

4 ENERGY

4.01 Overview

THE 1973 OIL EMBARGO created a national awareness that energy is an essential resource. Fossil fuels provide for the majority of the nation's energy needs. The quantity of these fuels are finite with the largest reserves located within foreign countries. At one time nuclear power was expected to develop into a replacement energy source. Cost and public controversy concerning facility safety and the problems associated with the disposal of nuclear wastes, combined with the high cost of building and operating a plant, however, have diminished the attractiveness of nuclear power as a replacement energy source for fossil fuels.

Public policy on energy efficiency has, in the past, been dictated by concerns for national security and economic viability. Emerging as an equal concern, however, is the environmental degradation caused by burning fossil fuels. The burning of fossil fuels creates air pollution and increases atmospheric concentrations of infrared-absorbing gases, such as carbon dioxide. These increases have been associated by some scientists with global warming. This has provided the impetus for stronger public policy on energy efficiencies, vehicle fuel economies and emission policies. The U.S. Department of Energy's goals are to improve the efficiency of energy utilization, increase energy production from renewable resources and reduce the United State's dependence on imported energy. Similar goals are now shared by privately-owned utilities.

Within the Ukiah Valley, as in most communities within this country, fossil fuels still provide most of the energy consumed. Gasoline, natural gas, propane and part of the Valley's electrical supply are all derived from fossil fuels. The Valley's best opportunity for reducing its dependence upon fossil fuels is to increase the efficiency of energy used within structures and for transportation. The largest use of energy is for automobile transportation, with heating and cooling within structures ranked second. Economic forces, both regional and local, have an effect on the feasibility and availability of alternative transportation systems. Energy savings can be realized by establishing land use patterns to optimize public transit, the use of bicycles, and availability of pedestrian paths.

Local governments can lead the Valley in reducing its dependence on fossil fuels by promoting alternative methods of transportation (walking, bicycling, and carpooling), energy efficient mass transit; the use of renewable energy sources (hydro, solar, wind and biomass); and increasing the efficiency of energy used within structures. The benefits of doing so include reducing the amount of money sent outside of the community to buy energy, increasing local employment opportunities, and increasing the environmental and aesthetic qualities of the Valley.

4.02 Land use

4.02.01 Summary of major findings

The types and amounts of energy used within a community are greatly affected by land use patterns and their associated transportation impacts. For instance, a sprawling, low density urban pattern increases dependency upon automobiles and therefore fossil fuels by limiting opportunities for mass transit use, bicycling and walking. Land use patterns are largely regulated through the General Plan and Zoning Ordinance. As a result, both the City of Ukiah and the County of Mendocino can have a dramatic



influence on energy use within their own jurisdictions. The efficiency of energy use within the Ukiah Valley can be increased by planning land use patterns to reduce dependence upon automobiles. This can be accomplished by locating relatively dense residential development, as well as major new employment and retail centers, along public transportation routes. Additionally, single family land uses should have safe bicycle and pedestrian access to shopping, employment and nearby residential neighborhoods.

4.02.02 General Plan goals, policies, and implementing programs

Goal EG-1: Create land use patterns which facilitate the conservation of energy.

Policy EG-1.1: Locate shopping, employment and recreation opportunities within walking or bicycling distance of proposed and existing housing.

Implementation Measure EG-1.1(a): The Land Development Code¹ shall incorporate standards and incentives for new development to provide safe and reasonable access for pedestrians and bicyclists. [Timeframe for completion: Short term planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: City Planning Department and County Department of Planning and Building]

Implementation Measure EG-1.1(b): The Land Development Code shall allow for mixed-use developments. [Timeframe for completion: Short term planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: City Planning Department and County Department of Planning and Building]

4.03 Transportation

4.03.01 Summary of major findings

Transportation activities account for approximately 28 percent of all energy use within the United States. Personal passenger transportation is the largest consumer, accounting for about 58 percent of all transportation energy use.

The personal auto is more energy intensive than other forms of passenger transportation, but not by as much as many may think. Average fuel efficiency for cars in use today is approximately 18 miles per gallon (mpg). In comparison, an urban transit bus achieves an average of 36 mpg per passenger. Consequently, an auto with two passengers, or an auto with one passenger but twice the average fuel economy, has roughly the same passenger fuel efficiency as a bus. Mass transit, however, has the added benefit of reducing traffic congestion and associated air pollution.

Progress has been made toward raising average vehicle fuel economy. However, these gains have been countered by increases in overall travel. The Motor Vehicle Information and Cost Savings Act of 1975 introduced average fuel economy standards; the average fuel economy for new cars is 28 mpg. Various auto manufacturers have developed high fuel efficient prototype vehicles. Fuel economies of these vehicles have ranged from 50 to nearly 100 mpg. The prototype vehicles tend to be smaller with lower acceleration performance than today's cars.

¹Land Development Code refers to a new compilation of ordinances that will replace the zoning ordinance, subdivision ordinance, and associated development ordinances by placing them all within a single code section

Additionally, California has mandated that by 1998, two percent of all cars a manufacturer sells in the state must produce no tailpipe emissions. The requirement increases to five percent by the year 2000 and ten percent by 2003.

In response to air quality concerns, alternative fuels have been developed. Mixtures of methanol and gasoline are being used. Natural gas and liquid petroleum gas (LPG) are also being considered as alternative vehicle fuels. PG&E is promoting the use of natural gas powered vehicles. It has several natural gas vehicle (NGV) fueling stations in California and is working with Shell Oil Company to install natural gas compressors at selected service stations. Many of the NGV or LPG vehicles operating today are company fleet vehicles.

Local governments within the Ukiah Valley can play a role in transportation energy management. They can promote pedestrian and bicycle travel, car-pooling and mass transit. Further, the City and County can set an example for private industry by developing fuel efficient vehicle fleets and developing on-site carpooling programs for their employees.

4.03.02 General Plan goals, policies and implementing programs

Goal -2: Improve the efficiency of energy use within the private transportation system.

Policy EG-2.1: Encourage the use of alternatively powered vehicles.

Implementation Measure EG-2.1(a): The City shall explore a program of offering a range of incentives for alternatively fueled automobiles. [Timeframe for completion: Intermediate-term planning period ♦ Measure applies to: City ♦ Agency/Department responsible: Electric Utility Department]

Goal EG-3: Improve the efficiency of energy use within the City's and County's vehicle fleet.

Policy EG-3.1: The City and County shall serve as models for programs to operate fleet vehicles at maximum fuel efficiency.

Implementation Measure EG-3.1(a): Perform regular maintenance on fleet vehicles to ensure they are operating at peak fuel efficiencies. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: General Services]

Implementation Measure EG-3.1(b): Coordinate work schedules and site visits so that city employees and elected officials share vehicles whenever feasible. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: General Services]

Implementation Measure EG-3.1(c): The City and County shall develop a model program for their fleets of vehicles which ensures the following:
The most energy efficient vehicles available are brought on line whenever replacement vehicles are needed and to the greatest extent possible.
Replacement vehicles are comprised of the least air polluting options available; and
Alternative fuels which create the least air pollution shall be used whenever available, practical and financially feasible. [Timeframe for completion: Long-term planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: Administration and vehicle fleet managers]

Policy EG-3.2: Support car-pooling.

Implementation Measure EG-3.2(a): Work with Caltrans and large employers to promote car-pooling. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: Local Transportation Commission through the Mendocino Council of Governments]

Implementation Measure EG-3.2(b): Develop incentives, such as preferred parking places at government buildings, for city employees who car-pool. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: General Services]

4.04 Site planning and landscape design**4.04.01 Summary of major findings**

The layout of streets and lots can play an important role in facilitating long-term energy conservation. Long after individual buildings are demolished and new buildings replace them, the initial layout of streets and lots continue to influence energy use demands and design options available to the community. Most developments in the Ukiah Valley were designed with little or no consideration of energy efficiency. Many of these developments cannot take advantage of solar energy due to their lot or building orientations restricting solar access. As familiarity with the relative low cost and simplicity of solar design increases, more and more people will be interested in developing solar energy sources for their homes and businesses. In order to facilitate future solar energy use, energy-related planning needs to occur now.

In relatively low-density hillside development, lots should be laid-out so that the maximum number of building sites have solar access. Housing densities on wooded, north-facing slopes should be low, as these sites are likely to remain relatively cold and damp during the winter, creating a less comfortable living environment and requiring more energy to heat. On larger sites structures should be clustered to maximize solar opportunities.

Energy requirements for heating and cooling buildings are also strongly influenced by local climatic conditions. Large areas of unshaded pavement, such as wide streets or parking lots, absorb and radiate heat which can significantly increase summer temperatures. This in turn can substantially increase the costs of cooling nearby structures. Trees create shade which can significantly reduce a building's cooling needs while providing a more comfortable outdoor environment. Trees which are too small, too tall, or too narrow should not be used because they will provide limited or no benefits. The best tree species for micro-climate enhancement are broad, low, and deciduous, preferably losing their leaves relatively early in the fall.

4.04.02 General Plan goals, policies and implementing programs

Goal EG-4: Maximize on-site solar energy use, especially in new developments.

Policy EG-4.1: Incorporate solar energy considerations into the design, review and approval of all development.

Implementation Measure EG-4.1(a): Streets and lots shall be oriented in such a way as to maximize design opportunities for passive solar heating and cooling. Streets shall

be generally oriented east to west unless topographical, engineering, and other significant visual considerations can be shown to warrant other design characteristics. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: City Planning Department, County Building and Planning Services]

Implementation Measure EG-4.1(b): The Land Development Code shall provide setbacks and height limitations that provide for optimal solar air and water heating and cooling opportunities. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: City Planning Department, County Building and Planning Services]

Implementation Measure EG-4.1(c): The Land Development Code shall require structures and landscaping in Planned Unit Developments be located to maximize solar access. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: City Planning Department, County Building and Planning Services]

Implementation Measure EG-4.1(d): The Land Development Code shall require hillside lots be configured to maximize solar access through clustering units or building sites on south-facing slopes whenever possible. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: City Planning Department, County Building and Planning Services]

Implementation Measure EG-4.1(e): The Land Development Code shall include incentives for project designs in all zoning districts which respond to principles of solar access and design. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: Utility Department, City Planning Department, County Building and Planning Services]

Goal EG-5: Site design shall incorporate shade trees for energy conservation.

Policy EG-5.1: Encourage minimum canopy coverage of all paved area on a lot.

Implementation Measure EG-5.1(a): the Land Development Code shall include in its design requirements the requirement that all new development shall provide a canopy coverage of 50% at maturity of all paved areas on the lot.² [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: Planning Department and Department of Planning and Building Services]

4.05 Building design

4.05.01 Summary of major findings

Building design is a significant factor in energy efficiency. Buildings which fail to respond to site and climatical factors are more difficult and costly to cool in summer and heat in winter. As energy costs continue to climb, energy efficiency and solar design features have increasingly become cost effective. In 1976, Title 24 of the Uniform Building Code was amended to include energy conservation measures, particularly increased insulation standards. In addition to existing codes, local governments can take steps to encourage these features and stimulate more energy efficient development.

²The objective is to try to obtain a fifty percent canopy over parking areas. The Land Development Code shall set the performance or other standards for site specific consideration. This footnote is a part of Implementation Measure EG5.1(a).

The City is in a unique position to encourage energy efficiency in building design because of its development review functions and because it owns the local utility agency.

Simple passive solar design features which are both cost effective and energy efficient include orienting buildings and placing windows and roof overhangs to receive the winter sun and deflect the summer sun; windows which open; thermal drapes or shutters; increased wall, roof, and floor insulation; double glazing of glass doors and windows; and attached greenhouses or solariums for direct solar heat gain. In addition, there are a variety of active solar design features which can be cost effective under the right circumstances, such as solar water heating.

Existing structures can increase their energy efficiency through upgrading their insulation, appliances, equipment and weatherization. They can also be retrofitted with solar design features. As an example, lighting retro-fits can greatly increase the energy efficiencies of existing commercial buildings.

4.05.02 General Plan goals, policies and implementing programs

Goal EG-6: Promote energy efficiency features in the design of all new structures and in the retrofitting of existing structures.

Policy EG-6.1: Design new buildings with the maximum feasible energy efficiency.

Implementation Measure EG-6.1(a): The Land Development Code shall require energy efficiency standards which adapt State requirements to the Ukiah Valley for all new development. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: Building Departments]

Policy EG-6.2: Public buildings shall operate at the highest energy efficiency level economically and operationally feasible.

Implementation Measure EG-6.2(a): During the short-term planning period, the City and County shall perform an energy survey on all their buildings and create a plan for accomplishing needed upgrades. [Timeframe for completion: Short-term planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: General Services and Administration]

Implementation Measure EG-6.2(b): New buildings constructed for public agencies shall be to the highest energy efficiency level financially feasible. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City and County ♦ Agency/Department responsible: General Services and Administration]

Policy EG-6.3: Promote retrofitting of privately-owned buildings to increase energy efficiency.

Implementation Measure EG-6.3(a): The City, through its utility agency and other programs to conserve non-renewable energy resources, shall offer incentives to individuals and companies willing to retrofit their buildings to increase energy efficiency and install more energy efficient appliances. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City ♦ Agency/Department responsible: Electric Utility]

4.06 Energy Suppliers

4.06.01 Summary of major findings

Energy suppliers can, through maintenance and system design, increase the efficiency with which they supply energy to their customers. Additionally, opportunities exist for suppliers of energy to work with their customers, offering education and incentive programs, to increase the efficiency of energy use on-site.

The primary energy supplies used within buildings are electricity, natural gas, oil, propane and wood. Electrical power is supplied to the planning area by either the City of Ukiah or the Pacific Gas and Electric (PG&E) Company. The City of Ukiah has owned and operated an electrical distribution system since 1897. It provides electrical service to approximately 7,700 customers, 80 percent of which are residential and the remaining of which are commercial or municipal. The City obtains its electrical supply from various sources as summarized in the Table IV.4-11 and Figure IV.4-O.

Ukiah purchases 22.0 MW of power from the Northern California Power Agency (NCPA).

The City of Ukiah was one of the founding members of NCPA, a joint power agency comprised of various cities and a rural electric cooperatives which own electric utility systems. The primary purpose of NCPA is to efficiently acquire, purchase, generate, transmit, distribute, sell, interchange and pool electric energy and capacity for its members. Ukiah currently participates in three types of generating resources of NCPA. NCPA operates five combustion turbine units to generate peaking capacity for its members. Four geothermal plants are operated by NCPA. Also, a major hydroelectric project has recently been completed in

Table IV.4-11: Ukiah sources of electricity

Source	Megawatts
Western Firm Power Allocation	5.9
Western Renewable Allocation	2.9
Lake Mendocino Hydro (City)	3.0
NCPA Geothermal	11.0
NCPA Combustion Turbine	7.0
NCPA Calaveras Hydro	4.0
Total	31.8

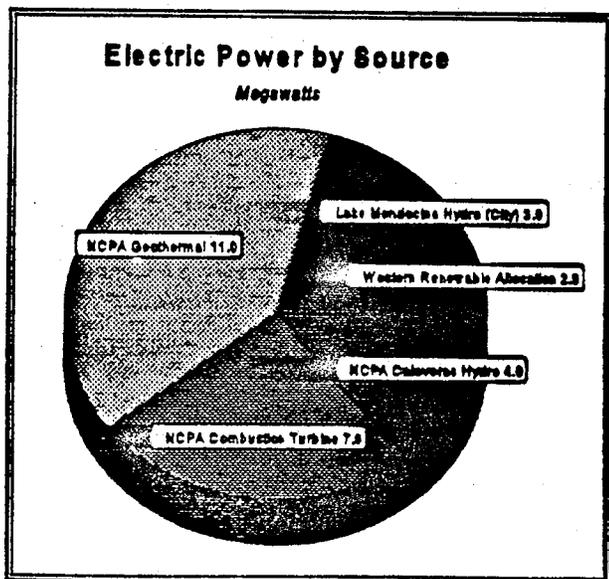


Figure IV.4-O: Sources of City power supply

Calaveras County. NCPA also has an Interconnection Agreement with PG&E to allow NCPA power resources to be delivered over PG&E transmission lines and to purchase supplemental power from PG&E. The City of Ukiah's power resources have been sufficient in the past to meet its loads and, therefore, the City has not needed to purchase supplemental power from PG&E. Electrical energy is delivered to the City of Ukiah over PG&E transmission lines under contracts with Western and NCPA. The City receives power from PG&E's Ukiah Substation. The City

then transmits the power over its own transmission line to its main sub-station located at Orchard and Gobbi Streets. The City's distribution system consists of approximately 50 miles of overhead lines and 25 miles of underground lines.

Ukiah's peak demand for electricity occurs during the summer months. The peak demand for the summer of 1993 reached 25.7 MW while demand in the winter was approximately 16 MW. The summer peak demand is due to hot weather conditions and air-conditioning loads.

In 1993, Ukiah had a total of 7,665 electric customers. Residential customers accounted for 80 percent, small commercial 19 percent and the remaining 1 percent were large commercial and municipal customers. In terms of electrical load, residential customers accounted for 30 percent, commercial customers 68 percent and the remaining 2 percent are industrial and municipal loads.

PG&E serves those electric customers in the Ukiah Valley that are not served by the City of Ukiah. PG&E is one of the nation's largest investor-owned gas and electric utilities. PG&E obtains its electrical supply from widely diversified resources.

PG&E owns and operates an electrical distribution system throughout northern and central California, serving 11.8 million people, including facilities within the Ukiah Valley. PG&E electric customers within the planning area include residential, commercial, industrial, agricultural and governmental. The largest individual electrical loads within the planning area are industrial.

PG&E also provides natural gas service to portions of the Ukiah Valley. These areas include the City of Ukiah northward to Redwood Valley. PG&E's sources of natural gas are derived from Canada, the U.S. Southwest and California. Natural gas customers include residential, commercial, industrial and governmental. Both Masonite and LP Corporations use natural gas at their wood product plants.

Other energy supplies used within buildings include propane, fuel oil and wood. Propane is used by residential and commercial customers in the Ukiah Valley, especially where natural gas service is not available. Fuel oil is used by the Masonite Corporation in combination with wood residue to fuel its steam boilers. Wood is used in the area by some residences for space heating.

Both the City of Ukiah and PG&E offer energy conservation programs to their customers. The City of Ukiah through its power service contract is required to have an on-going Conservation and Renewable Energy (CR&E) Program. Ukiah's CR&E Program identifies eight activities. Three of the activities are related to renewable energy "supply" and the other five activities are related to "demand-side" management.

The renewable energy supply activities include the City's ownership and operation of a small hydroelectric plant at Lake Mendocino's Coyote Dam. This project has an installed capacity of 3.0 MW. Two other renewable energy supply projects have been initiated in conjunction with NCPA. The city, through NCPA, operates two 110 MW geothermal facilities at "The Geysers." Also, the City is a participant in the NCPA North Fork Stanislaus Project located in Calaveras County. This project is a 205 MW hydroelectric project.

Demand-side energy management activities include equipment loans from Western to scan the City's distribution lines, pumping stations and buildings for electrical losses. The City also offers energy management programs to its electric customers. These include energy audits, commercial and residential rebates, and a compact fluorescent bulb rental program.

In the Fall of 1992, the U.S. Congress passed the "Energy Policy Act of 1992." Because of this Act, Ukiah will be required to prepare "Integrated Resource Plan" (IRP). An IRP must include both supply-side and demand side resource assessments, analyze environmental impacts, include public participation, and have action plans with quantifiable energy savings. Customer IRPs are due to Western twelve months from adoption of the final program regulations. The regulations were to be finalized by January, 1996. PG&E is required by the California Public Utilities Commission (CPUC) to offer its customers energy management programs.

PG&E residential customers are eligible for rebates, educational information and direct assistance. Rebates are offered for ceiling insulation, high-efficiency refrigerators and air conditioners, filters, showerheads, water heater blankets and shade trees. Educational information programs include energy audits, design services and time-of-use rates. Direct assistance is available to income-eligible households for such things as appliance replacements and rate discounts.

PG&E also offers energy management programs to its commercial and industrial customers. Electric and natural gas rebates and other financial incentives are available to customers that undertake efficiency improvements for heating, ventilation and air conditioning, lighting, refrigeration and pumping systems.

4.06.02 General Plan goals, policies, and implementing programs

Goal EG-7: Educate residents and businesses about the importance of energy efficiency.

Policy EG-7.1: Promote energy education programs.

Implementation Measure EG-7.1(a): The City shall utilize its utility bill mailings to promote education on energy efficiency and solar energy. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City ♦ Agency/Department responsible: Electric Utility Department]

Implementation Measure EG-7.1(b): The City, in conjunction with other groups, shall participate in or offer workshops, seminars, and newsletters on a periodic basis to provide information to utility users about energy efficiency and solar energy. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City ♦ Agency/Department responsible: Electric Utility Department]

Implementation Measure EG-7.1(c): The City, in conjunction with other groups, shall participate in or offer workshops, seminars, and newsletters on a periodic basis to provide information to utility users about energy efficiency and solar energy. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City ♦ Agency/Department responsible: Electric Utility Department]

Goal EG-8: Manage existing energy resources to meet increased demands and explore the use of new energy efficient technologies.

Policy EG-8.1: Develop a load management program whereby existing electrical supplies can accommodate, to the extent feasible, future growth and development.

Implementation Measure EG-8.1(a): Investigate thermal energy storage as a means of reducing peak power demands for cooling. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City ♦ Agency/Department responsible: Electric Utility Department]

Implementation Measure EG-8.1(b): Offer financial or other incentives to residential and commercial customers to install more efficient heating, ventilation, and air conditioning systems; lighting systems; and appliances. [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City ♦ Agency/Department responsible: Electric Utility Department]

Implementation Measure EG-8.1(c): The City shall offer to new residential and commercial customers information on efficient energy use and energy audits, as part of hook-up process. . [Timeframe for completion: Ongoing planning period ♦ Measure applies to: City ♦ Agency/Department responsible: Electric Utility Department]



