarily the probability of such conflicts occurring. Each development proposal must be examined on a case-by-case basis to gauge specific conflicts.

Source: Criterion

HYDRO
Continued

resort/recreational development that results in parcelization and construction which impedes resource access and operational flexibility. Given the location of the County's hydro resource sites in generally remote and sparsely populated areas, the likelihood of such conflicts causing substantive harm to hydro resources is considered small.

Alternatively, the uses which may be negatively impacted by moderate to large-scale hydro development include the same residential and resort/recreational activities, but in this instance the adverse effect would be one of "industrialization" of an area where a hydro facility is installed, and the resulting degradation of qualities usually sought in residential or resort/recreation areas. More significant are the potential conflicts with other natural resources, such as fish, scenic qualities, and competing water uses, e.g. agricultural applications. In these instances the potential conflict could be an alteration of water flow in a river or stream that obstructs or creates hazards for fish migration; creation of an impoundment of water that floods other wildlife habitat or natural area; or degradation of scenic, historic, or cultural values by construction of a facility and its accessory equipment in a natural setting.

The economic consequences of these conflicts are expected to be relatively minor given the relatively limited employment and revenue impacts that would accrue from either diminished hydro output or negative impacts to surrounding uses. In the case of social consequences, it is expected that none would apply to cases of adversely affected hydro resources, with moderate social consequences in instances where negative impacts to surrounding uses resulted in diminished recreational opportunities.

The most notable consequence from hydro conflicts is expected to be environmental, where negative impacts to surrounding uses could have moderate to severe impacts on fish and wildlife, water quality, other water uses, and scenic qualities.

HYDRO
Continued

In terms of energy consequences, hydro conflicts are expected to be similar to the previously discussed renewable resources, where diminished hydro output would necessitate reliance on other energy forms. No substantive energy consequence would apply to cases of negative impacts to surrounding uses.

Need for County Hydro Facility Standards

Although the likelihood of major hydro development in the future is not high, consideration should be given to hydro-specific standards given the relatively large number of resource sites that have been inventoried; the continuing viability of small and micro-scale projects on a cumulative level; and the sensitivities of environmental resources potentially impacted by hydro development on both the individual project and cumulative levels.

ENERGY TRANSMISSION FACILITIES

Energy transmission facilities are electric lines carrying power or pipelines carrying thermal energy (e.g. natural gas, geothermal fluid). Transmission facilities are constructed and operated independent of power plants, and in conjunction with both renewable and non-renewable power plants. This section on transmission facilities is in the Element's renewable chapter because most of the County's future transmission development is likely to be linked to renewable resource projects. An exception may be future expansion of the interstate transmission corridor that crosses southeastern Siskiyou County carrying electricity and natural gas.

Existing & Proposed Transmission Facilities

Existing electric transmission lines were shown in Figure 6, along with the interstate natural gas pipelines that constitute the remainder of the County's existing transmission facilities. Based on local interviews and agency inquiries, no electric line or thermal pipeline proposals are pending or expected in the near future in the County. However, the following transmission situations warrant monitoring:

- New lines from potential Medicine Lake geothermal generation in Siskiyou County connecting with the interstate lines described above, or possibly other local lines. Virtually all of this would occur on federal lands, and is contingent upon further confirmation of geothermal resource viability for power generation. Timing is also uncertain since the lead developer, Unocal, recently put its Medicine Lake geothermal leases up for sale.

- Additional interstate transmission capacity that may be developed over the long term between California and the Pacific Northwest, including expanded use of the existing interstate corridor near Tulelake and Pondosa, most of which is on federal lands. See reference 5 for additional interstate transmission planning information.

It is notable that both of Siskiyou County's transmission development prospects occur in proximity to Modoc County, underscoring again the need for inter-county coordination.

ENERGY TRANSMISSION FACILITIES *Continued*

Environmental & Land-Use Issues

High-voltage electric lines and large thermal pipelines are linear energy facilities possessing a variety of environmental and land-use implications depending on the type of transmission facility and the area being crossed by the facility. Issues that are likely to be relevant to Siskiyou County transmission siting and operations include:

- Geology and Soils. Transmission towers and pipelines should avoid areas known to experience landslides, subsidence, and soil erosion or expansion. If unavoidable, impacts can be mitigated through geotechnically-engineered and specially constructed tower foundations, and stabilization of landslide or erosive areas.

- Biological Resources. Facilities may displace or degrade wildlife habitat, and overhead power lines may result in bird kills from collisions. Major habitat and migration areas should be avoided. Unavoidable impacts can be minimized through careful micro-level site planning or off-site replacement of unavoidable habitat losses.

- Cultural Resources. The linear nature of transmission facilities increases the potential for impacting cultural resources. Known concentrations of cultural resources should be considered at the earliest stages of transmission planning, and avoided wherever possible. Detailed site surveys will further reduce impacts, along with appropriate treatment of any encountered resources.

- Land-Use. Electric lines and thermal pipelines can raise issues of land-use conflict with forestry, agriculture, mining, recreation, and certain urban uses. Conflicts can involve loss or degradation of resource lands (space lost to tower foundations and difficulty in maneuvering agricultural equipment around them); perceived health and safety concerns, particularly the health effects of electromagnetic fields; and visual or aesthetic concerns in areas unmarred by utility-type structures. Mitigations recommended for these potential impacts include routing transmission lines away from population areas, prominent visual sites, and prime agricultural and forestry lands; and using facility designs, materials, and colors that blend with the natural landscape.

ENERGY TRANSMISSION FACILITIES *Continued*

The last issue of land-use is particularly relevant in Siskiyou County where transmission corridor jurisdiction may often pass back and forth between a federal land management agency and the County as the transmission line crosses in and out of differing ownerships. Land-use coordination is essential in these circumstances because of the need for some amount of linear consistency in facility policies and standards.

Regulatory Setting

The regulation of transmission facilities is an area dominated by state authorities, followed by federal agencies if federal lands or state boundaries are crossed, and finally, to the least extent, by local governments.

The state's authority can be applied in two ways: CEC siting of certain electric lines and California Public Utility Commission (CPUC) licensing of certain other types of lines. Detailed agency authorities are given in Appendix E.

Federal regulation is involved if transmission facilities are interstate in nature (thereby requiring a FERC license) and/or if located on federal lands (thereby requiring a use permit from the responsible land management agency).

County authority for regulating transmission facilities resides in the state enabling legislation for land-use planning and zoning, where local governments are specifically authorized to regulate power lines through general plans and zoning ordinances. Local governments also provide right-of-way dedications and easements for transmission lines via their subdivision powers.

Siskiyou County presently zones transmission facilities generically as "public utility structures" as follows:

ENERGY TRANSMISSION FACILITIES
Continued

	Zones																
	RR	R1	R2	R3	R4	CR	CU	CC	CH	ML	MM	MH	AG1	AG2	TPZ	O	PD
Transmission Facilities																	
Electric lines	2	2	2	2	2	2	3	3	3	3	2	2	3	2	2	2	2
Thermal pipelines	2	2	2	2	2	2	3	3	3	3	2	2	3	2	2	2	2

1 Permitted use
2 Conditional use
3 Prohibited use
4 Not addressed

As with renewable resources, consideration should be given to clarifying the Zoning Ordinance's definition of transmission facility types and the zones in which they are to be allowed.

Although many state and federal agencies maintain that their legal authorities preempt local permitting, most California counties continue to ask for and receive use permit applications from transmission facility developers. The State Public Utility Code specifically requires municipal utility districts to obtain consistency statements from counties impacted by MUD lines.

Development Compatibilities Along Transmission Corridors

Transmission facilities should be examined for land-use and environmental conflicts similarly to renewable resources, since their physical impacts can be equally significant, particularly if a lengthy transmission corridor crosses a considerable distance. Table 19 summarizes potential conflicts along transmission corridors as was done previously for renewable resources.

Table 19

Potential Conflicts Along Transmission Corridors

Uses Which May Negatively Impact Transmission Corridors	Nature of Conflict
Residential	Parcelization and construction impedes access and limits flexibility in operations and maintenance.
Commercial	Parcelization and construction impedes access and limits flexibility in O&M.
Mining/quarrying	Parcelization and mining/quarrying activities impede access and limits flexibility in O&M.
Uses Which May be Negatively Impacted by Transmission Corridors	
Residential	Transmission access/clearance requirements.
Commercial	Transmission access/clearance requirements.
Agricultural	Transmission access/tower footing requirements.
Resort/recreation	Transmission access/clearance requirements.
Mining/quarrying	Lost or impeded access to mineral deposits.
Fish & wildlife areas	Displacement/disturbance of species.
Scenic views/sites	Loss/degradation of scenic qualities.
Historic areas	Loss/disturbance of historic qualities.
Cultural areas	Loss/degradation of cultural values.

This table is intended to illustrate a range of generalized potentials, but not necessarily the probability of such conflicts occurring. Each development proposal must be examined on a case-by-case basis to gauge specific conflicts.

Source: Criterion

ENERGY TRANSMISSION FACILITIES
Continued

These conflicts include incompatibility with the parcelization and structural characteristics of residential and commercial areas; incompatibility with the parcelization and cultivation requirements of agricultural areas; incompatibility with parcelization and excavation associated with mining and quarrying; and degradation of natural resources (fish and wildlife, scenic, historic/cultural) when transmission facilities encroach upon significant natural areas.

The economic consequences of these conflicts can be significant if a large transmission facility is in question, e.g. major rerouting to avoid sensitive wildlife habitat; and the social consequences could be moderate to significant if a particularly-valued community resource is diminished, e.g. a large power-line crossing a scenic site.

The energy consequences of transmission conflicts could be equally significant if the distribution of power-plant output is hampered in any way. The alternative consequences are environmental, and they too could be significant if sensitive environmental resources are lost or diminished.

In order to avoid or minimize these conflicts, and achieve a balanced trade-off between competing needs (agricultural lands protection versus economical line routing), existing transmission corridors should be fully utilized before new corridors are created; and if new corridors are necessary, their planning should be thoroughly coordinated with affected landowners and responsible agencies.

ENERGY TRANSMISSION FACILITIES *Continued*

Need for County Transmission Facility Standards

Given the possibility of increased renewable power generation over the Element's planning horizon, it is equally probable that existing electric lines will have to be upgraded, or in some cases, new lines constructed. Thermal pipeline activities may include further expansion of the existing interstate natural gas pipeline, and pipeline systems collecting geothermal resources from various well heads for delivery to a common power plant. Therefore, consideration should be given to adopting transmission facility policies and standards so that transmission developers are clearly aware of County expectations regarding the environmental, land-use, and health and safety compatibilities of such facilities.

POTENTIAL RENEWABLE SUPPLY SUMMARY

Table 20 summarizes inventoried renewable resource potentials in terms of their perceived development likelihood and potential contribution to future energy supplies (based on conservative estimates of achievable installed capacities over the next 18 years). In total, the estimated potential output of these resources exceeds the additional one trillion Btu/yr needed in the County by 2010. However, all of the output cannot be credited towards Siskiyou's needs since some of the electrical generation would most likely be exported. Nonetheless, it is apparent that the County's future incremental energy needs can be met by a combination of local renewables and the 720 billion Btu/yr in efficiency opportunities identified previously.

Table 20

Potential Renewable Energy Supply Summary (1992-2010)

	Direct Applications		Power Generation	
Renewable Resource	**Resource Viability**	**1992-2010 Countywide Potential (Billion Btu/yr)**	**Resource Viability**	**1992-2010 Countywide Potential (MW)**
Solar	Countywide occurrence of favorable resource values.	5.0	Favorable for small-scale PV but not large central station.	2.0
Biomass	Widespread availability of firewood.	Slight decrease in current per capita use due to equipment efficiency improvements.	Limited potential for small wood-fired plant contingent upon healthy timber economy.	5.0
Geothermal	Widespread occurrence of low-temperature resources; also moderate-temperature in Butte Valley.	1.0	Favorable potential at Medicine Lake.	50.0
Hydro	N/A	N/A	Favorable small and micro locations in western County.	3.0
Wind	N/A	N/A	Limited.	Under 1.0

Source: Criterion

AFFECTED COUNTY RESPONSIBILITIES

This chapter of the Element again concludes with Table 21 showing the affected County responsibility matrix used throughout the Element to identify energy issues that warrant attention through County policies or standards.

Table 21

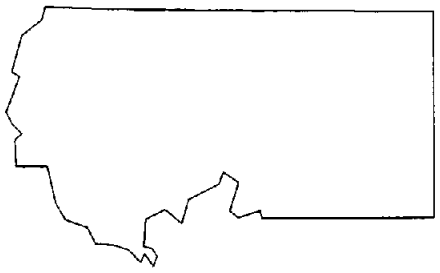
County Responsibilities Affected by Renewable Resources

Renewable Resources	County Responsibilities: Land-Use	CEQA & CCAA	Bldg. Code	County Facilities/ Vehicles	County Power Generation
Solar	Potential need for direct thermal and PV access protection and incentives.	N/A	Title 24 enforcement.	Potential for direct thermal installations on County buildings.	Potential for PV installations on County buildings.
Biomass	Forest Service dominated policy area; need for County advisory input.	Wood burning air quality and forest ecosystem implications.	Heating equipment code enforcement.	N/A	N/A
Geothermal	Potential need for high-temperature facility standards if resources are developed.	Potential comprehensive natural resource impacts if high-temperature resources are developed.	Low-temp. heating equipment code enforcement.	Potential for additional low temperature installations at County facilities.	Potential for County-owned generation projects.
Hydro	Potential need for minimum facility standards if previous proposals are reactivated.	Potential hydrology, fish, riparian impacts.	N/A	N/A	Potential for additional County-owned projects.
Wind	N/A	N/A	N/A	N/A	Limited potential for County-owned projects.

Source: Criterion

COUNTY ENERGY STRATEGY

- *Significant Issues*
- *Future Energy Alternatives*
- *Recommended Energy Strategy*



SIGNIFICANT ISSUES

This chapter of the Energy Element assembles the Element's findings into a set of significant issues; describes alternative future energy scenarios that derive from the issues; and presents a recommended strategy for achieving a preferred energy future.

Issue 1: Current Energy Sources

The County's energy resource portfolio is dominated by imported sources. The entire transportation sector is dependent upon petroleum imported from outside the County, and much of the County's electricity comes from outside generation sources. Gasoline and electricity dwarf the much smaller supply shares of fuel oil, propane, firewood, solar, and geothermal. Additionally, the diversity of sources is limited by the absence of natural gas in the County. There is a need to further diversify supplies, particularly transportation sector fuels. Except for transportation fuels, this can be done through a combination of efficiency improvements, expanded direct applications of renewables, and development of renewable power generation. Transportation fuels can be diversified through the introduction of alternative fuels such as methanol and electric-powered vehicles. There is also a need for a local contingency plan in the event outside supplies are disrupted, e.g. a gasoline shortage as a result of an international oil crisis.

Issue 2: Present and Future Energy Needs

Total Countywide energy use is presently estimated at eight trillion Btu per year, at an annual cost of approximately $80 million. Of this amount, transportation is the largest end-use sector at about 57% of the total, followed by the residential sector at 28%. Assuming growth in energy demand consistent with population growth, the County will require an additional one trillion Btu/yr by 2010. This future need could be even larger if local energy use efficiencies continue to worsen as they have in recent years. Siskiyou's citizens, businesses,

SIGNIFICANT ISSUES *Continued*

and local governments cannot afford to meet growth-induced energy needs while also tolerating economically-wasteful and environmentally-harmful energy inefficiencies.

Issue 3: Energy and the Local Economy

Annual Countywide energy expenditures are equivalent to roughly 16% of the local economy's annual output (measured in gross product values), while local energy jobs equate to less than 3% of Countywide employment, illustrating the significant "leakage" of energy expenditures out of the local economy. This "leakage" can be reduced through energy efficiency and local renewable investments that have much larger multiplier effects within the local economy than continued expenditures for imported supplies. Energy efficiency investments, in particular, have greater labor intensity and need for local goods and services. A concerted and coordinated effort amount citizens, businesses, utilities, and local agencies could produce meaningful economic results, e.g. jobs created in a weatherization program.

Issue 4: Energy Efficiency Potentials

The most inexpensive and environmentally-sound options for meeting future growth in energy demands are usually efficiency improvements. The County has particularly significant opportunities for improving the efficiency of its energy use given its reliance on single-occupant auto travel and the area's large number of older, unweatherized buildings. Approximately $11.5 million/yr in direct and indirect savings and economic benefits are possible if an aggressive commitment to improving efficiencies by 10% is made. This could mean as much as $400/yr in new disposable income for a typical Siskiyou family; direct improvement in the profitability of Siskiyou businesses; and dozens of new jobs providing efficiency goods and services. The issue is largely one of informing people about the value and benefits of

SIGNIFICANT ISSUES
Continued

investing in efficiency measures, and the technical and financial assistance sources that are available to help them.

Issue 5: Renewable Resource Potentials

After efficiency improvements, the County's next best self-sufficiency options are its renewable resources: solar, biomass, geothermal, and hydro (wind is not considered because of limited resource values). The main issues are sustainable management of resource output and protection of the surrounding environment during resource utilization. Resource-specific issues include: solar access protection and aesthetic integration of solar equipment; air quality and forest ecosystem impacts of firewood use; groundwater protection during low and moderate-temperature geothermal use; high-temperature geothermal environmental and land-use compatibility (with multiple sub-issues); protection of fish habitat and hydrology affected by hydro projects. Related to renewable development are transmission facility issues, including biological and cultural resource impacts, and land-use compatibility.

Issue 6: Environmental Monitoring and Mitigation

Increased use of renewables in direct applications and power generation will similarly increase the need for monitoring surrounding environmental conditions and assuring energy facility compliance with applicable environmental standards. The occasional local exceedence of air quality standards for particulates as a result of wood stove smoke and the near exceedence of ozone standards as a result of auto emissions is evidence that environmental quality thresholds can be reached even in small communities with generally excellent ambient conditions. This issue has County staff and budget implications because of the technical disciplines involved, and the County's limited resources for environmental monitoring. If adequate monitoring and compliance is to be achieved, it will likely require

SIGNIFICANT ISSUES *Continued*

substantial reliance on project developer funding and state and/or federal agency technical assistance.

Issue 7: Energy Facility Standards

If a meaningful amount of the County's renewable potential is to be achieved in a timely and orderly manner, it will be important to establish clear and objective policies and standards for renewable projects that: 1) reflect local consensus on acceptable facility siting and performance characteristics; and 2) clearly communicate those expectations to prospective developers and thereby encourage proposals designed to meet County expectations. This will allow development to occur more expeditiously and with less controversy, thereby ultimately helping to achieve long-range renewable goals.

Issue 8: Resource Inventories and Technology Monitoring

Achieving a meaningful amount of the County's renewable potential will also require an increasing information base about resource locations, quantities, and qualities. Expanding the resource information base reduces uncertainties and risks, allows for optimized facility designs, and supports greater public awareness of energy potentials generally. Similarly, the energy technology information used for local decisions on facility siting and performance must be regularly updated to include equipment advances and newly viable pollution control technologies.

Issue 9: Agency and Utility Coordination

In order to effectively address all of the foregoing issues, Siskiyou County must coordinate its energy planning with the following key entities: 1) the utilities that produce and distribute energy in the County; 2) independent power producers selling power to the grid; 3) the Forest Service and BLM, which dominate much of the County's

SIGNIFICANT ISSUES
Continued

land and resource management; 4) state and federal energy regulatory agencies, whose actions should be as consistent with County policies as is achievable; and 5) coordination with adjoining counties that have resource areas and/or transmission corridors shared in common with Siskiyou County. In particular, cooperation with Modoc County should be a priority because of the shared interstate transmission corridor, Medicine Lake geothermal area, and the Tulelake/Newell gas/coal plant site. Since both counties must address many of these issues in an advisory manner through federal processes, the weight of their federal input will be strengthened to the extent it represents a consistent position among affected local jurisdictions, e.g. common geothermal facility standards.

FUTURE ENERGY ALTERNATIVES

Depending on how the foregoing issues are addressed, the County has four alternative energy futures ahead of it:

- No action or "business as usual". In this case, the County would not take any special actions to improve its energy circumstances. Most supply decisions would continue to be made outside of the County, and the efficiency of energy usage inside the County would not receive special attention, nor would local renewable development. A large majority of citizens' and businesses' energy expenditures would continue to flow out of the local economy. Under this scenario, nearly all of the County's future need for an additional one trillion Btu/yr would have to come from more imported conventional supplies. The non-renewable fuels among these conventional supplies would, in turn, continue to degrade the environment, particularly air quality affected by auto and truck pollutant emissions.

- Energy efficiency improvements. This alternative would prioritize efficient use of energy as an important goal of the County, with emphasis on reducing usage, minimizing expenditures, and insuring that what expenditures do occur have the greatest local economic multiplier effects. Under this alternative, about 75% of the County's future growth in energy demands could be met by efficiency improvements, with the balance coming from more imported conventional supplies. This alternative would have notable beneficial effects on the environment because of reductions in air pollution from autos and inefficient building heating.

- Renewable resource development. In this case, County actions would be targeted towards renewable resource development as a means of reducing imported energy, creating jobs, and generating supplies for local use and perhaps export. The County's renewables are theoretically capable of meeting all future increases in local energy demands, but because some renewable electric output would inevitably be exported (due to greater demand and higher electric prices in other markets), this scenario would also require additional imported conventional supplies. This alternative carries the greatest potential for environmental impacts given the effects that some renewable technologies can have on surrounding natural resources. Thus, its selection would establish the need for a local policy and regulatory framework that could avoid or mitigate adverse renewable development impacts.

FUTURE ENERGY ALTERNATIVES *Continued*

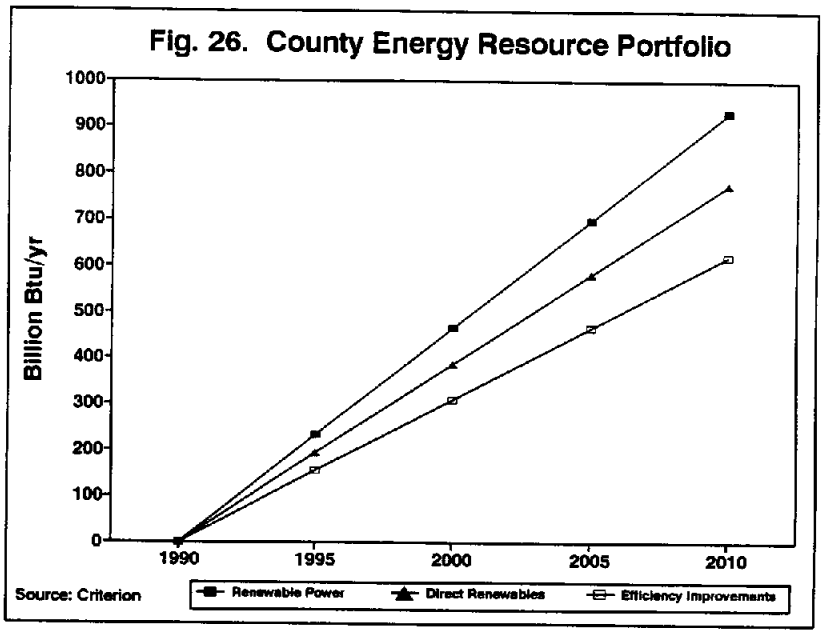
- Energy efficiency and renewable development. This alternative combines energy efficiency with renewable development in order to achieve maximum supply portfolio diversity, local self-sufficiency, and economic and environmental benefits. In this case, all of the County's future need for an additional one trillion Btu/yr could be met by local resources: approximately 75% through efficiency improvements, and 25% through new renewable utilization. Environmentally, this alternative represents the best possible combination: maximum reliance on efficiency measures that directly translate into environmental quality improvements; supported by renewable generation that reduces non-renewable fuel consumption without having to put maximum reliance on renewable capacities.

Of these alternatives, the fourth is clearly preferable if a reliable, affordable, and environmentally-sound energy future is to be achieved. In particular, the "efficiency/renewable" alternative is the strongest re-enforcement that can be given to local economic goals, since both efficiency improvements and local renewables can contribute significantly to local employment and economic competitiveness.

The "efficiency/renewable" alternative also carries a major responsibility for environmental protection because of the still significant long-term dependence placed upon the County's natural resources. Thus, the preferred fourth alternative becomes a three-fold scenario: efficiency improvements, renewable development, and environmental protection.

RECOMMENDED ENERGY STRATEGY

Figure 26 presents the mix of efficiency and renewables that can be developed over the Energy Element's planning horizon to achieve the preferred future just described. This resource portfolio should be able to accommodate the County's projected 2010 population without having to rely on additional imported supplies.



The strategy recommended for achieving the preferred resource mix includes the following four components:

1. The County should proactively seek a diversity of energy supplies, and support the use of resources and technologies that improve local economic self-sufficiency and environmental quality.

2. Most of the County's future growth in energy needs should be met by increased efficiency and direct application renewables

RECOMMENDED ENERGY STRATEGY *Continued*

since these are usually the least expensive and most environmentally benign resource options. The County should particularly work to improve the efficiency of its transportation sector since it consumes more than half of all the energy used in the County. And building retrofit programs should be promoted because existing structures are the largest untapped source of energy efficiency opportunities in the County's residential, and commercial, and local government sectors.

3. Local governments should implement all cost-effective energy efficiency improvements in their buildings and vehicle fleets to make savings available for other public services, and to set a leadership example for their constituents.

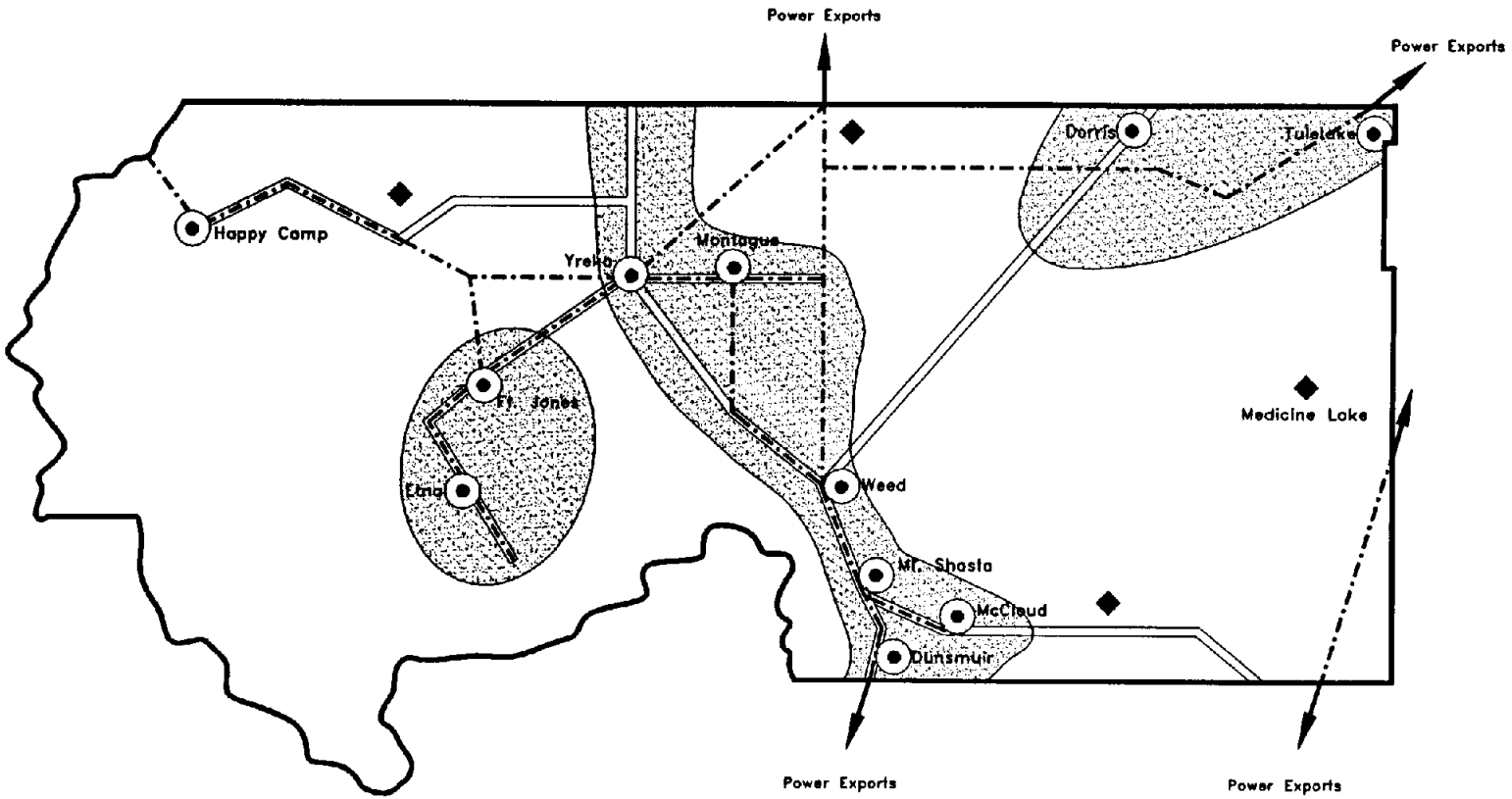
4. Energy education and information dissemination should be stressed to help citizens and businesses make informed decisions about energy options and costs, and their impacts on the local economy and environment.

Execution of this strategy should enable Siskiyou citizens and businesses to obtain the reliable, affordable, and environmentally-sound energy future which they desire. Figure 27 is a conceptual vision of what this strategy can achieve by the year 2010 if a strong commitment is made to its implementation.

The following chapters of the Energy Element elaborate on the strategy through goals for each of the end-use sectors, and policies and implementation measures designed to achieve the goals on a day-to-day basis.

Figure 27

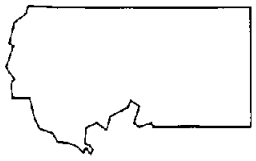
Conceptual Achievements of County Energy Strategy by 2010



Source: Criterion

GOALS & POLICIES

- *Energy Needs*
- *Land-Use & Transportation*
- *Buildings*
- *Commerce & Agriculture*
- *Community Services*
- *Renewable Resources*
- *Energy Facilities*



OVERVIEW

This chapter of the Element contains General Plan goals and policies to achieve the preferred energy strategy of local efficiency and renewable resource use. Goals and policies are presented according to the following topics:

- Energy needs
- Land-use and transportation
- Buildings
- Commerce and agriculture
- Community services
- Renewable resource use
- Energy facilities

The Energy Element's goals are similar to others in the County General Plan, in that they set a general direction for guiding community efforts. The Element's policies, in turn, indicate a clear County commitment to a specific circumstance or procedure. The policies are effectuated by implementation measures presented in the following chapter of the Element.

ENERGY NEEDS

Goal

A diverse, least-cost energy supply portfolio that is in balance with County energy demands; with an ability to accommodate future energy needs in a reliable, affordable, and environmentally-sound manner; and which gives priority to local self-sufficiency.

Policies

1. Proposed energy projects and programs shall be evaluated, in part, by the degree to which they support goal achievement.

2. The County shall monitor state and regional energy planning processes to identify potential local impacts; and where appropriate, shall participate in such processes to advocate local energy goals and policies.

3. Cooperative efforts shall be encouraged among local agencies and energy utilities to promote energy awareness and recognize energy accomplishments in the County.

4. At least every five years, the County Planning Department shall update the Energy Element to reflect changing energy conditions and determine any need for additional Energy Element provisions.

5. Citizens, businesses, and affected utilities and agencies shall be provided with opportunities to participate in all phases of County energy planning and decision making.

EFFICIENT LAND-USE & TRANSPORTATION

Goal

An arrangement of land-uses and transportation systems that maximize the efficiency of all forms of energy use based upon sound economic principles. A specific objective of this goal is a 10% improvement in 1990 transportation energy efficiencies on a per capita basis by the year 2010.

Policies

6. County land-use planning shall seek an arrangement of uses that minimizes energy needed for transportation, buildings, and infrastructure. This shall be accomplished through:

   a) Compact residential and commercial areas that reduce travel and infrastructure distances among uses.

   b) Mixed uses that can meet a variety of needs at one location and thereby reduce travel and infrastructure requirements.

   c) Location of residential and commercial uses in close proximity to main transportation routes, to facilitate future development of transit service.

   d) Location of new uses in close proximity to existing infrastructure to minimize extension requirements.

7. Land developments shall be encouraged to use natural land forms to enhance building energy efficiency, including techniques such as use of south-facing slopes for optimum solar exposure, and use of topography and existing vegetation for shielding buildings from winter winds.

EFFICIENT LAND-USE & TRANSPORTATION
Continued

8. Land development designs that encourage solar energy utilization shall be encouraged, including orientation of streets and lots on an east-west axis to the greatest extent practical.

9. The reduction of single-occupant vehicle travel shall be encouraged through measures that achieve more passengers per vehicle, including car pools and public transit, and development patterns that provide favorable access to alternative transportation.

10. Pedestrian and bicycle travel shall be encouraged wherever practical, including site design and facility improvements dedicated to these modes as part of major development projects.

11. The reduction of vehicle trips through telecommuting shall be encouraged by allowing home-based occupations, and by encouraging telecommunication systems that connect outlying residents and businesses with services in urban areas.

12. The County Planning Department shall maintain and distribute basic reference information and referrals for persons interested in energy efficient land-use and transportation techniques.

EFFICIENT BUILDINGS

Goal

Construction, operation, and maintenance of residential and non-residential buildings to be as energy efficient as practical in consideration of sound economic principles. A specific objective of this goal is a 10% improvement in 1990 building energy use efficiencies on a per capita basis by the year 2010.

Policies

13. The County shall cooperate with energy utilities and other local agencies in promoting energy efficient building construction and renovation practices, particularly weatherization of inefficient dwellings.

14. The County Building Inspector shall not only enforce Title 24 energy efficiency standards, but also encourage builders to exceed Title 24 where cost-effective.

15. Landscaping shall be encouraged as a means of enhancing building energy efficiency, including winter wind shielding and summer shading.

16. Direct thermal solar applications shall be encouraged where cost effective, including passive measures such as orientation and sunspaces, and active systems for space and domestic hot water heating.

17. The County Building Inspector shall maintain and distribute basic reference information and referrals for persons interested in energy efficient building construction practices.

EFFICIENT COMMERCE & AGRICULTURE

Goal

Operation of business and agricultural enterprises as energy efficiently as possible based upon sound economic principles. A specific objective of this goal is a 10% improvement in 1990 business and agricultural energy efficiencies on a per capita basis by the year 2010.

Policies

18. Local business and agricultural participation in utility and agency efficiency programs shall be encouraged. The County shall request that local economic development efforts include distribution of business energy assistance information; and the County Agriculture Department shall maintain the same energy efficiency information and referral capabilities as the Planning Department and Building Inspector.

19. The County shall request that local economic development efforts monitor energy utility and agency programs for demonstration or pilot projects testing efficiency approaches or technologies relevant to Modoc business conditions and needs; and participate in such pilot projects where appropriate.

EFFICIENT COMMUNITY SERVICES

Goal

Construction, operation, and maintenance of community services and facilities as energy efficiently as possible based upon sound economic principles. A specific objective of this goal is a 10% improvement in 1990 community service energy efficiencies on a per capita basis by the year 2010.

Policies

20. Energy efficiency shall be included as a selection criteria in all future County purchases of energy-consuming equipment and vehicles.

21. All future construction of new County facilities shall incorporate energy efficiency measures deemed to be cost-effective within the projected life of the facility.

22. The operation and maintenance of all existing County facilities shall include energy efficient practices wherever practical, and all major facility renovations shall include cost-effective efficiency improvements.

23. Any County leasing of privately-owned building space shall include provisions that minimize the cost of energy to the County for occupying the space.

24. All other local governments and agencies in the County shall be encouraged to adopt and implement similar efficiency policies in order to improve Countywide public sector energy efficiencies.

RENEWABLE RESOURCE USE

Goal

The technically and environmentally-sound use of renewable energy resources for direct application and power generation purposes. An objective of this goal is increasing the amount of current local renewable use, and sustaining such use over time without adverse effects to energy resources or the surrounding environment.

Policies

25. Public and private sector efforts to further identify and characterize local renewable energy resource potentials shall be encouraged, including technical and scientific surveys that define resource locations, quantities, and/or qualities, thereby enabling better informed evaluations of development probability and potential impacts.

26. The potential for renewable resource use in County-owned facilities shall be examined and incorporated during new construction and major renovations if found to be cost-effective within the projected life of the facility.

27. When reviewing and commenting upon new construction and major renovation proposals of all types, the County Planning Department and Building Inspector shall encourage consideration of renewable resource uses and provide information and technical assistance referrals accordingly.

28. Use of renewable resources for power generation or thermal energy production in amounts of 500 kW or more (or the thermal equivalency thereof) shall only be approved after technical documentation and analysis has confirmed a sufficient resource base to sustain the power generation or thermal production over the useful life of the proposed generation or production facility; and also confirmed a lack of significant negative effects on any surrounding renewable resource generation or production already in operation.

ENERGY FACILITIES

Goal

Thorough and expeditious evaluation of energy facility proposals; siting of such facilities in a timely, orderly, and environmentally-sound manner; and assurance of the compatible and environmentally-sound operation, maintenance, and eventual abandonment of such facilities.

Policies

29. For purposes of applying Policies 30 through 40, "energy facilities" shall be defined as those which use any type of fuel or energy resource to produce electrical power or thermal energy of 500 kW capacity or more (or the thermal equivalency thereof); and those which transmit electrical power of 69 kV capacity or more, or pipelines conveying thermal energy and exceeding one-quarter mile in length.

30. Proponent applications for energy facility projects shall contain comprehensive information in sufficient detail to enable the County to conduct a thorough analysis of the project. At a minimum, information shall include descriptions of all project phases (resource or fuel supply confirmation, construction, operations, maintenance, abandonment); the facility's physical and performance characteristics; environmental effects of all project phases; and a project cost/benefit analysis that includes a County fiscal component.

31. Energy facilities shall only be approved if in compliance with all applicable provisions of the General Plan and Zoning Ordinance; and construction shall start only after all applicable federal, state, and local permits have been obtained and permit conditions satisfied.

ENERGY FACILITIES
Continued

32. In the absence of compelling or contravening considerations, energy facilities should not be sited in sensitive natural resource areas, including: unstable geologic or soil areas; floodplains; wetlands; habitat of fish or wildlife species of rare, threatened, endangered, or special concern status; known paleontological, archeological, ethnographic, or historical sites; or designated scenic areas. If siting in such areas is unavoidable, it shall be limited to the smallest possible portion of the energy facility in question, and shall be mitigated in accordance with CEQA.

33. Wherever possible, increased demand for energy transmission shall be accommodated with existing transmission facilities. Where new capacity is necessary, priority shall be given to upgrading or reconstruction of existing facilities, followed by new construction along existing transmission or other utility corridors. Any new transmission facilities shall be sited so as to minimize interference with surrounding land-uses, and in ways that minimize their visual impacts.

34. The operation of energy facilities shall not violate, or threaten to violate, applicable environmental standards, including noise, wastes, pollutant discharges, or electronic discharges or interference.

35. The siting and operation of energy facilities shall be accomplished so as not to exceed the carrying capacity of affected public infrastructure, including but not limited to roads and highways, water and wastewater systems, public safety services, and schools. Where applicable, the actual cost of public improvements directly necessitated by a specific energy facility shall be paid by the facility developer.

ENERGY FACILITIES
Continued

36. Energy facilities shall minimize the generation of wastes and allow for their recycling whenever practical. Wastes shall only be transported and disposed in accordance with applicable laws and regulations.

37. Energy facilities shall prepare and periodically update emergency plans for reasonably foreseeable accidents and emergency incidents, and such plans shall be coordinated with local public safety agencies.

38. If and when abandoned, energy facility sites shall be reclaimed according to a plan that restores and preserves land values for subsequent and surrounding uses.

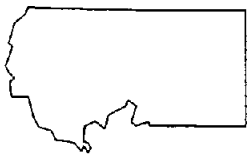
39. The County Planning Department shall actively participate as an affected agency in facility siting processes that may occur on federal or State-owned lands within the County in order to advocate County energy facility policies.

40. The County Planning Department shall monitor interstate transmission planning processes for electricity and natural gas lines that affect Siskiyou County, and participate when appropriate in order to advocate County energy facility policies.

41. In connection with Policy 4, at the time of the Energy Element's first update, the County Planning Department shall specifically evaluate the adequacy of Policies 29-40 and the need for any additional resource-specific or technology-specific energy facility policies or regulatory measures.

IMPLEMENTATION MEASURES

- *Public Information & Assistance*
- *Agency Coordination*
- *Zoning Ordinance*
- *Design Guidelines*
- *Special Projects*



OVERVIEW

Implementation measures are procedures, programs, or standards that carry out General Plan policies. Implementation of Energy Element policies will be achieved through specific measures embodied in the following actions:

- Amendment of the General Plan and Zoning Ordinance to incorporate the Element's goals, policies, and standards.
- Planning Commission and Board of Supervisor conformance with Element policies and standards when reviewing projects subject to the General Plan and Zoning Ordinance.
- County staff administration of the General Plan and its implementing ordinances in conformance with the Energy Element; and administration of the CEQA process in conformance with the Element.
- Implementation of additional special programs, projects, and procedures pursuant to Element goals and policies.

The principal County official responsible for interpreting and implementing the Element shall be the Planning Director. Questions of applicability, sufficiency, and similar interpretations shall be determined by the Planning Director, subject to appeals to the Planning Commission first, and Board of Supervisors second.

Proposed implementation measures are presented in this chapter according to the following categories:

- Public information and assistance
- Agency coordination
- Zoning ordinance
- Design guidelines
- Energy efficiency and renewable projects

Specific measures are described in the following sections according to measure content; lead and coordinating agency responsibilities; funding requirements and sources; and implementation time frame.

PUBLIC INFORMATION & ASSISTANCE

Implementation Measures

A. As part of its standard collection of reference documents, the County Planning Department shall maintain for public use a set of basic reference publications on energy efficiency and renewable resources drawn from the Energy Element's references.

B. The County Planning Department shall: 1) compile a set of "fact sheets" or comparable brochure-length booklets on energy efficiency and renewable resource opportunities as described in the Element; 2) establish and maintain ongoing distribution of the "fact sheet" materials from the Planning Department office; and provide the same materials to the Building Inspector and Agriculture Department for similar public distribution.

C. The County Planning Department shall maintain (and provide to the Building Inspector and Agriculture Department) a referral list of technical and financial assistance sources for persons interested in energy efficiency and/or renewable resource opportunities. An initial draft of such a list appears in Appendix C.

Lead Agency

County Planning Department.

Coordinating Agencies

County Building Inspector, County Agriculture Department.

PUBLIC INFORMATION & ASSISTANCE
Continued

Funding Sources

Measures A and B will be accommodated within the CEC grant budget for preparation of the Energy Element; any additional incremental costs associated with maintaining references, hand-outs, and referrals will be absorbed within the Planning Department's regular budget.

Implementation Time Frame

Measures A and B have already been initiated, and A through C will be ongoing activities.

AGENCY COORDINATION

Implementation Measures

D. The County Planning Department shall establish and maintain regular communications and coordination with the following "core" group of energy-related organizations: PP&L, CEC, CPUC, DOG, Caltrans, FERC, Forest Service, BLM, WAPA, TANC, and Pacific Gas Transmission. Each of these organizations shall receive: a copy of the adopted Element; ongoing requests for review and comment on energy proposals submitted to the County; and requests for reciprocal opportunities for the County to comment on energy projects or programs being considered by each organization that may impact the County.

E. The County Planning Department shall continue its energy planning coordination with Modoc County, and establish and maintain regular communications with other counties adjoining Siskiyou in a manner similar to that described above for the core energy group. Inter-county energy coordination should focus in particular on renewable resource areas and impact zones that cross county boundaries, and transmission facilities that cross boundaries.

F. The County Planning Department shall establish and maintain regular communications with regional, state, and federal agencies responsible for environmental resources impacted by energy development in a manner similar to that described above for the core energy group. Environmental coordination should focus on sustainable resource management, and insure that ongoing energy facility operations are compatible with surrounding land-uses and natural resources.

AGENCY COORDINATION *Continued*

G. The CEC, Caltrans, and CARB are capable of producing county-level energy use data, but none of the agencies presently does so without a special time-consuming request. The County Planning Department should contact other local jurisdictions with energy interests, and prepare a joint request to the state agencies for regular annual publication of county-level data. This request should also seek a reconciliation of the different gasoline use estimates produced by Caltrans' and CARB's respective methodologies.

Lead Agency

County Planning Department.

Coordinating Agencies

As specified in each coordination measure.

Funding Sources

Nominal incremental administrative expenses will be absorbed within existing agency budgets. The exception would be major site-specific energy facility proposals that significantly increase the agencies' coordination obligations, in which case some form of administrative cost reimbursement should be sought from the energy facility proponent.

Implementation Time Frame

Immediate/ongoing.

ZONING ORDINANCE

Implementation Measures

H. Amend the Zoning Ordinance as proposed in Table 22 so as to: 1) clearly define various types of energy systems according to specific resources, applications, and facility size; and 2) clearly specify the allowable or prohibited status of each system in all zones. Small and large-scale power plants are distinguished in Table 22 by a proposed 500 kW demarcation: smaller plants beneath 500 kW capacity are normally generating electricity for on-site consumption versus larger plants above 500 kW that are most often connected to the electric grid for commercial power sales.

I. Amend the Zoning Ordinance to require that geothermal energy facilities (including wells, well field pipelines, and power plants), regardless of resource temperature, comply with all applicable DOG regulations and the following County standards:

1. Define "best available control technology" as the maximum degree of environmental control of any pollutant or noise emitting equipment taking into account technology which is known to be practical and feasible but not necessarily in widespread use yet. In cases of disputed interpretation, the County shall request the assistance of responsible state agencies in determining final control requirements.

The remainder of the standards are organized according to phases of geothermal development. Standards applicable to geotechnical investigations include:

Table 22

Proposed Energy Facility Zoning

Energy Facility	Zones																
	RR	R1	R2	R3	R4	CR	CU	CC	CH	ML	MM	MH	AG1	AG2	TPZ	O	PD
Solar																	
Direct-use thermal system	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Power gen. up to 500 kW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Power gen. over 500 kW	2	3	3	3	3	2	3	3	3	2	2	2	3	2	2	3	2
Biomass																	
Comm. collection/processing	2	3	3	3	3	2	3	3	3	2	2	1	2	2	1	3	2
Power gen. up to 500 KW	2	2	2	2	3	2	2	2	2	2	2	1	2	2	1	3	2
Power gen. over 500 kW	3	3	3	3	3	3	3	3	3	2	2	2	3	2	2	3	2
Geothermal																	
Exploration drilling	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Direct-use thermal system	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	3	1
Power gen. up to 500 kW	2	2	2	2	3	2	2	2	2	2	2	1	2	2	2	3	2
Power gen. over 500 kW	3	3	3	3	3	3	3	3	3	2	2	2	2	3	2	3	2
Wind																	
Power gen. up to 500 kW	1	1	1	2	2	1	2	2	2	1	1	1	1	1	1	3	2
Power gen. over 500 kW	2	3	3	3	3	3	3	3	3	2	2	2	2	3	2	3	2
Hydro																	
Power gen. up to 500 kW	2	2	2	2	3	2	2	2	2	2	2	2	2	2	2	2	2
Power gen. over 500 kW	2	3	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2
Other facilities																	
Transmission lines up to 69 kV	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Transmission lines over 69 kV	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Thermal pipelines over 1/4 mile	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Fossil-fueled gen. up to 500 kW	1	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2	2
Fossil-fueled gen. over 500 kW	3	3	3	3	3	3	3	3	3	2	2	2	3	2	2	3	2

1 Permitted use
2 Conditional use
3 Prohibited use

Source: Criterion

ZONING ORDINANCE
Continued

2. Operations shall be designed and implemented to disturb the minimum amount of land area needed to adequately execute operations. Existing roads and trails shall be used for access whenever feasible. The use of truck mounted and/or core type drill rigs for temperature gradient or geophysical investigations shall be encouraged.

3. Protection of terrestrial and riparian wildlife habitats shall be required. Unavoidable loss of habitat shall be appropriately mitigated.

4. Wherever feasible, geothermal operations shall avoid locating within one-quarter mile of residential or recreational noise receptors. Geothermal operations may be required to use the best available noise control technology and operating practices to minimize noise emissions in sensitive areas. Abatement measures may be required to reduce adverse effects to acceptable levels, along with ongoing compliance monitoring.

5. Any drilling activities shall occur in a manner that minimizes the generation of hazardous materials and waste; allows for their recycling whenever practical; and is in compliance with all applicable waste management regulations. The use of portable tanks and sumpless drilling shall be encouraged, particularly when located within 500 ft. of surface waters.

6. All project sites shall be sufficiently fenced and posted with signs to facilitate the provision of emergency services and warn the public of potential hazards.

ZONING ORDINANCE *Continued*

Standards for exploratory well drilling include the foregoing standards where applicable and the following:

7. Erosion control and soil stabilization techniques shall be implemented and continued throughout the life of each project. To minimize soil erosion and restore wildlife habitat, revegetation efforts shall include adequate ground coverage of native or desirable perennial plant species replanted in a timely manner. Ongoing vegetation maintenance shall be provided for the life of the project, or until revegetated areas are self-sustaining.

8. Operations shall conform to established water rights, and shall not adversely affect other beneficial users of water.

9. Pursuant to RWQCB regulations, surface and groundwater quality shall be protected by environmentally sound construction and operation methods that minimize sedimentation and prevent accidental discharges. Setbacks of 500 feet from surface waters shall be required. Periodic upstream and downstream water quality monitoring may be required.

10. All geothermal activities that may potentially result in surface disturbance shall have project areas surveyed by a qualified specialist for the presence of historic, cultural, archaeologic, and/or paleontologic resources prior to initiation of geothermal activities. Such resources shall be protected and conserved by avoidance or mitigation through recordation and

ZONING ORDINANCE *Continued*

collection in accordance with state and/or federal regulations.

11. Geothermal operations shall be planned and carried out consistent with applicable air quality standards. Appropriate operating practices shall be used to minimize emissions, avoid vegetation damage or increased fog or haze conditions, prevent nuisance odors, and control dust. Wherever feasible, geothermal operations should avoid locating near sensitive air pollutant receptors or in areas of poor air dispersion. Abatement measures may be required to reduce impacts to acceptable levels, along with ongoing compliance monitoring.

12. Exterior lighting of drill rigs shall be directed and shielded to prevent unnecessary visual intrusion onto surrounding properties.

13. Geothermal operations shall be accessed via roads built and maintained to County safety standards, including at a minimum all-weather surfacing. Existing roads shall be used when the new combined use remains in compliance with County road standards. Joint use of private access roads shall be encouraged. Use of roads by geothermal operations which could result in unacceptable traffic safety or other significant environmental impacts may be denied or subject to special conditions.

14. Geothermal operators shall ensure that the transport of hazardous material or waste is minimized whenever possible, and is accomplished in a safe manner. Geothermal operators and their subcontractors shall

ZONING ORDINANCE *Continued*

include worker training and safety programs on the generation, handling and transport of designated or hazardous materials and wastes as required by applicable regulations.

15. All inactive sumps shall be fenced or otherwise protected to prevent intrusion by persons and animals. Testing of inactive or abandoned sumps may be required and, if necessary, long-term monitoring for ground and surface water contamination shall be instituted.

16. Emergency plans shall be prepared and updated for potential incidents including but not limited to blow-outs, fluid spills, earthquakes, fires, and worker accidents, consistent with the policies and procedures of responsible public safety agencies. Geothermal operations shall be conducted to minimize the possibility of fire, explosion, or any unplanned release of hazardous materials to air, soil, or water resources which could threaten human health or the surrounding environment. Geothermal operator security, medical, and fire-fighting personnel shall maintain communication and cooperation with corresponding public agencies.

Standards for geothermal field development include the foregoing standards where applicable and the following:

17. Directional drilling of multiple wells from a single drilling pad and other measures designed to minimize land disturbance shall be encouraged whenever appropriate.

ZONING ORDINANCE
Continued

18. Geothermal operators shall utilize best available control technologies and operating practices to prevent and rapidly detect water pollution which may result from their operations.

19. Ongoing monitoring and characterization of geothermal noise sources may be required over the life of geothermal field development projects.

20. Geothermal facilities shall be sited to utilize existing vegetative and topographic conditions as visual screens and barriers as much as possible. Exterior lighting shall be shielded and directed to reduce visual impacts to the surrounding vicinity. Pipelines and other facilities shall be painted or otherwise designed to blend in with surrounding vegetation and natural features.

21. Geothermal operations shall occur at levels that do not exceed the carrying capacities of surrounding public facilities and services as specified in applicable agency plans, including but not limited to roads, schools, water and sewer facilities, and public safety services, unless the actual direct cost of improvements necessitated by a specific project are passed on to the project developer.

Standards for geothermal power generation include the foregoing standards where applicable, and the following:

22. Power plants shall demonstrate adequate availability of, and disposal plans for, water supplies for plant cooling requirements. Generating technologies that

ZONING ORDINANCE *Continued*

have the potential for using less water or increasing the use of recycled water shall be encouraged.

23. Power plants shall be designed and operated to minimize air pollutant emissions by use of the best available air pollution control technology for the type of geothermal resource involved.

24. Best available noise control technologies shall be required for all power plant noise sources, including, but not limited to, the turbine generator building, and cooling tower.

Standards applicable to the abandonment and reclamation of all geothermal operations shall include the following:

25. All geothermal operations shall be abandoned and land reclaimed upon completion of the life of the project in accordance with a County-approved plan. Proof of adequate financial assurances for abandonment and reclamation shall be submitted as part of such plan.

26. Following abandonment, the land shall be reclaimed in accordance with the approved plan. At a minimum, geothermal sumps shall be abandoned in a manner which prevents contamination of any nearby water supplies. The need for monitoring of potential ground and surface water contamination from abandoned sumps shall be addressed in the reclamation plan.

ZONING ORDINANCE *Continued*

J. Amend the Zoning Ordinance to require that hydroelectric facilities, regardless of installed generation capacity, comply with the following County standards:

1. The facility shall maintain or enhance to the greatest extent possible the existing visual qualities of the affected water body.

2. The facility shall maintain or enhance any existing recreational opportunities on or adjacent to the affected water body.

3. The facility shall maintain or enhance existing fish and wildlife habitat, and shall have no adverse impact upon any threatened or endangered fish, wildlife or plant species or their habitat.

4. The facility and its operation shall maintain or enhance existing water quality in the affected water body except during construction of the facility when adverse impacts on water quality shall be minimized. Specifically, the facility and its operation shall not:

   a) Deposit or create a zone for the deposit of sediments in the water body at or adjacent to the site;

   b) Increase the temperature of the water in the affected water body by any means, including but not limited to removal of vegetation or reduction in stream flow; or

   c) Create the potential for, or result in, spillage, leakage or discharge of oil, waste products,

ZONING ORDINANCE *Continued*

chemicals or other substances which could reach the water body.

5. The facility and its operation shall not increase soil or bank erosion or destroy bank habitat at or on land adjacent to the site except during construction of the facility, during which time soil or bank erosion and destruction of bank habitat shall be minimized.

6. The facility and its operation shall maintain existing public access to the affected water body, except for appropriate public safety exclusion areas.

K. Amend the Zoning Ordinance to require that all electric transmission lines of 69 kV capacity or greater comply with the following County standards:

1. In very steep or inaccessible areas, helicopter placement of transmission towers or other roadless construction methods may be required to minimize soil disturbance.

2. Transmission lines shall be sited to avoid impacting critical fish and wildlife habitat. Special attention shall be paid to the location of flyways, nesting and feeding sites of waterfowl and other birds in order to reduce the possibility of collision or electrocution.

3. The siting of transmission lines shall avoid interfering with scenic views, and shall be visually integrated with the surrounding setting to the greatest extent possible. Applicable visual mitigations include, but are not limited to avoiding ridgelines or other visually prominent features, and using non-glare towers and

ZONING ORDINANCE *Continued*

non-specular lines which more readily blend into the natural landscape.

4. Space consuming towers and diagonal alignments of transmission lines through agricultural fields should be avoided. Where possible, transmission lines should follow property lines or routes with the least environmental and land-use impacts.

5. Cooperative study of opportunities for providing wholesale power to local jurisdictions from transmission lines constructed in their vicinity should be encouraged.

Lead Agency

County Planning Department.

Coordinating Agencies

Agencies and organizations listed in Implementation Measures D through F.

Funding Sources

Nominal administrative costs for amending the Zoning Ordinance will be absorbed within the Planning Department's regular budget. Ongoing administration of the standards will be paid by project developers through permit fees covering application evaluation and facility monitoring.

Implementation Time Frame

The Zoning Ordinance shall be amended to incorporate energy facility standards within one year of the Energy Element's final adoption.

DESIGN GUIDELINES

Implementation Measures

L. The County Planning Department shall provide the following design guidelines to interested land developers and builders as a means of encouraging greater solar use:

1. Topography

   a) Locate structures on south-facing slopes or flat land.

   b) Avoid locating structures on steep north-facing slopes.

2. Vegetation

   a) Locate lots away from dense clusters of trees; designate dense tree clusters for open spaces.

   b) Use selective tree cutting for roads, building sites, sewer and utility easements, clear vision areas, septic fields and other land improvements to provide solar access.

   c) When planting new vegetation, know the mature heights of trees to ensure that they will not penetrate beyond the solar envelope on a lot in the future.

3. Open Spaces

   a) Locate open spaces on the south, southeast and southwest portions of the site.

DESIGN GUIDELINES
Continued

b) Use parking areas as a solar access buffer.

4. Street and Lot Orientation

a) Orient streets on an east-west axis (plus or minus 30 degrees).

b) On north-south streets consider using flag lots and combining lots to increase solar access.

5. Southern Building Lines

a) Establish southern building lines which are unshaded at ground level whenever feasible.

b) If shadow patterns penetrate too far north into the lot to provide solar access at ground level of the southern building line, establish a southern building line which is unshaded 10 feet above ground level.

c) Make southern building lines uniform from lot to lot in the east-west dimension, whenever feasible, to simplify construction of solar envelopes.

d) Establish the southern building line as far north on the lot as feasible to allow for taller solar envelopes on neighboring lots to the south.

DESIGN GUIDELINES
Continued

6. Building Design and Orientation

a) Orient buildings so their long axis is in the east-west dimension to maximize solar gain.

b) Orient roof lines on lots facing north-south streets so that their highest shade producing point is not on the northernmost point of the structure.

c) Orient roof lines so that they slope north and south for current and future solar uses.

Lead Agency

County Planning Department.

Coordinating Agencies

County Building Inspector.

Funding Sources

No incremental costs anticipated.

Implementation Time Frame

Immediate/ongoing.

ENERGY EFFICIENCY & RENEWABLE PROJECTS

Implementation Measures

M. The County Planning Department, with the assistance of coordinating agencies, shall monitor opportunities for funding local energy efficiency and renewable development projects using outside financial assistance sources. In particular, the County should seek funding for: transportation efficiency improvements, residential weatherization, business and agricultural assistance, and renewable resource characterization and end-use demonstrations. Funding should also be sought for preparation of a local contingency plan for conventional supply interruptions.

N. In recognition of new federal legislation requiring federal government purchase of clean-fuel vehicles, and inasmuch as the Forest Service operates the largest public vehicle fleet in the County, the County shall seek a joint clean-fuel demonstration project with the Forest Service to create the basis for wider availability of clean fuels in the County.

O. The Air Pollution Control District shall continue to monitor wood smoke conditions that are causing state PM_{10} standards to be occasionally exceeded in the Yreka area, and shall prepare compliance plans as required by CARB.

P. The County Planning Department shall request that the Division of Oil and Gas, in cooperation with the USGS and BLM, prepare a geothermal resource management plan for Medicine Lake. The objectives of such a resource plan should be characterization of resource carrying capacities and establishment of baseline sustainable resource management practices before resource development occurs.

ENERGY EFFICIENCY & RENEWABLE PROJECTS *Continued*

Q. The County Planning Department shall continue to develop energy applications for its geographic information system, particularly expansion of the renewable resource database, and further environmental constraint mapping at energy resource sites.

Lead Agency

County Planning Department (Air Pollution Control District for Measure O).

Coordinating Agencies

As listed in Implementation Measures D through F.

Funding Sources

Nominal incremental administrative costs anticipated; to be absorbed in Department budgets.

Implementation Time Frame

Immediate/ongoing.

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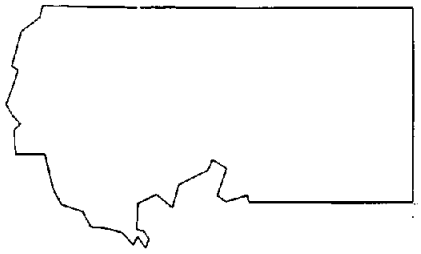

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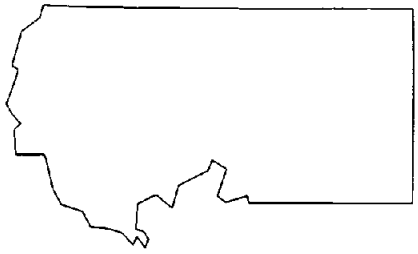
APPENDICES



Appendix A
CEQA INITIAL STUDY

INTRODUCTION

Adoption of the Energy Element as part of the County General Plan constitutes a "project" under CEQA, necessitating an environmental review of the Element prior to its adoption. The type of required CEQA review is determined by the likelihood of the Element having a "significant effect" on the environment. "Significant effect" is defined by CEQA as a substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by the project including land, air, water, minerals, flora, fauna, ambient noise, and objects of historic or aesthetic significance. A determination of "significant effect" is made through an Initial Study.

The Initial Study presented in this appendix is an administrative draft which concludes that the Element will not have a significant effect on the environment.

PROJECT DESCRIPTION

The "project" evaluated in this Initial Study is the adoption of the Energy Element. The geographic location of the project is the unincorporated area of Siskiyou County. The project consists of the following components: 1) background information on current sources and uses of energy by all sectors of the County; 2) identification and analysis of opportunities for improving the efficiency of energy use in all sectors; 3) identification and analysis of renewable energy resources that occur in the County and their viability for expanded use; 4) identification and evaluation of current and potential transmission facilities serving the County; 5) a summary of major issues derived from the foregoing topics that warrant County attention; 6) formulation of a strategy to meet future growth and energy demand through efficiency improvements and renewable development to the greatest extent practical; 7) goals and policies for carrying out the strategy, including policies to mitigate potential adverse environmental and land-use impacts of energy facilities; and 8) implementation measures for further execution of the strategy, including zoning standards to more specifically mitigate potential adverse environmental and land-use impacts of energy facilities.

ENVIRONMENTAL SETTING

The following environmental setting description is a summary adapted from the County General Plan; the Klamath National Forest Draft Land and Resource Management Plan and EIS; the Shasta-Trinity National Forest Land and Resource Management Plan and EIS; and BLM management plans and environmental reviews for its lands in Siskiyou County (ref. 12, 14, 15, 17):

Geology

The County lies within three physiographic provinces, the Klamath Mountains, Cascades, and Modoc Plateau. The Klamath Mountains province is characterized by rugged terrain formed of intensely folded and faulted Mesozoic an paleozoic rocks. The Cascade province is less rugged and consists of Tertiary and Quaternary volcanic rocks (approximately 30 million years to recent). The Modoc Plateau is also formed of tertiary volcanic rocks and typically exhibits low relief. It is cut by numerous Quaternary (0-2 million years old) faults which have formed closed basins such as Butte Valley.

Geological Hazards

Landslide hazards, hazardous materials, seismic hazards, volcanic hazards, snow avalanche hazards, and land subsidence and collapse hazards have been identified in the County. Geologic resources in the County include minerals, construction materials, groundwater, oil and gas, geothermal resources, and areas of unique geological value.

Landslides have a high probability of occurrence in the County relative to the other geologic hazards, as indicated by several damaging landslide episodes which occurred in the past 50 years. Landslides constitute the most significant of the geologic hazards in the County, particularly in the Klamath Mountains Province, and in the Cascades Province adjacent to the Klamath River.

Seismic hazards in the County are associated with moderate probability events (return periods of tens to hundreds of years) with moderate to severe consequences such as damage to buildings and disruption of utilities and transportation systems. They are generally not influenced by man's activity, with the exception that large reservoirs have been shown to initiate seismic activity as a result of the additional loads placed on the earth's crust. Potential seismic hazards in the County include ground shaking and rupture, liquefaction, and seismically induced landsliding.

Groundwater withdrawal can cause land subsidence (sinking of the ground) in areas where natural water tables are lowered by pumping which exceeds recharge. The potential for subsidence exists in Scott Valley, Butte Valley, and possibly Shasta Valley, but it is not known to be a problem at the present time. The potential for collapse of underground cavities (both natural and man-made) has been a relatively small issue in the County. However, local incidents of collapse have occurred. The potential for ground subsidence and collapse of underground cavities is considered to be limited in scope in the County.

Soils

The soils in Siskiyou County are variable in physical and chemical properties. This variability is due to differences in parent material, climate, topography, biology, and age. Each soil has its own respective characteristics, suitabilities, and limitations. The soils to the east of Interstate 5 have developed from volcanic parent materials (rhyolite, andesite, basalt and pyroclastic material) with inclusions of alluvium, colluvium, glacial moraines, and outwash. The soils to the west of Interstate 5 have developed from metamorphic, granitic and ultrabasic parent material with inclusions of colluvium and alluvium. The geomorphic landforms are dominated by very steep mountains and mountain valleys. The soils on the westside of Interstate 5 are more prone to soil erosion due to steeper slopes and higher rainfall.

Timber

There are approximately twenty five species of conifers found in Siskiyou County and forty three species of hardwoods. The predominant conifer species in the County are Douglas-fir (Peuedotsuga menziesii), ponderosa pine (Pinus ponderosa), red fir (Abies magnifica), white fir (Abies concolor), sugar pine (Pinus lambertiana), and incense cedar (Libocedrus decurrens). The predominant hardwood species are California black oak (Quercus kelloggii), Canyon live oak (Quercus chrysolepis), tan oak (Lithocarpus densiflorus), madrone (Arbutus menziesii) and Oregon white oak (Quercus garryana).

Range

Rangelands in the County provide a variety of forage and habitats for grazing livestock and wildlife. Many ranchers depend on grazing allotments to provide forage for their stock on a seasonal basis. Range vegetation consists of grasses, grasslike plants, forbs and shrubs and vegetation providing forage value

primarily to grazing ungulates either as nutritional forage or a habitat component (e.g. cover). Rangeland in the County is most commonly associated with ecosystems found in natural and created forest openings, narrow riparian stringers and similar settings. On the eastside of the County, extensive sagebrush-steppe and montane browse rangelands are common.

The County also has dense wooded foothill areas or brushland, other than sagebrush types, supporting sufficient herbaceous and/or browse plants for grazing animals.

Minerals

Gold has been found in the County in both placer and lode deposits. The majority of placer deposits occur on the westside along major streams. Platinum group metals have been recovered as a by-product of placer gold mining in some areas. Placer deposits will continue to be of interest, especially for the small-scale miner in the years ahead. Lode gold deposits occur commonly in quartz veins and are generally worked underground. Silver is sometimes produced as a by-product. The less common gold-sulfide replacement deposits are targeted by many of the larger mining operations in the County.

Gold is the principal mineral extracted from the County. Although there has been some exploration for chromite and copper recently, future production from the County is uncertain. Chromite production is unlikely to occur in peacetime as it cannot compete with foreign supplies.

Mineral materials are available throughout the County, except for volcanic cinders which are found primarily on the eastside. Future demand for these materials is expected to continue to decline as the about of road construction declines from past levels. The majority of the use has been for construction aggregate and is expected to continue so in the future.

Water Resources

Siskiyou County is for the most part drained by the Klamath River and three of its major tributaries; the Salmon, Scott, and Shasta Rivers. In most parts of the County, water is adequate for existing uses. Flows in the Klamath River are regulated by dams and reservoirs from the Iron Gate Dam upstream but the river is free-flowing downstream from Iron Gate Dam. The Shasta River and its tributaries contain several reservoirs, most notably Lake Shastina. The Scott River and its tributaries are subject to several diversions, but remains essentially unregulated. The Salmon River and other tributaries to the Klamath below Iron Gate Dam are completely unregulated.

Groundwater, a valuable resource in the County, occurs in three main types of aquifers. They are valley alluvium, landslide and colluvial deposits, and fractured bedrock. The largest aquifers occur in the Scott, Shasta, and Butte Valleys.

The Scott Valley aquifer is an alluvial deposit several hundred feet thick (Mack, 1958). Recharge is from streams and from large alluvial fans which occupy the flanks of the valley such as at Kidder Creek. In Shasta Valley, the most continuous aquifer is the Plutos Cave Basalt which occupies the southeast part of the valley in the Big Springs area. The most important aquifer in Butte Valley is the Butte Valley Basalt which underlies the southeast part of the valley in the Big Springs area. The most important aquifer in Butte Valley is the Butte Valley Basalt which underlies the southeast part of the valley. This fractured, highly permeable aquifer is the source of much of the irrigation water used in the valley and is depleted and naturally recharged on an annual basis.

Beneficial uses of water occur throughout the County. These include municipal and household water supply, agricultural irrigation, stock watering, aquatic and riparian habitat, hydroelectric power generation, recreation, and scenic enjoyment.

Municipal water supplies are provided by Yreka, Weed, Dorris, Mt. Shasta, McCloud, Ft. Jones, Elk, Etna, and Antelope Creeks, for the towns of Happy Camp, Etna, and Tennant, respectively. There are many other streams and springs originating in the County which provide water to individuals and small communities. Most of the agricultural use occurs in Butte, Shasta, and Scott Valleys.

Wildlife

The wide mix of physical and biological conditions found in the County provide for a multitude of wildlife species. The County is home to approximately 372 species of wildlife including 92 mammals, 237 birds, 20 amphibians and 23 reptiles which live in a wide array of habitats.

Three federally-listed threatened or endangered species, and possibly one proposed species, are found in the County: bald eagle, peregrine falcon, northern spotted owl, and marbled murrelet. Federal candidate species include: Siskiyou mountain salamander, Del Norte salamander, northern web-legged frog, foothill yellow-legged frog, Ferruginous hawk, loggerhead shrike, Pacific western big-eared bat, California wolverine, and karok indian snail. Species that have been identified by the U.S. Forest Service as sensitive and known or suspected to occur in the County include: American marten, Pacific fisher, northern goshawk, great grey owl, and willow flycatcher.

Management indicator species used in the County by the Forest Service and BLM include: northern spotted owl, black bear, American marten, Pacific fisher, black-tailed deer, red-breasted sapsucker, hairy woodpecker, white-headed woodpecker, saux swift, bowny woodpecker, pileated woodpecker, acorn woodpecker, western grey squirrel, northern red-legged frog, western pond turtle, tailed frog, American dipper, and yellow-breasted chat.

Fisheries

The County has large populations of a variety of fish species, both consumptive and non-consumptive. The Sacramento River basin sustains important anadromous salmon and steelhead populations. However, natural catastrophes and other causes have contributed to a population decline of 60-70% in the last few decades. The resident coldwater fisheries is characterized by three major gamefish trout species: rainbow, eastern brook, and brown. Resident warmwater fish include largemouth and small mouth bass, catfish, and bullhead. Non-consumptive species include: anadromous lamprey, threatfin shad, bace, sculpin, suckers, minnows, and sunfish.

There are no federally-designated threatened or endangered fish species known to the occur in the County. Sensitive species include: spring-run steelhead, bull trout, rough sculpin, and redband trout.

Management indicator species used by the Forest Service and BLM include: steelhead trout, rainbow trout, and largemouth bass.

Air Quality

Siskiyou County is a rural area with an extremely low population density, a limited number of industrial and agricultural installations, and no significant problems with traffic congestion, thus air quality in the region is generally excellent.

There is one pollution monitoring station in Siskiyou County. It is located in Alturas, and conducts measurements of atmospheric concentrations of PM_{10} (particulate matter of a size less than 10 microns, or 10 millionths of a meter) and ozone (no other criteria pollutants are monitored).

Some relatively mild and short-lived local air pollution episodes can occur, particularly in low-lying cities and towns. During the winter many residences in the area burn wood as a fuel. During some winter days climatic conditions known as temperature inversions prevail. Under temperature inversions, the air close to the ground is cooler than the air, for example, a few hundred meters above the ground. What this means is that wood smoke and other emissions, rather than rising out of the local area, are trapped in stagnant (not moving) air near \the ground, and levels of pollutants, especially particles of unburned carbon and ash known as "particulates," can build up. The few towns with larger populations that are located in narrow valleys are more likely to experience such pollutant episodes. Brief local air pollution episodes can also occasionally occur in the summer due primarily to smoke from forest fires and, to a much more limited extent, from agricultural dust and agricultural burning. During the winter and early spring the burning of forest slash results in some incidents of poor air quality, but the affected areas are generally far from population centers.

In the winter of 1990, PM_{10} concentrations at the Yreka monitoring station exceeded the daily CARB standard of 50 millionths of a gram per cubic meter of air on six occasions, due primarily to problems with wood smoke and temperature inversions. Winter air quality problems in Yreka are typically an early morning phenomenon; wood stoves started in the early morning burn more cleanly in the late morning and afternoon as they reach operating temperature, and the inversion layer typically breaks up in the late morning, taking the wood smoke with it. The annual average for PM_{10} levels at this station was just below the CARB standard.

Climate

Climatic conditions in the County are characterized normally by cool, moist winters and warm, dry summers. Annual precipitation totals increase from east to west, and with elevation. The range is from about 10 inches in Tennant to nearly 100 inches on Preston Peak according to the annual precipitation maps of S.E. Rantz. Precipitation typically occurs between September and May, with 80 percent falling from November through March. At the lower elevations (700 to 4000 feet) this falls primarily as rain, with snow mainly occurring above 4000 feet.

Cold storms typically leave snow as low as 1000 feet elevation but the snow usually melts quickly below about 3000 feet. There are also occasional wintertime warm storms in which rain falls as high as 7000 feet, often on snow that had accumulated from previous cold storms. These rain-on-snow events can cause a rapid snow melt which combines with the rainfall to create a rapid release of high volumes of runoff. The most significant cases of this phenomenon in recent memory have occurred in the floods of 1955, 1964, 1971 and 1974. These events have been the catalysts for much of the landslide failure that has occurred historically in the County.

Recreation

The County offers visitors many recreational opportunities in a variety of settings. National forest attractions include highly scenic landscapes, abundant wildlife, and numerous lakes, rivers and streams. The County has over 152 miles of trails and 381,000 acres of wilderness. The most popular recreational activities are boating, camping, fishing, hiking, backpacking, horseback riding, hunting, and winter sports.

Developed recreational sites in the County consist of 30 campgrounds, two picnic grounds, nine trailheads, three observation sites, and seven visitor information sites. All of these sites are easily reached

by road and used as a base of operation for fishing, boating, swimming, hunting, hiking, and other activities. Most of them are located along the Klamath, Scott and Salmon Rivers.

The County has a significant wilderness resource, including all of the Marble Mountain Wilderness (223,456 acres), all of the Russian Wilderness (12,653 acres), nearly half of the Siskiyou Wilderness (70,098 acres), part of the Trinity Alps Wilderness (74,901 acres) and a 5-acre portion of the Red Buttes Wilderness. Their total area represents almost 23% of the County's landbase (over 381,000 acres); about 3,800 acres remain in private ownership. The Pacific Crest Trail crosses 3 of the wilderness areas within the County: the Marble Mountain, the Russian and the Trinity Alps.

The Klamath River and three of its tributaries in the County (Scott River, Salmon River and Wooley Creek) comprise 200 miles of the National Wild an Scenic River System. All three classifications, Wild, Scenic, and Recreational, are represented.

Cultural Resources

The County has a rich cultural heritage. There is evidence that Native American use of this area began over 8,000 years ago; that use continues today for contemporary Shasta and Karuk people. Anglo entrance began with the fur trappers of the 1820's, and greatly accelerated with the gold rush of the 1850's. Other ethnic groups (e.g., Chinese, Hawaiian, Portuguese) were attracted by the gold rush as well. Current evidence of Native American and gold rush era activities can be found as artifacts, archaeological sites, and traditional secular and religious practices maintained by the inhabitants of the area.

Visual Resources

The County's scenery is known for its diversity, ruggedness, and primitive character. Its abundance of scenic river canyons, mountain crests and pristine (unroaded) land offers a high-quality setting for a growing number of recreational pursuits, including sightseeing from an auto, a raft, or while hiking.

Approximately 60 percent of the County's land is visible from areas where users are expected to have a high concern for scenic values. Twenty-two percent of the Klamath National Forest's landscapes are classified as highly attractive. These landscapes generally occur in mountain ranges above 5,000 feet elevation, river canyons, large, wet meadows or many other of the Klamath's prominent geologic features. The majority of the County consists of mostly pleasing yet common landscapes located on moderately steep slopes and ridges or on fairly level terrain.

ENVIRONMENTAL IMPACT

By itself, the Energy Element will not directly or indirectly result in any change to the natural or built environment in Siskiyou County. There are no specific projects that will be built or altered as a result of the Element's adoption. The Element's lack of significant environmental impacts is further detailed by the following CEQA checklist:

	Yes	Maybe	No
1. Earth. *Will the Element result in:*			
a) Unstable earth conditions or in changes in geologic substructures?	☐	☐	☒

	Yes	Maybe	No
b) Disruptions, displacements, compaction or over covering of the soil?	☐	☐	☒
c) Change in topography or ground surface relief features?	☐	☐	☒
d) The destruction, covering or modification of any unique geologic or physical features?	☐	☐	☒
e) Any increase in wind or water erosion of soils, either on or off the site?	☐	☐	☒
f) Changes in deposition or erosion of beach sands, or changes in siltation, deposition or erosion which may modify the channel of a river or stream or the bed of the ocean or any bay, inlet or lake?	☐	☐	☒
g) Exposure of people or property to geologic hazards, such as earthquakes, landslides, mud slides, ground failure, or similar hazards?	☐	☐	☒
2. Air. *Will the Element result in:*			
a) Substantial air emissions or deterioration of ambient air quality?	☐	☐	☒
b) The creation of objectionable odors?	☐	☐	☒
c) Alteration of air movement, moisture, or temperature, or any change in climate, either locally or regionally?	☐	☐	☒
3. Water. *Will the Element result in:*			
a) Changes in currents or the course of direction of water movements, in either marine or freshwaters?	☐	☐	☒
b) Changes in absorption rates, drainage patterns, or the rate and amount of surface runoff?	☐	☐	☒
c) Alterations to the course or flow of flood waters?	☐	☐	☒
d) Changes in the amount of surface water in any water body?	☐	☐	☒
e) Discharge into surface waters, or in any alteration of surface water quality, including, but not limited to, temperature, dissolved oxygen or turbidity?	☐	☐	☒
f) Alteration of the direction or rate of flow of ground waters?	☐	☐	☒
g) Change in the quantity of ground waters, either through direct additions or withdrawals, or through interception of an aquifer by cuts or excavations?	☐	☐	☒

	Yes	Maybe	No
h) Substantial reduction in the amount of water otherwise available for public water supplies?	☐	☐	☒
i) Exposure of people or property to water related hazards such as flooding or tidal waves?	☐	☐	☒
4. Plant Life. *Will the Element result in:*			
a) Change in the diversity of species, or number or any species of plants (including trees, shrubs, grass, crops, and aquatic plants)?	☐	☐	☒
b) Reduction of the numbers of any unique, rare, or endangered species of plants?	☐	☐	☒
c) Introduction of new species of plants into an area, or in a barrier to the normal replenishment of existing species?	☐	☐	☒
d) Reduction in acreage of any agricultural crop?	☐	☐	☒
5. Animal Life. *Will the Element result in:*			
a) Change in the diversity of species, or numbers of any species of animals (birds; land animals, including reptiles; fish and shellfish, benthic organisms or insects)?	☐	☐	☒
b) Reduction of the numbers of any unique, rare, or endangered species or animals?	☐	☐	☒
c) Introduction of new species of animals into an area, or result in a barrier to the migration or movement of animals?	☐	☐	☒
d) Deterioration to existing fish or wildlife habitat?	☐	☐	☒
6. Noise. *Will the Element result in:*			
a) Increases in existing noise levels?	☐	☐	☒
b) Exposure of people to severe noise levels?	☐	☐	☒
7. Light and Glare. *Will the Element result in:*			
a) Substantial alteration of the present or planned land-use of an area?	☐	☐	☒
8. Land-use. *Will the Element result in:*			
a) Substantial alteration of the present or planned land-use of an area?	☐	☐	☒
9. Natural Resources. *Will the Element result in:*			
a) Increase in the rate of use of any natural resources?	☐	☐	☒

	Yes	Maybe	No
10. Risk of Upset. *Will the Element result in:*			
a) A risk of an explosion or the release of hazardous substances (including, but not limited to: oil, pesticides, chemicals or radiation) in the event of an accident or upset conditions?	☐	☐	☒
b) Possible interference with an emergency response plan or an emergency evacuation plan?	☐	☐	☒
11. Population. *Will the Element:*			
a) Alter the location, distribution, density or growth rate of the human population of an area?	☐	☐	☒
12. Housing. *Will the Element:*			
a) Affect existing housing, or create a demand for additional housing?	☐	☐	☒
13. Transportation/Circulation. *Will the Element result in:*			
a) Generation of substantial additional vehicular movement?	☐	☐	☒
b) Effects on existing parking facilities, or demand for new parking?	☐	☐	☒
c) Substantial impact upon existing transportation systems?	☐	☐	☒
d) Alterations to present patterns of circulation or movement of people and/or goods?	☐	☐	☒
e) Alterations to waterborne, rail or air traffic?	☐	☐	☒
f) Increase in traffic hazards to motor vehicles, bicyclists, or pedestrians?	☐	☐	☒
14. Public Services. *Will the Element have an effect upon, or result in a need for new or altered governmental services in any of the following areas:*			
a) Fire protection?	☐	☐	☒
b) Police protection?	☐	☐	☒
c) Schools?	☐	☐	☒
d) Parks or other recreational facilities?	☐	☐	☒
e) Maintenance of public facilities, including roads?	☐	☐	☒

	Yes	Maybe	No
f) Other governmental services?	☐	☐	☒
15. Energy. *Will the Element result in:*			
a) Use of substantial amounts of fuel or energy?	☐	☐	☒
b) Substantial increase in demand upon existing sources of energy, or require the development of new sources of energy?	☐	☐	☒
16. Utilities and Service Systems. *Will the Element result in a need for new systems, or substantial alterations to the following utilities:*			
a) Power or natural gas?	☐	☐	☒
b) Communications systems?	☐	☐	☒
c) Water?	☐	☐	☒
d) Sewer or septic tanks?	☐	☐	☒
e) Storm water drainage?	☐	☐	☒
f) Solid waste and disposal?	☐	☐	☒
17. Human Health. *Will the Element result in:*			
a) Creation of any health hazard or potential health hazard (excluding mental health)?	☐	☐	☒
b) Exposure of people to potential health hazards?	☐	☐	☒
18. Aesthetics. *Will the Element result in:*			
a) The obstruction of any scenic vista or view open to the public?	☐	☐	☒
b) The creation of an aesthetically offensive site open to public view?	☐	☐	☒
19. Recreation. *Will the Element result in:*			
a) Impact upon the quality or quantity of existing recreational opportunities?	☐	☐	☒
20. Cultural Resources. *Will the Element:*			
a) Result in the alteration of or the destruction of a prehistoric or historic archaeological site?	☐	☐	☒
b) Result in adverse physical or aesthetic effects to a prehistoric or historic building, structure, or object?	☐	☐	☒

	Yes	Maybe	No
c) Have the potential to cause a physical change which would affect unique ethnic cultural values?	☐	☐	☒
d) Restrict existing religious or sacred uses within the potential impact area?	☐	☐	☒
21. Mandatory Findings of Significance.			
a) Potential to degrade: Does the Element have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☒
b) Short-term: Does the Element have the potential to achieve short-term, to the disadvantage of long-term, environmental goals?	☐	☐	☒
c) Cumulative: Does the Element have impacts which are individually limited, but cumulatively considerable?	☐	☐	☒
d) Substantial adverse: Does the Element have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☒

CONSISTENCY WITH EXISTING PLANS & ORDINANCES

The draft Energy Element has been reviewed against the existing Siskiyou County General Plan and its implementing ordinances, and the Element has been found to be consistent with the policies and standards contained in those measures. In particular, the Energy Element is supportive of General Plan goals and policies for conserving natural resources, protecting agricultural and forestry lands, insuring public health and safety, and strengthening the local economy.

ORGANIZATIONS & PERSONS CONSULTED

The Energy Element and Initial Study was prepared by Criterion Inc. under the supervision of the County Planning Department. The following persons and organizations were consulted and/or provided information during preparation of the Energy Element and Initial Study:

Jim Anderson	Klamath National Forest
Robert Bayuk	Siskiyou County Public Health Department
Mike Bender	Federal Energy Regulatory Commission
Roger Borkey	Pacific Gas & Electric
Roger Cummins	Siskiyou County Public Works Department

Kathleen DuBois	California Department of Transportation
Dick Ebert	Pacific Power
Andrea Gough	California Energy Commission
John Graham	Pacific Power
Patrick Griffin	Siskiyou County Air Pollution Control District
Dave Gravenkamp	Siskiyou County Public Works Department
Ed Hale	Siskiyou County Agriculture Department
Lynda Karns	Klamath National Forest
George Kruchko	Siskiyou County Public Works Department
Sally LaBrie	Pacific Power
Tom Lindley	Siskiyou County Office of Education
Greg Miata	California Department of Transportation
Larry Moran	Siskiyou County Public Works Department
Dick Ober	Klamath National Forest
Bob Sherve	Bureau of Land Management
Jim Stout	Klamath National Forest

Additionally, the following organizations were notified of the Element's preparation, provided with draft copies, and invited to comment at public workshops and hearings:

Big Springs Union School
Bogus Elementary School
California Air Resources Board
California Department of Fish and Game
California Department of Forestry
California Department of Transportation
California Division of Aeronautics
California Division of Water Rights
California Waste Management Board
California Water Resources Control Board
City of Dorris
Klamath National Forest
Lake Shastina Community Services District
Lake Shastina Mutual Water Company
Little Shasta Elementary School
Montague Branch Library
Montague Fire Protection District
Montague Water Conservation District
Mt. Shasta High School
Mt. Shasta Union Elementary School
Pacific Bell
Pacific Power and Light Company

City of Dunsmuir
City of Etna
City of Montague
City of Mt. Shasta
City of Tulelake
City of Weed
City of Yreka
College of the Siskiyous
Delphic Elementary School
Discovery High School
Evergreen Elementary School
Federal Aviation Administration
Gold Street Elementary School
Jackson Street School
Shasta Nation
Shasta-Trinity National Forest
Shasta Valley Resource Conservation District
Sisson Elementary School
Southern Pacific Transportation Company
South Yreka Fire Protection District
Town of Fort Jones
U.S. Army Corps of Engineers
Weed High School
Weed Parks and Recreation District
Weed Union Elementary School
Willow Creek Elementary School
Yreka Union Elementary School District
Yreka Union High School District

Appendix B
BUILDING ENERGY PERFORMANCE ESTIMATES

ENERGY TYPE IN SITE MBTU - CATEGORY OF USE	ELECTRICITY	BIOMASS
SPACE HEAT	29.49	62.73
SPACE COOL	4.04	0.00
HVAC AUX	3.34	0.00
DOM HOT WTR	16.53	0.00
AUX SOLAR	0.00	0.00
LIGHTS	12.22	0.00
VERT TRANS	0.00	0.00
MISC EQUIP	5.59	0.00
TOTAL	71.21	62.73

TOTAL SITE ENERGY	133.94 MBTU	111.6 KBTU/SQFT-YR GROSS-AREA	111.6 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY	276.56 MBTU	230.5 KBTU/SQFT-YR GROSS-AREA	230.5 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.0
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.0

NOTE ELECTRICITY AND/OR FUEL USED TO GENERATE ELECTRICITY IS APPORTIONED BASED ON THE YEARLY DEMAND. ALL OTHER ENERGY TYPES ARE APPORTIONED HOURLY.

SISKYOU SFD T-24 1992 PACKAGE A (MT. SHAMT. SHASTA WEATHER ADMDOE2D 9/25/1992 10:38:39 PDL RUN 1

REPORT- BEPS ESTIMATED BUILDING ENERGY PERFORMANCE WEATHER FILE- MOUNTSHASTA 2.1B

ENERGY TYPE IN SITE MBTU - CATEGORY OF USE	ELECTRICITY	BIOMASS
SPACE HEAT	9.16	16.68
SPACE COOL	3.14	0.00
HVAC AUX	1.73	0.00
DOM HOT WTR	13.97	0.00
AUX SOLAR	0.00	0.00
LIGHTS	11.41	0.00
VERT TRANS	0.00	0.00
MISC EQUIP	3.91	0.00
TOTAL	43.31	16.68

TOTAL SITE ENERGY	59.99 MBTU	50.0 KBTU/SQFT-YR GROSS-AREA	50.0 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY	146.74 MBTU	122.3 KBTU/SQFT-YR GROSS-AREA	122.3 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 0.2
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.0

NOTE ELECTRICITY AND/OR FUEL USED TO GENERATE ELECTRICITY IS APPORTIONED BASED ON THE YEARLY DEMAND. ALL OTHER ENERGY TYPES ARE APPORTIONED HOURLY.

SISKYOU MOBILE HOME HUD + 10% (MT.SHASTA ADMDOE2D 9/25/1992 10:54:39 PDL RUN 1

REPORT- BEPS ESTIMATED BUILDING ENERGY PERFORMANCE WEATHER FILE- MOUNTSHASTA 2.1B

ENERGY TYPE IN SITE MBTU - CATEGORY OF USE	ELECTRICITY	BIOMASS
SPACE HEAT	8.03	34.42
SPACE COOL	1.78	0.00
HVAC AUX	1.47	0.00
DOM HOT WTR	14.61	0.00
AUX SOLAR	0.00	0.00
LIGHTS	11.41	0.00
VERT TRANS	0.00	0.00
MISC EQUIP	3.91	0.00
TOTAL	41.21	34.42

TOTAL SITE ENERGY	75.63 MBTU	63.0 KBTU/SQFT-YR GROSS-AREA	63.0 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY	158.16 MBTU	131.8 KBTU/SQFT-YR GROSS-AREA	131.8 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 1.0
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.0

NOTE ELECTRICITY AND/OR FUEL USED TO GENERATE ELECTRICITY IS APPORTIONED BASED ON THE YEARLY DEMAND. ALL OTHER ENERGY TYPES ARE APPORTIONED HOURLY.

SISKYOU LARGE RETAIL BUILDING CRITERION ADMDOE2D 9/25/1992 10:31:32 PDL RUN 1
RETAIL BASELINE CLIMATE ZONE 1
REPORT- BEPS ESTIMATED BUILDING ENERGY PERFORMANCE WEATHER FILE- MOUNTSHASTA 2.1B

ENERGY TYPE IN SITE MBTU - CATEGORY OF USE	ELECTRICITY	FUEL OIL/PROPANE
SPACE HEAT	85.63	195.59
SPACE COOL	64.73	0.00
HVAC AUX	65.86	0.00
DOM HOT WTR	21.72	0.00
AUX SOLAR	0.00	0.00
LIGHTS	443.71	0.00
VERT TRANS	0.00	0.00
MISC EQUIP	0.00	0.00
TOTAL	681.64	195.59

TOTAL SITE ENERGY	877.25 MBTU	58.5 KBTU/SQFT-YR GROSS-AREA	58.5 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY	2242.60 MBTU	149.5 KBTU/SQFT-YR GROSS-AREA	149.5 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 0.0
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.0

NOTE ELECTRICITY AND/OR FUEL USED TO GENERATE ELECTRICITY IS APPORTIONED BASED ON THE YEARLY DEMAND. ALL OTHER ENERGY TYPES ARE APPORTIONED HOURLY.

SISKYOU LARGE RETAIL BUILDING T-24 SCRITERION ADMDOE2D 9/25/1992 10:27:32 PDL RUN 1
RETAIL BASELINE CLIMATE ZONE 1
REPORT- BEPS ESTIMATED BUILDING ENERGY PERFORMANCE WEATHER FILE- MOUNTSHASTA 2.1B

ENERGY TYPE IN SITE MBTU - CATEGORY OF USE	ELECTRICITY	FUEL OIL/PROPANE
SPACE HEAT	46.13	106.39
SPACE COOL	57.85	0.00
HVAC AUX	60.25	0.00
DOM HOT WTR	18.39	0.00
AUX SOLAR	0.00	0.00
LIGHTS	385.18	0.00
VERT TRANS	0.00	0.00
MISC EQUIP	0.00	0.00
TOTAL	567.80	106.39

TOTAL SITE ENERGY	674.20 MBTU	44.9 KBTU/SQFT-YR GROSS-AREA	44.9 KBTU/SQFT-YR NET-AREA
TOTAL SOURCE ENERGY	1811.53 MBTU	120.8 KBTU/SQFT-YR GROSS-AREA	120.8 KBTU/SQFT-YR NET-AREA

PERCENT OF HOURS ANY SYSTEM ZONE OUTSIDE OF THROTTLING RANGE = 0.0
PERCENT OF HOURS ANY PLANT LOAD NOT SATISFIED = 0.0

NOTE ELECTRICITY AND/OR FUEL USED TO GENERATE ELECTRICITY IS APPORTIONED BASED ON THE YEARLY DEMAND. ALL OTHER ENERGY TYPES ARE APPORTIONED HOURLY.

Appendix C
TECHNICAL & FINANCIAL ASSISTANCE SOURCES

Pacific Power & Light Company

- CUSTOMER SERVICE ANALYSIS. The company's customer-service-analysis (CSA) service offers resolution of customer inquiries regarding high usage along with efficiency information. When appropriate, referral is made to the Home Energy Analysis program (see below).

- HOME ENERGY ANALYSIS PROGRAM. This audit recommends insulation and infiltration upgrades based upon an assessment of existing levels. Recommendations are also made regarding reductions in energy used for water heating, lights, and refrigeration.

- HOME COMFORT PROGRAM. This new program is currently being offered in the Yreka and Mt. Shasta districts. The program features a sophisticated heat loss/infiltration test, installation of "bolt-on" measures at the time of the audit, and ESC financing of measures recommended in the audit. Program staff report high conversion rates from the program's design, which features price-list unit pricing, immediate calculation of customer savings, and immediate installation of "bolt-on" measures.

- SUPER GOOD CENTS MANUFACTURED HOME PROGRAM. Manufactured homes sited in California and constructed by one of 18 manufacturers participating in the Manufactured Acquisition Program are built with a $2,500 incentive to the manufacturer to install energy-efficient measures exceeding Super Good Cents levels.

- LOW-INCOME WEATHERIZATION PROGRAMS. This program offers no-cost weatherization services to qualifying low-income customers with electric heat.

- WATER HEATER WRAP PROGRAM. Insulating blankets are available for water heaters in unconditioned spaces, and can save about 480 kWh per year.

- ENERGY FINANSWER. This lost-opportunity new-construction program provides design assistance and measure funding for new commercial structures which exceed energy code levels. Repayment is made through an energy service charge.

- ENERGY PARTNERS. This retrofit industrial program offers services similar to its commercial new-construction counterpart.

- IRRIGATION PUMPING AND SYSTEM EFFICIENCY. Beginning in 1992, the cycle of testing pumps during irrigation season and carrying out indicated efficiency improvements in the winter non-pumping season began.

California Energy Commission

- ENERGY PARTNERSHIP PROGRAM. Provides local governments with training, technical and financial assistance to identify cost-effective energy-efficiency projects.

- LIGHT DUTY FUEL FLEXIBLE VEHICLE DEMONSTRATION PROJECT. Provides local governments and private businesses with comprehensive information about the advantages of owning and operating clean fuel fleet vehicles.

- SITING AND PERMIT ASSISTANCE. Grants are available to local governments to review and modify energy project permitting processes, evaluate environmental impacts, and amend local agency general plans to incorporate energy policies. technical assistance is available for environmental and project reviews and ordinance and policy development.

- ENERGY SHORTAGE CONTINGENCY PLANNING PROGRAM. Provides for efficient, coordinated statewide response to a disruption of petroleum, natural gas or electricity by enhancing local government energy emergency response capabilities.

- ENERGY TECHNOLOGY ADVANCEMENT PROGRAM. Local governments, research facilities, universities and private developers may receive contracts and loans for research, development and demonstration projects using alternative and advanced energy technologies such as fuel cells and photovoltaics.

- BUILDING AND APPLIANCE EFFICIENCY OFFICE. Local building department personnel can receive training on current residential and non-residential energy codes ("standards"). These standards may apply to newly constructed public facilities such as municipal office buildings.

- SCHOOLS AND HOSPITALS PROGRAM. California school, hospitals, and other non-profit institutions can qualify for matching grants and low-interest loans for various types of energy conservation projects. The loans are repaid from energy savings generated from these projects.

- SMALL SCHOOL DISTRICT PROGRAM. This program provides small public school districts with less than 2,500 students with technical consultants, at no cost to the school district, to address the district's specific energy needs. The program also provides loans to purchase hardware to implement energy conservation projects.

- HIGHER EDUCATION ENERGY CONSERVATION PROGRAM. Provides money to the Regents of the University of California, Trustees of the California University system, and the Board of Governors of the California Community Colleges to improve energy efficiency.

- SAFE SCHOOL BUS CLEAN FUEL EFFICIENCY DEMONSTRATION PROGRAM. This program provides $60 million to demonstrate advanced and alternative transportation technologies in school bus fleets. The three phased project enables school districts to upgrade their bus fleets in a cost-effective, environmentally-sound manner with at least 35% of the buses purchased being powered by methanol, compressed natural gas or other low-emission, clean-burning fuels.

- GEOTHERMAL RESOURCE DEVELOPMENT. Local jurisdictions and private entities are eligible for grants and loans to undertake geothermal development activities.

- FARM EFFICIENCY PROGRAM. Financial and technical assistance for demonstration projects by farmers are available through this program, including on-farm demonstrations in conjunction with the University of California.

California Energy Extension Service

- BUSINESS ENERGY ADVOCATES PROGRAM. Small businesses are eligible for audits and implementation assistance.

- INDIAN ENERGY ASSISTANCE. Tribes and indian organizations are eligible for technical assistance and planning grants.

- PUBLICATIONS. The Energy Extension Service distributes a variety of free publications on energy efficiency in businesses, schools, and communities.

California Department of Commerce Office of Small Business

- ENERGY CONSERVATION LOW-INTEREST LOAN PROGRAM. Small businesses are eligible for low-interest loans to improve energy management practices or install energy efficient equipment. This program is administered in cooperation with the Energy Extension Service.

State Assistance Fund for Energy-California Business and Industrial Development Corporation

- ENERGY EFFICIENCY IMPROVEMENTS LOAN PROGRAM. Small businesses and non-profit organizations are eligible for loans to install conservation and load management measures. This program is also administered in cooperation with the Energy Extension Service.

Appendix D

COUNTY FACILITIES ENERGY EFFICIENCY SURVEY

APPENDIX D CONTENTS

FACILITY:	Museum
YEAR CONSTRUCTED:	1978 and 1988
SQ.FT. OCCUPIED:	5,470
SQ.FT. WAREHOUSE:	- - -
APPROX. ENERGY COSTS/YR:	$2,691 ($0.49/sq.ft.)
APPROX. ENERGY USE INDEX:	25,831 Btu/sq.ft./yr
ENVELOPE:	Block R-19/R-38 ceiling, slab-on-grade, R-19/R-11 walls
HVAC:	Heat pump
LIGHTING:	Fluorescent, 4 ft., 40 watts
DOMESTIC HOT WATER:	Electric

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Weatherstrip doors.
- ❑ Energy saver lamps.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Ceiling insulation.
- ❑ Seven-day thermostats, economizer.
- ❑ Energy saver fixtures/ballasts, exterior incandescent and mercury vapor to metal halide or high pressure sodium, occupancy sensors.
- ❑ Domestic hot water timer.

NOTES:

The building is only open part of the year to the public. The office is open all year.

FACILITY:	Sheriff & Detention
YEAR CONSTRUCTED:	1977
SQ.FT. OCCUPIED:	6,200
SQ.FT. WAREHOUSE:	
APPROX. ENERGY COSTS/YR:	$22,389 ($3.61/sq.ft.)
APPROX. ENERGY USE INDEX:	228,920 Btu/sq.ft./yr
ENVELOPE:	Block, R-30 ceiling, R-0 walls
HVAC:	Oil boiler to fan coil, single pass, split air conditioning, no reset, electric duct heaters.
LIGHTING:	4 ft., 2 lamp and 4 lamp, 40 watts
DOMESTIC HOT WATER:	18 kilowatts

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Repair weatherstrip on doors and window seals.
- ❑ Readjust R-30 fiberglass batts in attic where they have been disturbed by HVAC/electrical workers.
- ❑ Repair damaged exterior air conditioning pipe insulation.
- ❑ Energy saver lamps.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Wall insulation (when remodeling), ceiling insulation.
- ❑ Replace boiler (single pass) with 2+pass system, consider propane or oil fired systems, new heat exchange coils, add resets, damper on flue, small energy management and control system controls tied in with new addition or new thermostats.
- ❑ Energy saver fixtures or ballasts, incandescent to compact fluorescent, occupancy sensors in offices, metal halide in cells/kitchen, fluorescent mercury vapor exterior to metal halide.
- ❑ Heat recovery from air conditioning and/or boiler to domestic hot water.
- ❑ Variable speed and/or High efficiency fan motors.

FACILITY:	Courthouse
YEAR CONSTRUCTED:	1914
SQ.FT. OCCUPIED:	27,488
SQ.FT. WAREHOUSE:	- - -
APPROX. ENERGY COSTS/YR:	$24,189 ($0.88/sq.ft.)
APPROX. ENERGY USE INDEX:	91,801 Btu/sq.ft./yr
ENVELOPE:	Poured in place, wood frame.
HVAC:	Boiler to hot water radiators with room thermostats.
LIGHTING:	Fluorescent, incandescent, exterior incandescent
DOMESTIC HOT WATER:	Electric

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Weatherstrip doors and windows, close off chimney effect to attic in Courthouse, caulk.
- ❑ Covers for air conditioning wall units, repair/replace air conditioning pipe insulation.
- ❑ Incandescent to compact fluorescent energy saver lamps.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Double glass, insulate attic.
- ❑ Outside air reset with energy management and control system, replace cast iron radiators with fan coil room units, flue damper, economizers, new boiler upgrade to higher efficiency unit.
- ❑ Energy saver fixture/ballasts, metal halide exterior, high pressure sodium exterior, occupancy sensors.
- ❑ Point of use domestic hot water, timers.
- ❑ Boiler flue gas heat recovery.

FACILITY:	Annex (Probation & Justice Center)
YEAR CONSTRUCTED:	1967
SQ.FT. OCCUPIED:	4,080
SQ.FT. WAREHOUSE:	- - -
APPROX. ENERGY COSTS/YR:	$8,484 ($2.08/sq.ft.)
APPROX. ENERGY USE INDEX:	138,736 Btu/sq.ft./yr
ENVELOPE:	Wood frame, R-11 walls (1992), R-22 roof, single glazed
HVAC:	Oil fired forced air
LIGHTING:	Fluorescent, incandescent, exterior incandescent
DOMESTIC HOT WATER:	Electric

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Weatherstrip doors, caulk doors and windows.
- ❑ Incandescent to compact fluorescent energy saver lamps.
- ❑ Repair/replace missing/damaged pipe insulation on air conditioning.
- ❑ Blanket for hot water heater and pipe insulation.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Double glass, roof insulation.
- ❑ Flue dampers, economizers, energy management and control system, 7-day thermostats.
- ❑ Energy saver fixtures/ballasts, high pressure sodium exterior lights, occupancy sensors. vapor exterior to high pressure sodium or metal halide.
- ❑ Hot water timer.

FACILITY:	Library
YEAR CONSTRUCTED:	1947/58/80
SQ.FT. OCCUPIED:	7,590
SQ.FT. WAREHOUSE:	- - -
APPROX. ENERGY COSTS/YR:	$6,783 ($0.89/sq.ft.)
APPROX. ENERGY USE INDEX:	57,673 Btu/sq.ft./yr
ENVELOPE:	Block, brick, slab-on-grade, Modules
HVAC:	Forced air #1 oil, heat pump, electric, wall air conditioning
LIGHTING:	4 ft., fluorescent, 40 watts
DOMESTIC HOT WATER:	Electric

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Weatherstrip doors and windows.
- ❑ Energy saver lamps.
- ❑ Covers for air conditioning wall units.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Ceiling insulation, double glass.
- ❑ 7-day stat with override for heat pump.
- ❑ Energy saver fixtures/ballasts, incandescent exterior with high pressure sodium, mercury vapor exterior to high pressure sodium or metal halide.
- ❑ Domestic hot water timer.

FACILITY:	Hospital
YEAR CONSTRUCTED:	1947
SQ.FT. OCCUPIED:	23,082 ($1.371/sq.ft.)
SQ.FT. WAREHOUSE:	- - -
APPROX. ENERGY COSTS/YR:	$31,565
APPROX. ENERGY USE INDEX:	134,033 Btu/sq.ft./yr
ENVELOPE:	Wood frame, attic with fire sprinklers and HVAC, estimated R-7 walls, R-19 attic
HVAC:	Oil fired low pressure (high pressure not used) to radiators and fan coils
LIGHTING:	4 ft., 4 lamp, 40 watts, some 50 watts and 75 watts included
DOMESTIC HOT WATER:	Electric

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Weatherstrip doors and windows, caulk.
- ❑ Service fan coils, motor in attic vibrates and air leaks at air handlers.
- ❑ Cut low return for forced air propane unit in shop.
- ❑ Energy saver camps.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Insulation on roof deck (due to equipment and sprinklers and hidden pockets in walls and ceiling), double glass.
- ❑ High efficiency motors for HVAC, fix steam traps and leaks, individual radiator thermostats, replace the three boilers with one new high efficiency unit and leave one low-pressure as backup. Small (Paragon) controller for zones. Split emergency room, operating room and delivery into three zones with separate air handlers and controls. Heat recovery from 100% outside air hall units exhaust via run around coil, economizer.
- ❑ Change incandescent to circline or compact fluorescent from 60 and 25 watts. Change emergency room and X-ray 250 watts x 4 lamp units to fluorescent, occupancy sensors.
- ❑ Energy saver fixtures and ballasts.

FACILITY:	Public Works
YEAR CONSTRUCTED:	1958/1972
SQ.FT. OCCUPIED:	5,715
SQ.FT. WAREHOUSE:	- - -
APPROX. ENERGY COSTS/YR:	$7,135 ($1.25/sq.ft.)
APPROX. ENERGY USE INDEX:	65,549 Btu/sq.ft./yr
ENVELOPE:	Block, slab-on-grade, single glass
HVAC:	Baseboard and wall electric, wall air conditioning
LIGHTING:	4 ft. fluorescent, 40 watts
DOMESTIC HOT WATER:	Electric

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Weatherstrip doors, caulk, repair window seals.
- ❑ Energy saver lamps.
- ❑ Covers for air conditioning wall units.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Ceiling and wall insulation, double glass.
- ❑ Replace system with forced air propane and split air conditioning, 7-day thermostats and economizers or heat pumps.
- ❑ Energy saver fixtures/ballasts, incandescent to high pressure sodium exterior, occupancy sensors.
- ❑ Domestic hot water timer.

FACILITY:	Public Health
YEAR CONSTRUCTED:	1982
SQ.FT. OCCUPIED:	1,849
SQ.FT. WAREHOUSE:	- - -
APPROX. ENERGY COSTS/YR:	$1,527 ($0.83/sq.ft.)
APPROX. ENERGY USE INDEX:	43,374 Btu/sq.ft./yr
ENVELOPE:	Wood frame (Module) R-19, R-11, Double
HVAC:	Walls and baseboard electric, wall air conditioning
LIGHTING:	4 ft. fluorescent
DOMESTIC HOT WATER:	Electric

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Door weatherstrip.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Floor insulation.
- ❑ Heat pumps and 7-day thermostats.
- ❑ Energy saver fixtures/ballasts, occupancy sensors.
- ❑ Domestic hot water timer.

FACILITY:	Mental Health
YEAR CONSTRUCTED:	1982
SQ.FT. OCCUPIED:	1,822
SQ.FT. WAREHOUSE:	- - -
APPROX. ENERGY COSTS/YR:	$1,372 ($0.75/sq.ft.)
APPROX. ENERGY USE INDEX:	39,534 Btu/sq.ft./yr
ENVELOPE:	Wood frame (portable), double glass, R-19, R-11
HVAC:	Heat pump
LIGHTING:	4 ft. fluorescent
DOMESTIC HOT WATER:	Electric

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Door weatherstrip.
- ❑ Energy saver lamps.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Floor insulation.
- ❑ 7-day thermostats for heat pump.
- ❑ Domestic hot water timer.
- ❑ Energy saver fixtures/ballasts, occupancy sensors.

FACILITY:	3rd Street Shop/Warehouse
YEAR CONSTRUCTED:	1940's
SQ.FT. OCCUPIED:	1,747
SQ.FT. WAREHOUSE:	- - -
APPROX. ENERGY COSTS/YR:	$
APPROX. ENERGY USE INDEX:	38,688 Btu/sq.ft./yr
ENVELOPE:	Wood frame/metal
HVAC:	Forced air propane unit
LIGHTING:	8 ft., 2 lamp, 75 watts
DOMESTIC HOT WATER:	N/A

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Energy saver lamps.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Thermostat set at night low limit and override timer (heat is frequently left on when unoccupied).

FACILITY:	Chamber of Commerce
YEAR CONSTRUCTED:	1879/1920's
SQ.FT. OCCUPIED:	1,177
SQ.FT. WAREHOUSE:	- - -
APPROX. ENERGY COSTS/YR:	$1,814 ($1.54/sq.ft.)
APPROX. ENERGY USE INDEX:	139,522 Btu/sq.ft./yr
ENVELOPE:	Brick, stucco, wood frame
HVAC:	Forced Air propane, electricity
LIGHTING:	Incandescent
DOMESTIC HOT WATER:	Electric

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Weatherstrip doors and windows.
- ❑ HVAC maintenance and filters.
- ❑ Incandescent lamps to compact fluorescent.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Insulate ceiling and double windows.
- ❑ Timer for water heater.
- ❑ Heat pumps.

FACILITY:	Veterans Hall
YEAR CONSTRUCTED:	1,937
SQ.FT. OCCUPIED:	4,616
SQ.FT. WAREHOUSE:	- - -
APPROX. ENERGY COSTS/YR:	$3,476 ($0.75/sq.ft.)
APPROX. ENERGY USE INDEX:	124,298 Btu/sq.ft./yr
ENVELOPE:	Wood frame/stucco, no insulation
HVAC:	Forced air oil ~ 5 yrs old with single setpoint thermostat
LIGHTING:	8 ft., 2 lamp, 75 watts, incandescent exterior with photocell
DOMESTIC HOT WATER:	Electric

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Weatherstrip doors, caulk, weatherstrip windows.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Insulate (ceiling, floor, walls), double glass.
- ❑ Night low limit stat with override timer and/or 7-day with override.
- ❑ Energy saver lamps, high pressure sodium/metal halide exterior lights.
- ❑ Timer for water heater.

FACILITY:	Office of Education
YEAR CONSTRUCTED:	1930's
SQ.FT. OCCUPIED:	7,080
SQ.FT. WAREHOUSE:	- - -
APPROX. ENERGY COSTS/YR:	$10,948 ($1.55/sq.ft.)
APPROX. ENERGY USE INDEX:	117,161 Btu/sq.ft./yr
ENVELOPE:	Wood frame/stucco, single and 1/4" double glass
HVAC:	Heat pump and propane and electric
LIGHTING:	4 ft. fluorescent, 2 and 4 lamp, surface and recess, 40 watts
DOMESTIC HOT WATER:	Electric, interior

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Keep filters/systems on regularly scheduled maintenance.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Insulation (ceiling, floor, walls), double glass.
- ❑ 7-day thermostats for heat pumps and propane systems.
- ❑ Energy saver lamps, energy saver ballasts, energy saver fixtures, occupancy sensors, high pressure sodium/metal halide fixtures on exterior.
- ❑ Timer for water heater.

NOTES:

Maze of additions to original building. Asbestos in crawl has been removed.

FACILITY:	Social Services
YEAR CONSTRUCTED:	1920's
SQ.FT. OCCUPIED:	5,919 without warehouse
SQ.FT. WAREHOUSE:	5,609 unoccupied/unheated 2nd floor
APPROX. ENERGY COSTS/YR:	N/A
APPROX. ENERGY USE INDEX:	Only open 4 months
ENVELOPE:	Brick facade over poured in place cement, double & single glass
HVAC:	Forced Air propane with 7-day stat
LIGHTING:	4 ft. - 4 lamp - 40 watts, 45 watts incandescent flood
DOMESTIC HOT WATER:	Electric

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Incandescent to compact fluorescent.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Insulate 2nd floor (ceiling and walls) when heating system is installed, double glass.
- ❑ Timer on domestic hot water
- ❑ Energy saver ballasts/fixtures, occupancy sensors.

FACILITY:	Long Term Care
YEAR CONSTRUCTED:	1969
SQ.FT. OCCUPIED:	17,176
SQ.FT. WAREHOUSE:	- - -
APPROX. ENERGY COSTS/YR:	$52,138 ($3.04/sq.ft.)
APPROX. ENERGY USE INDEX:	172,696 Btu/sq.ft./yr
ENVELOPE:	Wood/brick, double glass
HVAC:	Electric baseboard, wall air conditioning
LIGHTING:	4 ft., fluorescent, 40 watts
DOMESTIC HOT WATER:	Electric, solar

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Weatherstrip doors, caulk.
- ❑ Covers for wall air conditioning units.
- ❑ Energy saver lamps, recess incandescent in halls, entry, etc. to compact fluorescent, exit signs to compact fluorescent.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Double glass, insulate ceiling, solar film.
- ❑ Energy saver fixtures/ballasts, occupancy sensors, incandescent exterior to high pressure sodium.
- ❑ Air-to-water heat pump heat recovery in the laundry room and use old solar water heater tank.
- ❑ Repair solar domestic hot water system. Redesign controls and drain down system to drain back or closed loop with antifreeze.

FACILITY:	Main Shop - Roads
YEAR CONSTRUCTED:	1974 and 1990
SQ.FT. OCCUPIED:	9,998 with warehouse
SQ.FT. WAREHOUSE:	8,568 (heated)
APPROX. ENERGY COSTS/YR:	$7,400 ($0.74/sq.ft.)
APPROX. ENERGY USE INDEX:	120,564 Btu/sq.ft./yr
ENVELOPE:	Block, single and storm glass, R-19 ceiling
HVAC:	Forced air oil
LIGHTING:	8 ft., 2 lamp, 4 ft., 2 lamp
DOMESTIC HOT WATER:	Domestic hot water

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Weatherstrip doors and windows.
- ❑ Covers for wall air conditioning units in office during winter.
- ❑ Energy saver lamps.
- ❑ Wrap domestic hot water, fix dripping faucet in bath tank and liner.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Windows to double, insulate office walls.
- ❑ Night low limit with 7-day thermostats for office and shops.
- ❑ Energy saver ballasts/fixtures, incandescent exterior to high pressure sodium with photocell over doors, mercury vapor to metal halide shop and exterior.
- ❑ Timer for domestic hot water.

FACILITY:	Veterans/Park Grounds Maintenance Shop/Bathrooms
YEAR CONSTRUCTED:	1890's
SQ.FT. OCCUPIED:	1,610 without warehouse
SQ.FT. WAREHOUSE:	581 unheated
APPROX. ENERGY COSTS/YR:	$2,369 ($1.47/sq.ft.)
APPROX. ENERGY USE INDEX:	235,338 Btu/sq.ft./yr
ENVELOPE:	Brick without insulation, single glass
HVAC:	Interior free standing #1 oil stove
LIGHTING:	4 ft., 2 lamp, 40 watts, incandescent exterior
DOMESTIC HOT WATER:	- - -

NO OR LOW COST ENERGY CONSERVATION MEASURES:

- ❑ Weatherstrip doors, caulk, weatherstrip windows.
- ❑ Energy saver lamps.

ENERGY CONSERVATION MEASURES TO STUDY:

- ❑ Insulation (ceiling).
- ❑ * Cabinet for chemicals, paints, etc. that is heated above freezing so oil stove doesn't have to be on 24 hours/day.
- ❑ ** Infrared electric heaters for bathrooms (public not on the shop meter).
- ❑ high pressure sodium exterior with photocell.

NOTES:

* The current heater is on 24 hours/day to prevent problems with paint, etc. that cannot be below a certain temperature.

** The staff currently uses portable electric heaters in the restrooms to prevent pipe/water freezing problems. These units have no controls and overheat the space 24 hours/day. These units are not on the meter for the shop building.

Appendix E

ENERGY FACILITY REGULATORY & ENVIRONMENTAL REVIEW INFORMATION

MAJOR PERMITS POTENTIALLY REQUIRED BY ENERGY FACILITIES (ref. OPR Permit Handbook)

Affected Resource	Agency	Permit/Approval
Air	Air Pollution Control District	Authority to Construct and Permit to Operate for activities emitting pollutants to the atmosphere.
Fish and Wildlife	Department of Fish and Game	Stream or Lake Alteration for activities in streams, lakes, channels and crossings.
Water	State Lands Commission	Land-Use Lease for encroachments, docks, crossings on submerged lands.
	State Water Resources Control Board, Regional Board	National Pollutant Discharge Elimination System Permit for discharges to surface water.
		Waste Discharge Requirements for discharges to surface water or groundwater to the waters of the state.
	State Water Resources Control Board, Division of Water Rights	Permit to Appropriate Water and Statement of Diversion and Use for activities diverting surface water not previously appropriated and Certificate of Registration for Small Domestic Use Appropriations.
	United States Army Corps of Engineers	Permit for dredging and filling.
Proposed Activity		
Power Plants and transmission lines	County Planning Department	Conditional Use Permit.
	California Energy Commission	Notice of Intention and Application for Certification.
	Public Utilities Commission	Certificate of Public Convenience and Necessity.
Timber harvesting	California Department of Forestry	Timber Operators License and Timber Harvesting Plan.
Conversion of timberland to non-forest uses	California Department of Forestry	Timberland Conversion Permit.

Proposed Activity Continued

Pipelines, railroad crossings	Public Utilities Commission	Certificate of Convenience and Necessity.
Solid waste facilities	Integrated Waste Management Board	Solid Waste Facility Permit.
Geothermal well	Department of Conservation, Division of Oil and Gas	Geothermal (including temperature gradient) Well Permit (on private or State land).
	State Lands Commission	Geothermal Exploration or Prospecting Permit.
Storing, treating or disposing of hazardous waste	Department of Health Services, Toxic Substances Control Program	Hazardous Waste Facilities Permit.
	State and Regional Water Quality Control Boards	Waste discharge requirements.
Encroachment on or across a state highway	Department of Transportation	Encroachment Permit.
All activities involving dams or reservoirs	Department of Water Resources, Division of Safety of Dams	Approval of Plans.
Dredging	Department of Fish and Game	Standard for Special Suction Dredging Permits.
	State Lands Commission	Dredging Permit.

ENVIRONMENTAL REVIEW PROCESS SUMMARY (ref. 9)

Private & State Lands (CEQA)	Federal Lands (NEPA)
❑ Submission of permit application	❑ Submission of permit application
❑ Determination of permit application completeness within 30 days of receipt	❑ Determination of permit application completeness
❑ Lead agency prepares initial study	❑ Lead agency conducts environmental assessment
❑ Decision to prepare EIR within 30 days after permit application completeness is determined	❑ Decision to prepare EIS
❑ Notice of Preparation (NOP)	❑ Notice of Intent (NOI) ❑ Formal scoping
❑ Lead agency prepares draft EIR	❑ Lead agency prepares draft EIS
❑ Notice of Completion (NOC)	❑ Federal register notice
❑ Public notice of availability of draft EIR	❑ Public notice of availability of draft EIS ❑ Circulation by lead agency of draft EIS
❑ Public review period (30-90 days) and agency consultation	❑ Public review period including public meetings (45 days typically)
❑ Lead agency responds to comments; prepares final EIS	❑ Lead agency responds to comments and prepares final EIR ❑ Federal register notice ❑ Public notice of availability of final EIS ❑ Distribution of final EIS
❑ Certification of final EIR by lead agency	
❑ Lead agency approves project	❑ Lead agency approves project
❑ Notice of Determination (NOD)	❑ Record of Decision (ROD)
❑ Disposition of final EIR	❑ Public notice of availability of ROD

TRANSMISSION FACILITY REGULATORY RESPONSIBILITIES (ref. 5)

Transmission Line Types	LEAD AGENCY				
	California Public Utilities Commission	California Energy Commission	Municipal Utility Districts or Irrigation Districts	California Cities & Counties	California Department of Water Resources
Lines entirely within California (new lines and upgrades > 25%)					
Any size line connected to a new or modified thermal power plant over 50 MW	1[a]	1, 2, 3, 4, 5 [b]	---	---	---
Smaller than 200 kV line connected to a thermal power plant less than 50 MW or a non-thermal plant	1	---	2	3, 5	4
200 kV line or larger not connected to a power plant	1	---	2	3, 5	4
Interstate Lines					
200 kV or larger	1	---	2	3, 5	N/A
Smaller than 200 kV	1	---	2	3, 5	N/A

Proponent

1 Investor owned utility

2 Municipal utility, utility district, or irrigation district

3 Independent third party

4 Department of Water Resources

5 Western Area Power Administration

(a) A Certificate of Public Convenience and Necessity is required even where the CEC is the lead agency.

(b) CEC jurisdiction ends at the point of new line interconnection with the existing grid.