## ENERGY CONSERVATION ELEMENT

### 12.10 PURPOSE

The purpose of this section is to identify energy resources, inventory the amount and type of energy consumed in the UGB, determine future energy needs and examine methods for conserving energy and promoting energy diversification.

### 12.20 ENERGY RESOURCES

Energy prices in the 1970's in real terms, ceased to decline. Slowly citizens and the national economy began adjusting to both higher energy costs and diminished energy supplies. The occasional symptoms of the larger problem, including the 1973 oil embargo, the 1976-77 natural gas shortage and the 1979 gasoline lines, emphasize and clearly highlight a need to provide for the transition to new sources of energy and new ways to use it.

**Fossil Fuels -** For generations, fossil fuels have provided a cheap, efficient and readily available supply of energy for western cultures. Today, nearly all commodities are dependent on oil, natural gas and coal for their manufacture and distribution. The realization that these energy sources, especially crude oil, are finite and therefore subject to depletion has placed increased emphasis on the dual need to conserve remaining supplies and seek alternative renewable sources. The previously mentioned symptomatic factors have made these needs evident to consumers. The most obvious solution to the energy problem has been to increase the search for more deposits of fossil fuels; making use of recent technological advances and information to extract deposits in more isolated areas. It is expected, however, that in a rather short time the cost of retrieving newly found reserves will exceed the benefits. Although it will be possible to increase the total annual energy produced, it will require increasing energy to extract, transport, refine and distribute these resources. In the long range, therefore, exclusive or disproportionate reliance on these nonrenewable energy fuels will likely result in higher inflation and make the transition to alternative renewable sources more disruptive to the economy.

Patterns of energy use will continue to be shaped by the cost and availability of energy resources. Although Oregon does not possess significant deposits of fossil fuels, the state is well endowed with other renewable energy resources.

No known oil reserves or refining facilities exist in Oregon. Like electricity and natural gas, petroleum is imported to the state. Until 1973, the price Oregonians paid for petroleum products rose at a rate less than general inflation. Disruption of the international oil market since the 1973 oil embargo has caused the price of petroleum products, most notably gasoline, to increase substantially.

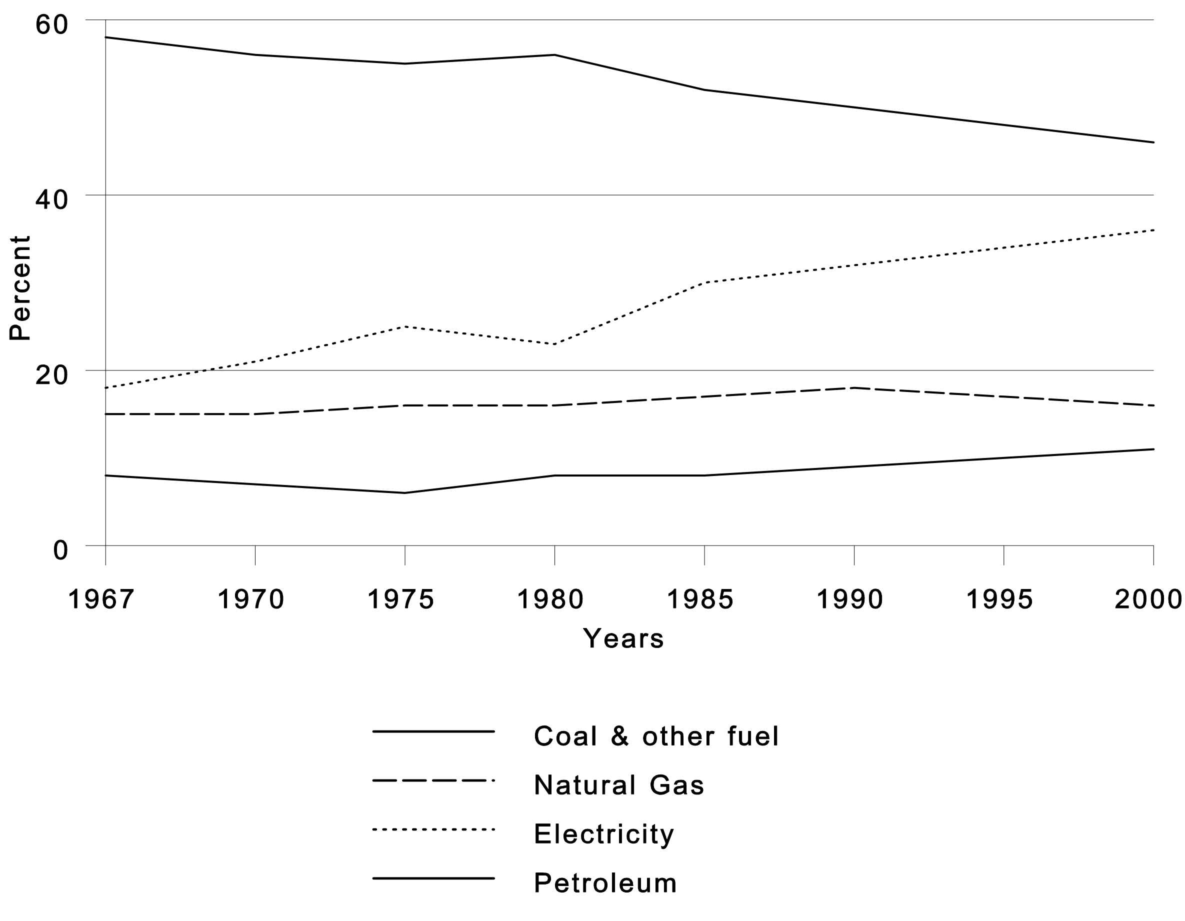
Changing sources of petroleum imports from Canada and other Western countries to principle reliance on oil from the Middle East and other politically unstable ports of the world has a profound effect on consumer prices. It is expected that reliance on these sources will continue several years, at least through a period of transition to other renewable energy sources. The speed and ease of transition will be based largely upon international factors and the country's general adaptability to other energy sources.

The Natural Gas Policy Act of 1978 marked major change in federal policy, allowing substantial price increases and eventually resulting in total price decontrol of natural gas. The Act also promotes through incentive, further exploration, development and production.

The overall outlook for the availability of natural gas has improved although some uncertainties still exist. The quantity and price of the state's future supply, like most other large scale energy sources will continue to be a function of federal and international policy decisions.

Table 12.10.1 depicts recent and future trends in the distribution of energy sources in Oregon from 1967 to 2000.

**TABLE 12.20.1**
**Trends in Relative Shares of Energy Sources**



Detailed energy consumption forecasts for conventional energy sources by source type and sector are presented in the ODOE Fourth Annual Report (1980). The report also contains much information relative to energy supply and the state's role in energy conservation. Those wishing further information relative to state energy planning are referred to that document.

**Alternative Energy Sources -** Decreasing known reserves of conventional energy supplies have highlighted a need to seek ways to harness new energy sources in the form of power from the sun and wind, from falling water and water heated within the earth, from wood and plant fibers and organic wastes. The increasing cost of conventional fuels and the prospect of even higher future costs have made the potential use of alternate, renewable resources more attractive. The increasing emphasis has also shifted the responsibilities of energy production away from the national and international levels and more in line with the state and local level. It is in developing these alternate sources to appropriate levels that state and local government and the private sector will play an increasingly important role in the overall solution to the energy problem. A nine-member Alternate Energy Development Commission (AEDC) has recently published a final report titled *Future Renewable* that will become the cornerstone in the State's effort to prepare a clear and workable plan for the development of alternate energy sources. The report provides an analysis of six primary alternate energy sources and makes eighty-seven recommendations pertaining to state energy planning, energy conservation and production. The single most significant conclusion reached by the study was that no single renewable source can contribute a substantial share of projected energy demand growth, but together, the contributions of all can meet a significant portion of that demand growth. The following section is a brief presentation of the nine categories of energy resources and their expected applicability to Grants Pass and the region in general.

There are several energy resources available in the State of Oregon, including hydroelectric, solar, Biomass, alcohol fuels, wind and geothermal. Natural gas is a potential resource. In addition, Oregon imports coal and uranium for thermal powered electrical plants. Petroleum products like gasoline, oil and diesel are imported also.

**Hydroelectric -** Hydroelectric accounts for approximately 80% of all the electricity sold in Oregon. Although the U.S. Geologic survey reports that less than 50% of the state's potential hydro sites have been developed, most large hydro sites are not environmentally or economically acceptable. The Oregon Department of Energy's Fourth Annual Report (1980) indicates that no large scale or low-head hydroelectric projects are feasible for Josephine County or the Grants Pass area in light of the economic issue. It is likely, however, that as energy costs increase, environmental priorities will, in some cases, give way to energy priorities. Under these circumstances, it appears likely that some locally generated hydroelectric may be available in the future if the economic problems can be overcome.

In the Rogue Basin, there are 135 streams that are identified as having hydroelectric potential. A number of constraints to development of these streams were identified in a study by the Water Resources Research Institute. The greatest limitation was the distance of the potential hydroelectric sites to a viable market. Table 12.20.2 illustrates these constraints.

**TABLE 12.20.2**

| Constraints | Number of Streams |
|---|---|
| Land Use Restrictions | 27 |
| Utility Displacement | 50 |
| Building Displacement | 50 |
| Special Fish Problems | 77 |
| Distance to nearest power line greater than ten miles | 31 |
| Distance from reach to viable local market too great | 130 |

Source: Water Resources Research Institute

**Solar -** There are several programs in Oregon to promote the conservation and utilization of solar energy. Contrary to the popular belief that solar power is unsuitable for the Pacific Northwest due to the long, overcast winters, a recent Oregon Department of Energy study reveals that Oregon homeowners can meet a year round average of fifty percent of home heating needs with solar energy. Solar power is clean, inexpensive, relatively dependable and technologically feasible. Solar utilization may take two basic forms-- passive and active. Passive solar utilization basically involves the proper orientation of buildings and exterior building design and landscaping to maximize large unobstructed southern exposures, while protecting northern exposures. Active systems involve mechanical solar collection and storage components. The Alternate Energy Solar Task Force estimates that the nation's use of solar by the residential, commercial and industrial sectors could account for a savings of approximately 132 trillion BTU's annually.

Opportunities for the use of both passive and active solar systems are high. Although other parts of the state are afforded somewhat greater solar potential based on the average daily solar radiation, Grants Pass rates very highly.

Solar heating potential is measured in British Thermal Units per square foot ($BTU/ft^2$). The annual average daily solar radiation measured in Medford, in neighboring Jackson County, is 386 $BTU/ft^2$. That is sufficient energy to bring one quart of water to a boil during the daily period of solar radiation. A 55 gallon hot water heater, maintaining a temperature of 150°F, would need approximately 144 square feet of solar collector to provide daytime water heating. Of course, cloudy days would impair the efficiency of the solar panels. Passive solar space heating is achieved by placing large areas of glass on the south side of a building. The solar heat gained by the building is relative to the area of glass. Heat can be retained in the building if a large mass of masonry, water or wood is incorporated in other design of the structure, in proximity to the glass.

**Biomass -** Biomass is plant material and solid waste that can be used for energy production. Biomass is considered second only to hydro in terms of its potential contribution to the state's renewable energy resource. Currently, biomass accounts for 58% of the State's industrial process steam. Most of its present usage is by the forest products industry. Cordwood also currently supplies approximately 8 to 10 percent of the share of the State's residential space heating needs.

It is likely that biomass will provide an increasingly greater share of the region's total energy requirements since Southern Oregon has a proportionally large timber supply. Greater wood burning appliance efficiency will result in more heat per unit in the future. Opportunities also exist for the utilization of solid waste through its burning to generate power and through the capture of methane from solid waste landfills. It is estimated that biomass could account for up to 29% of the State’s 1980 energy demand on a raw fuel basis.

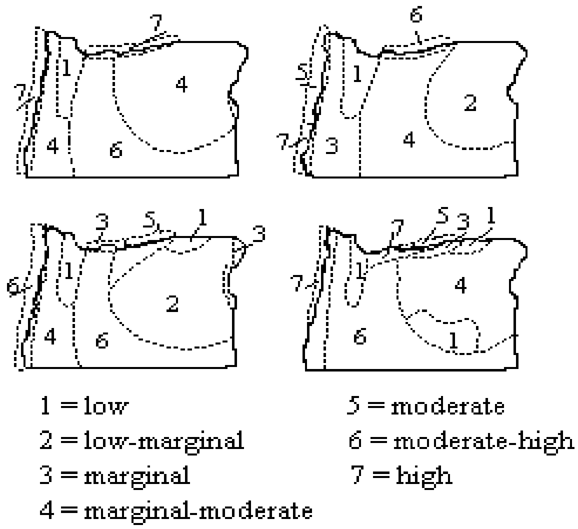
**Alcohol Fuels -** Fuel grade ethyl alcohol can be readily produced from a wide variety of crops and wastes through fermentation and distillation. The scale of production is quite flexible, varying from small scale farm units which can produce several hundred gallons per day, to large scale operation capable of several thousand gallons per day. Ethyl alcohol which is 95% pure alcohol, can be utilized by conventional automobiles with but minor modifications. If steps are taken to purify the ethyl alcohol, it can be used with gasoline in mixtures of up to ten percent without automobile modifications. Another alcohol fuel, methyl or wood alcohol can be efficiently produced but generally requires larger scale facilities and has a somewhat lower fuel value than ethyl alcohol. Methyl alcohol is produced from coal, straw and wood fiber.

Production of alcohol fuels is generally not well suited for urban areas due to the nature of the operations and need to store large volumes of combustible material. Although alcohol production is probably not desirable within the City, the agricultural capabilities of the Southern Oregon region make it attractive for alcohol fuel production. Key government programs now in place provide incentives for the formation of alcohol production operations. As the price of oil increases, alcohol production and use are likely to become a more important source of fuel.

**Wind -** Current research indicates that approximately 4,500 square miles of Oregon land has usable wind resources for power generation. Many areas have not been studied. Wind utilization may be either large or small scale, weaving both residential and industrial needs. The maps in Figure 12.20.3 indicate the potential use of wind for various parts of the state.

The Grants Pass area has marginal wind potential for energy generation, due mainly to its inland, intermountain location.

**FIGURE 12.20.3**
**Seasonal Wind Potential for Energy Generation in Oregon**




**Geothermal -** Some of the most promising geothermal resources in the country are found in Oregon although no known sources exist in Josephine County. In Klamath Falls, thermal waters have been used for space heating for many years. Generally, geothermal energy resources are situated in areas of geologically recent volcanic activity. Although more study is needed, it does not appear that geothermal will play a role in grower generation for the Grants Pass area.

**Natural Gas -** Currently, there are several oil companies searching for natural gas in western Oregon. Some gas wells have been drilled and gas has been found.

In 1977, approximately 18.1 percent of the State's total conventional energy supply came from natural gas. This figure represents a steady decline from previous years when natural gas consumption accounted for as much as 20.5% in 1973. The majority of natural gas is imported. Two-thirds of the State's natural gas supply comes from Canada, with the remaining one-third coming from resources in the southwest and Rocky Mountains.

**Thermal Electric -** In 1975, thermal generation accounted for approximately 15 percent of the State's electrical demands. Sources were usually located out of the State. By 1977, Oregon's first commercial thermal nuclear plant, Trojan, supplied up to 25 percent of the State's total energy demand. Several new thermal coal-fired plants are expected to become operational during the 1980's. If electrical demand increases in Oregon, then it is likely that the state will rely increasingly on thermal generation of electricity.

**Petroleum Products -** No known oil reserves or refining facilities exist in Oregon. Like electricity and natural gas, petroleum products are imported. Until 1973, the price Oregonians paid for petroleum products rose at a rate less than general inflation. Disruption of the international oil market since the 1973 oil embargo has caused the price of petroleum products, most notably gasoline, to increase substantially. Recent price reductions relate to the worldwide recession, and are not expected to be long term.

Changing sources of petroleum imports from Canada and other Western countries to principal reliance on oil from the Middle East and other politically unstable parts of the world has had a profound effect on consumer prices. It is expected the reliance on these sources will continue several years, at least through a period of transition to other renewable energy sources. The speed and ease of transition will be based largely upon international factors and the country's general adaptability to other energy sources.

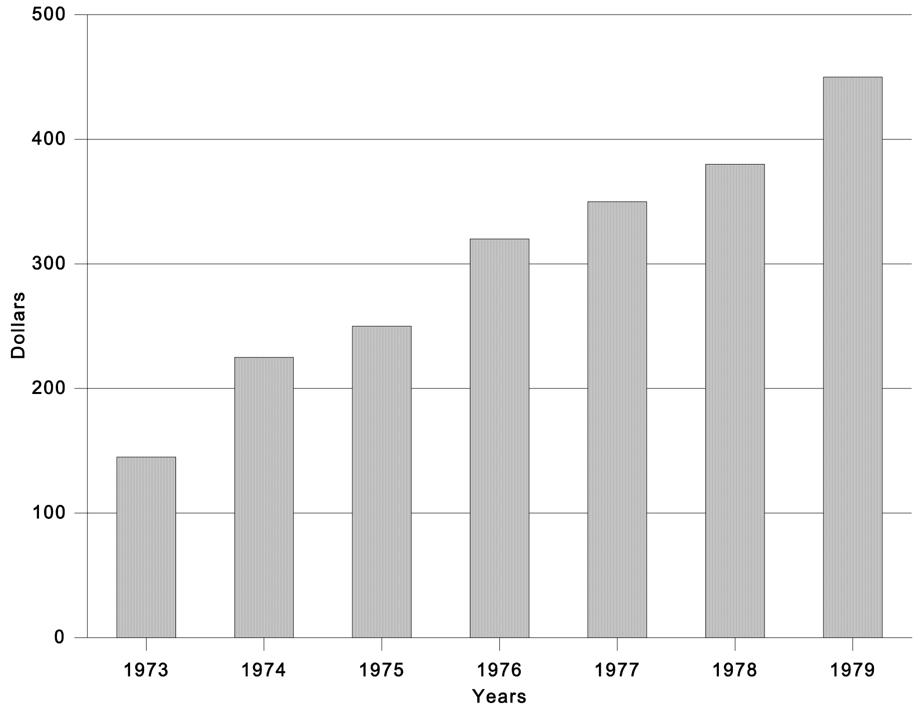
## 12.30 INVENTORY OF ENERGY CONSUMPTION

Energy consumption in the Grants Pass Urban Growth Boundary is predominantly limited to three energy resources; hydro and thermal generated electricity, natural gas, and petroleum products. Solar energy is becoming a more recognized resource as many more residential homes and commercial buildings are incorporating some form of solar design.

**Natural Gas -** The overall outlook for the availability of natural gas has improved although some uncertainties still exist. The quantity and price of the State's future supply, like most other large scale energy sources, will continue to be a function of federal and international policy decisions.

Since 1973, the price of natural gas has increased about two and one-half times. The primary reason for such excessive price increases is the 915% increase in Canadian export prices since 1973. Table 12.20.4 illustrates average annual residential natural gas price increases.

**TABLE 12.20.4**
**Typical Annual Residential Natural Gas Fill**
**Based on 1970 consumption Levels**




In 1976, 23 percent of the homes in Oregon used natural gas for space heating. Natural gas is provided to consumers in Josephine County by the California Pacific Natural Gas Company. The gas is received from the Northwest Pipeline Cooperative Canada. In 1982, there were approximately 4,140 gas accounts (households) in the UGB area: those accounts comprise 45% of the total area households.

Medford-Ashland Air Quality Maintenance Area Analysis, October, 1976, estimated that 13% of the new homes built in that study area would utilize gas. The Housing Element, (Section 9) reveals that there may be additional 8,600 to 11,900 new households by the year 2000, of which 1,100 to 1,500 will use gas. Under this assumption, by the year 2000, the percent of total households using gas will be 27%.

**Electricity -** The single provider of electrical energy to Josephine County is the Pacific Power and Light Company (PP&L). The company's sources of electricity are: 13% hydro-generated, 69.5% thermal-generated, and 16% purchased power and metropolitan interchange. The number of customers in Josephine County, including customers in Glendale and Rogue River, served by electricity increased by 65% from 1970 to 1979. (Josephine County Comprehensive Plan) The use of electricity in Josephine County increased 5.49% from 1977 to 1978. PP&L projected an annual increase in consumption of 6.2% from the period 1978 to 1988. However, electricity consumption declined from 1980 to 1982 for reasons attributed to electricity rate increases and declines in the rate of population growth. (PP&L, Grants Pass Office)

As of January 1, 1980, PP&L served a total of 5,816 electrical customers in the City, of which 1,250 were commercial and industrial accounts.

The Grants Pass electricity service district includes all Josephine County, Glendale in Douglas County and Rogue River in Jackson County. The total amount of electricity consumed by all users in that district from March 1981 to March 1982 was 55,195 megawatt hours. The distribution of the electricity consumption is shown in Table 12.20.5.

**TABLE 12.20.5**
**Electricity Consumption: Grants Pass District**
**March 1981 - March 1982**

| User | Number of Accounts | Consumption (megawatt hours) |
|---|---|---|
| Residential | 27,044 | 35,105 |
| Commercial | 5,703 | 20,000 |
| Industrial | 167 | 20,000 |
| Public Street Lighting | 37 | 20,000 |
| TOTAL | | 55,195 |

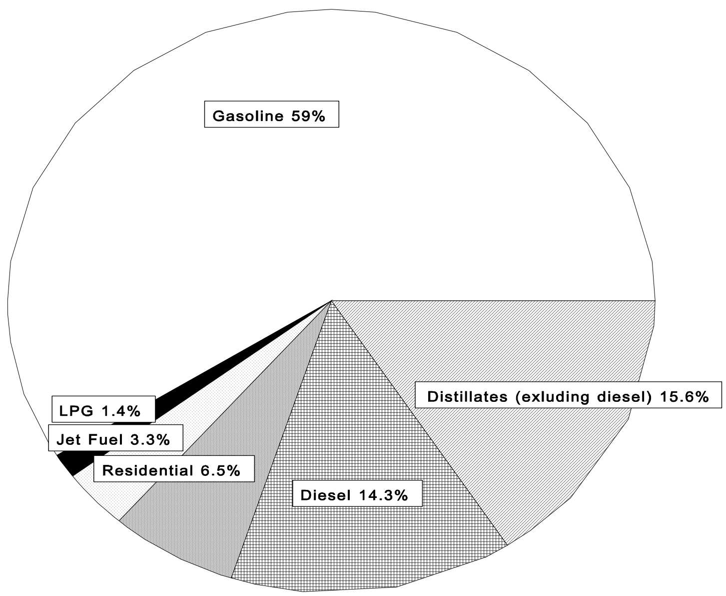
According to PP&L, there were 23,821 residential accounts in Josephine County in March, 1982. The average consumption per account was 1300 kilowatt hours per year. The estimated population for the UGB in 1980 was 22,000 persons. Therefore, assuming that the annual consumption per account (household) is constant, and that the total households in the UGB was 9,282, then the 1980 residential electricity consumption for the UGB was 12,066 megawatt hours.

**Petroleum Products -** Petroleum products, as used here, refer almost exclusively to the use of gasoline for powering automobiles. In the appendix to the Grants Pass Airshed Study, meteorologist Donald Ballanti described the existing consumption of gasoline as it related to vehicle miles traveled by the automobiles in the UGB area and vicinity during 1976.

Gasoline mileage for automobiles and light trucks is estimated to be 12.7 mpg in 1976. Mileage for heavy duty gasoline vehicles was estimated to be 6 miles per gallon (mpg). The total vehicle miles traveled by gasoline vehicles in 1976 was estimated to be 212 million miles. Therefore the total gasoline consumption in 1976 was estimated to be 180 million gallons. It is also estimated that approximately 33,200 persons live within the airshed study area in 1976, making the per capita consumption of gasoline in 1976 approximately 5400 gallons. Of course, that figure is a population equivalent which includes all consumption by all types of consumers; residential, commercial and industrial vehicles, including a substantial tourist component. The 1980 population for the UGB was 22,000 persons: that is a gasoline equivalent of 118 million gallons, assuming the same tourist to population ratio.

Fuel oil is another petroleum product used in the Grants Pass area. In 1976, 13% of the homes in Oregon used fuel oil for space heating. Fuel oil also comprised 21% of the total commercial/industrial space heating fuel in 1976. (Oregon Department of Energy, Oregon Energy Future, January 1978.) Table 12.20.6 depicts the distribution of petroleum products in Oregon.

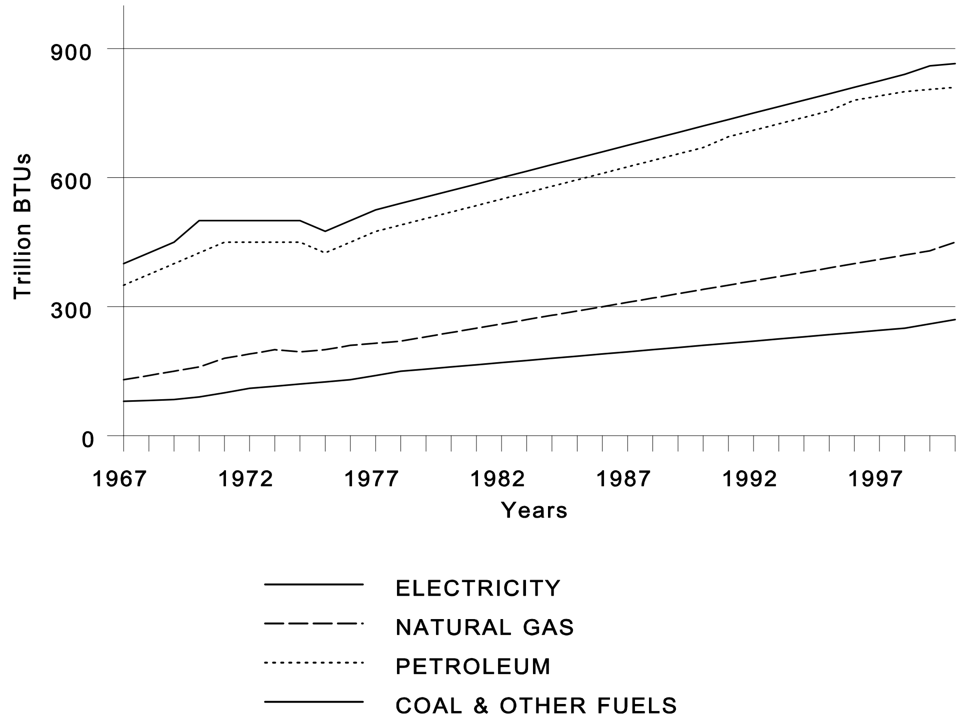
**TABLE 12.20.6**




## 12.40 FUTURE ENERGY NEEDS

During the period from 1978-200, state total and per capita energy consumption is expected to increase but at a slower rate than in the past. Energy demand is also expected to increase at an annual rate of 1.8% from 1978-1990 and 1.7% between 1990-2000. In the eleven year period from 1967-1977 the average annual growth equaled 2.9%. Figure 12.20.7 illustrates the total energy consumption by energy source and how the proportional usage of each conventional source is expected to change.

**Figure 12.20.7**
**Energy Consumption by Source**




The population of the UGB area is projected to increase by 16,000 to 22,000 persons by the year 2000. Without the application of conservation measures or the diversification of consumption among all the alternative energy resources, the total consumption for the basic energy resources will increase with the population growth.

**Natural Gas -** According to the Medford-Ashland Air Quality Maintenance Area Analysis, October, 1979, 13% of future new homes will be served by natural gas. The UGB area is projected to add approximately 12,000 new homes by the year 2000. Therefore, approximately 1,600 new homes will use natural gas.

**Electricity -** If the year 2000 UGB population is 44,750 with approximately 20,800 households, then the projected residential electricity consumption in the year 2000 may be 27,040 megawatt hours.

**Petroleum Products -** According to the appendix of the Grants Pass Airshed Study, mileage efficiency for automobiles and light trucks is projected to double by 1990 from 12.7 mpg to 26.2 mpg. Based on that assumption, the per capita population equivalent gasoline consumption of 1976 should be reduced from 5,400 gallons to 2,700 gallons. The 1990 population of the UGB area is projected to be approximately 30,000 persons. Therefore, the total consumption of gasoline by consumers within the UGB area in 1990 is projected to be 81 million gallons. If the mileage remains the same through the year 2000 and the high population projection of 44,750 persons is realized, then the gasoline consumption in the year 200 will be 121 million gallons. Therefore, even with twice as many people living in the boundary area in the year 2000 than residents there in 1980, and related increases in tourist consumption, total gasoline consumption will be almost the same for both years. That achievement is attributed to greater vehicle mileage efficiency. If the actual vehicle miles traveled is reduced and/or alternative forms of transportation are used more frequently, then gasoline consumption in the year 2000 may be less than consumption in 1980.

## 12.50 METHODS FOR CONSERVING ENERGY

**Energy Use Surveys -** Two separate energy related surveys were taken in the Grants Pass area during the summer of 1980. One survey conducted by PP&L was a survey of 72,454 customers throughout the State. This mail-out survey posed a variety of questions related to energy consumption, conservation and sources of future power generation. The second survey, conducted by SUNERGI, a non-profit energy interest group, focused specifically on the Grants Pass community. The survey was conducted by door-to-door interviews using a sample equaling 354. All persons surveyed were occupants of single family detached homes; no mobile home or apartment dwellers were surveyed. The sample size and survey technique had a confidence rating of 95% - 5%. The results of these surveys are available through PP&L, SUNERGI, and the City of Grants Pass. The results are summarized below:

Pacific Power's Oregon Electric Energy Poll, June 1980.

1. An overwhelming majority (90%) of Oregonians believe that Oregon should become more energy self-sufficient in terms of power generation and that Oregon should start now to develop more sources of energy.

2. When asked how to best manage electric energy shortages, the following methods were supported by a majority of respondents: a) restrict the operating hours of a business to a 40 hour week (63%), b) establish electric rates that would penalize customers for electrical usage above the "normal" amount (60%), and c) require complete insulation and weatherization of homes before they can be sold (69%).

3. Nuclear power was cited as the least practical source of new energy (40%).

4. Most Oregonians have taken steps to reduce home energy consumption (86%) and another 71% are willing to cut back even further.

5. When asked what percentage of energy should be produced by conventional vs. alternate sources over the next 10-20 years, 57% favored convention and 43% favored alternate sources.

6. Given the choice between solar, wind, geothermal and wood waste as electric sources, the following were favored: solar (33%), wood waste (25%), wind (22%) and geothermal (20%). Substantial majorities were found in favor of building generation facilities for any of these sources within the county of those surveyed.

7. Given the same choice as in #6 above but relating to either coal, nuclear, or hydro, the following were favored: coal (22%), nuclear (22%), and hydro (56%). The only power source for which there was a majority opinion for building generation facilities within the county of those surveyed was hydro (79%). Nuclear and coal received 37% and 47% respectively.

8. When provided with the relative costs of generating electricity for each of seven electric sources and asked to rank each by priority, the ranking was as follows: hydro (67%), geothermal (44%), solar (43%), nuclear (38%), coal (35%), wind (21%), and wood waste (20%).

<u>SUNERGI Survey, June and July, 1980.</u>

1. A majority of City residents (70%) found that rising utility bills forced them to consume less energy.

2. When asked what the main source of heat in the home was, the following responses were tabulated: electricity (38%), natural gas (29%), wood (26%), oil (4%).

3. The majority (71%) favored meeting energy needs with local resources.

4. A strong majority (83%) agreed that individuals like themselves have a responsibility to conserve energy to help resolve the national energy problem, as opposed to 17% who favor trusting the federal government to find a solution to the problem.

5. A majority (64%) agree that the City should protect access to sunlight.

6. A strong majority (83%) agree that municipal zoning should be flexible enough to allow for the use of solar energy.

7. A strong majority (78%) agree that local programs to encourage solar energy use should be developed.

8. No clear majority was in either agreement or disagreement with the proposition that solar heating systems should be installed in homes prior to sale.

9. A majority (54%) favored solar heating requirements as a part of home design.

10. A majority (61%) felt that building contractors should be trained in solar home construction prior to issuance of their license.

11. A majority (53%) favored regulations that require the seller of a home to disclose the pas year's energy bills, energy efficiency of the home and amount of available winter sunlight.

12. When asked which of several energy sources are preferred, the following responses were tabulated: solar (37%), hydro (17%), conservation (12%), nuclear (10%), coal (96%), oil and natural gas (6%), and synfuels (4%).

13. When asked what measures have been taken to conserve energy , the following measures received at least a 30% or greater response: recycle newspapers, cans and bottles (78%), set thermostat at 65° or lower during the winter (43%), drive a small car (52%), install shutters and shades on windows (43%), install weatherstripping and caulk around doors and widows (38%), install storm or double pane windows (34%), install energy saving device on fireplace (44%), and lower temperature settings on hot water heater (937%).

**Survey Interpretation: Local Attitudes -** From the results of the two energy use surveys presented above, a few obvious conclusions can be drawn. It is apparent that the local population has indeed felt the consequences of the energy problem. This is reflected by the response to questions related to recent utility bills and personal measures taken to conserve energy. The surveys do not reflect whether or not most consumers believe the current energy problem is real or contrived; the responses of both do, however, appear willing to take personal and local actions to help solve the overall problem. Most respondents have already taken certain steps to reduce energy consumption. It is not clear weather this is a purely economic response to increasingly high utility bills or a genuine response to a perceived bona fide problem, or both.

It appears that people are more willing to turn their thermostats down during the winter than up during the summer. There is also a distinct preference for the purchase of a smaller automobile than to carpool or use other alternate modes of transportation. Other than the purchase of smaller cars, conservation actions have generally been limited to those actions that reduce comfort and convenience rather than those that require substantial cash outlays such as building insulation. This may be an indication that people do not believe the energy problem will be of long duration, or perhaps it is simply a question of economics and the perceived cost and benefits of the more costly conservation actions.

There is substantial agreement that the local area should be more energy self-sufficient. There is also clear majority agreement on the role solar power should play in the future. This is indicated by majority opinions supporting regulations that ensure adequate access to sunlight and the local, as well as statewide, preference expressed for the development of and opportunities for the use of solar energy. On the other hand, nuclear power has generally been cited as one of the least preferred alternatives. Also frequently cited as a preferred source of power are hydroelectric projects. This was clearly represented by both surveys. As reported earlier, no economically potential hydro sites were identified by ODOE in Josephine County. This is not to say that potential sites do not exist, in fact, eighteen such sites were identified in 1976 by the US Army Corps of Engineers. Although since 1976 some of the proposed sites have come under federal ownership, it is likely that other sites may be developed during the planning period. Acceptance of the tradeoff resulting in dam construction over environmental concerns will necessarily result in disturbance of anadromous fish runs and displacement of existing buildings and utilities, according to the Water Resources Research Institute.

**Conservation and Adjusting to Resource Scarcity -** The United States consumes over 30% of the world's energy. Since the national population equals only about 6% of the world's population, it appears that energy conservation is a readily attainable goal. The federal and state governments have reported in numerous documents that less than 50% of total energy is consumed efficiently. The remaining share is simply lost energy. Clearly, a sound case can be made for more efficient energy use.

Typically, conservation has been perceived as a type of crisis-response behavior. Recently, a more positive view has been taken of conservation, as itself a source of energy that can be influenced and encouraged through incentives. Numerous state and federal programs are available which provide tax incentives to achieve conservation objectives. Studies by the Harvard Business School, National Academy of Science and Ford Foundation have concluded that conservation is not only cost effective, but is the only major new energy source that can quickly become operational. Various specific conservation programs are detailed in a later section of this element.

Energy conservation can take many different forms, from weatherization programs for habitable buildings, to proper automobile maintenance and upkeep. It is an area where State government can, and is, playing a major role in providing incentives, key regulation and information disbursal. An important ingredient to any state or local conservation program is positive public involvement and the need for individuals to recognize the enormous opportunities for energy and financial savings.

Resource scarcity today not only relates to energy supply, however, and greater numbers of people are now realizing that the planet we live on has finite quantities of numerous minerals and other raw materials, including water, land and air. Recognition of this fact is the first step to finding solutions to the economic problems of supply and demand that invariably arise once the end of the supply can be seen. Ignoring this fact will undoubtedly leave future generations with a world resource base ill equipped to meet their needs.

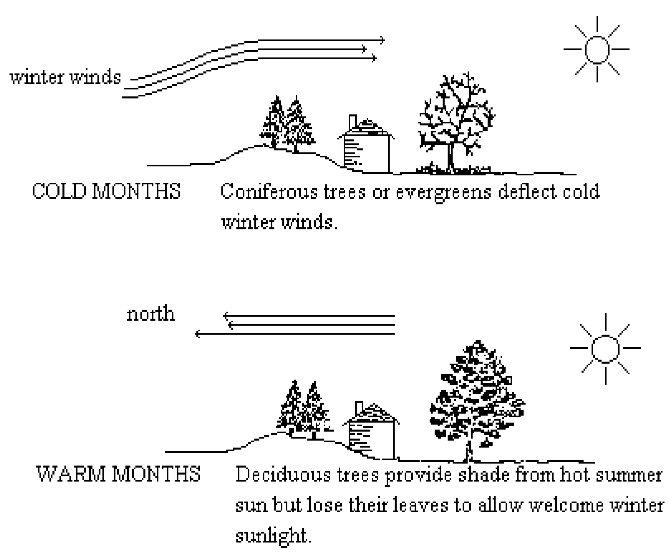
**Planning and Designing for Energy Conservation** - As indicated by the previous evaluation of conventional and alternate energy resources, local government is generally unable to influence many sources of energy supply significantly. The City of Grants Pass will not, for example, dramatically influence the decisions of the Bonneville Power Administration or the State or federal government regarding energy consumption and conservation. Local government can, however, take steps to ensure that our cities and buildings are planned and designed to optimize the efficient use of conventional energy and provide for the practical use of alternate energy resources. The following sections are designed to detail the various planning and design techniques available to local government to aid Grants Pass in meeting the overall goal of energy conservation and the wise use of local renewable energy resources.

**Circulation Patterns -** Use of the private automobile accounts for more fuel consumption than all other residential energy uses combined. On a subdivision scale, the developer has several options by which to develop energy efficient circulation patterns. The use of long cul-de-sacs instead of through streets directs traffic around neighborhoods and reduced the unnecessary use of gasoline. The use of narrower streets reduces the heat generated by the street in the summer months and reduces construction costs, both in terms of financial cost and the energy used in construction.

The orientation of streets has a major influence on passive solar utilization. By orienting streets in an east-west direction, lots and dwellings will be oriented in a north-south direction. This ensures that at least one side of the structure and a major yard or the street is open to the sunny southern exposure. It should be noted that due to rectilinear construction and placement, that streets in mobile home parks should be oriented in a north-south direction.

**Natural Conservation Features -** An especially beneficial effect of trees is their thermal performance. In winter, they can act as windbreaks and reduce heat loss from buildings. In summer, trees absorb solar radiation, provide shade and create cooling through evaporation processes. To maximize their use, trees must be selected carefully and located strategically. Whereas shade is valuable in summer and sunlight is welcome in winter, it is important to select only deciduous trees for southerly placement. Conversely, coniferous trees should be selected and placed to deflect cold winter winds. On building sites with large existing trees, the emphasis should be placed on strategic street and dwelling locations to utilize existing vegetation.

**FIGURE 12.50.1**

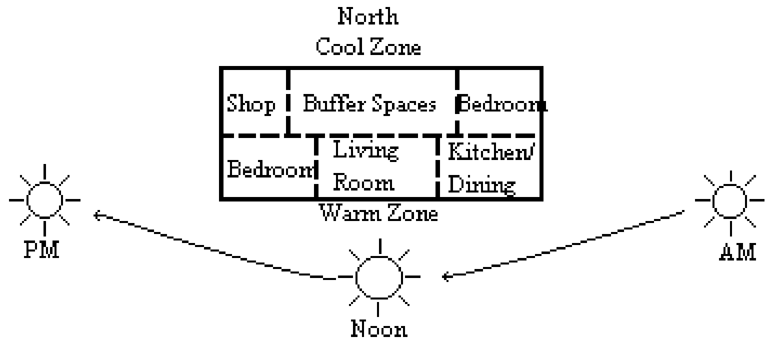


In addition to their aesthetic and shade giving properties, properly placed trees can create beneficial summer and winter airflows. The above illustration indicates how property placed in trees can be used to provide shade and divert cold winter winds. Calculations indicate that the heating load on a dwelling with a 20 mph wind is almost two and a half times greater than with a 5 mph wind.

**Designing the Energy Efficient Dwelling -** On a building lot that has good access to the winter sun, designing the energy efficient home follows two basic strategies. The first strategy is simply to ensure that the dwelling will make maximum use of the energy it consumes. The second strategy is to generate heat within the house by making use of the sun's energy.

The south side of a dwelling receives over three times more solar radiation in winter than the east or west sides, and nearly 14 times more energy than the north side. Maximize this fact by use of the following design factors:

- Face the elongated side of the dwelling to the south
- Keep house lines simple on the north and minimize north facing windows and doors
- Protect doorways and widows from prevailing winter winds
- On all windows, use double glazing that is separated by a thermal break
- Place at least 50% of the south facing wall area in windows
- Locate rooms according to their requirements for heat and light
- Prevent summer overheating by protecting southern exposures with deciduous trees and roof hangings
- Locate operable windows high on south facing walls when overheating is likely
- Use interior or exterior shades or curtains to block undesirable summer sunlight
- Insulate attics and exterior walls including floors
- A large thermal mass located where the winter sun will shine on it provides heat storage within the dwelling.



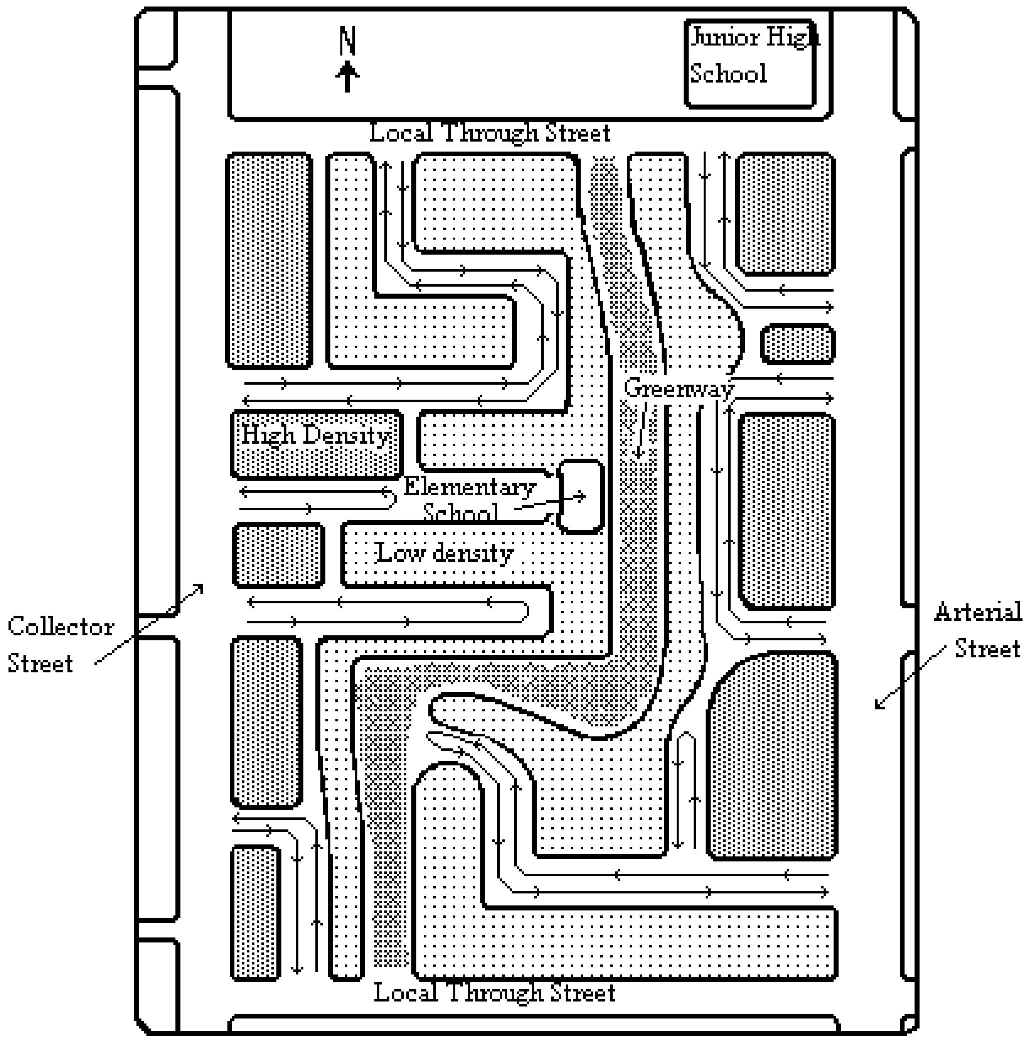

These are the basic components of passive solar utilization. There are also several examples of active solar systems that can be used for water and space heating. Numerous studies and publications are now readily available to aide the home builder in maximizing the use of solar energy.

**Urban Form Energy Implications -** Controlling the urban form through the prevention of sprawl is an effective way to reduce energy consumption. By encouraging the development of land in outlying or remote areas, land use policy works at cross purposes with an energy conservation ethic. Sprawl development serves to spread land uses over a large area, thereby increasing the public's reliance on the private automobile and diminishing the attractiveness of public transportation as well as increasing travel distances for employment and to obtain basic necessities.

By definition, urban growth boundaries should be only large enough to support reasonably expected population levels during the planning period. This feature of the goals, in and of itself, will result in significant long range energy savings. Other less significant energy conservation features are also set forth in the state-wide planning, some of which also relate to urban form in a slightly different sense. Urban growth boundaries are a quantitative measure of external urban form. Urban form is, however, an internal feature that relates to the layout of the urban infrastructure including streets, schools, chopping and employment centers and other public facilities. Energy conservation is realized through the allocation of density to optimize population along high capacity transportation corridors and hear high vehicle trip generating uses such as shopping facilities, employment centers and high use public buildings. In terms of land use, this translates to high density residential development along arterial streets, around the central business district, around shopping and employment centers and near to schools, libraries, parks, government offices and other public and private uses that are traveled to frequently. Although from this description it appears that most residential areas would be planned for high density development, in reality, probably less than 30 percent of the entire residential land base would be planned for high density development. For a city the size of Grants Pass, high density development simply implies dwelling groups of two or more units clustered in low profile planned developments.

As discussed, urban growth boundaries predetermine the external urban form. Internal urban form is largely determined by the routing of the transportation network. Cities can therefore effectively guide the internal urban form to the advantage of energy conservation by the careful routing of streets and laying out of blocks. The super block concept provides an excellent tool to achieve the objectives of energy conservation through intelligent planning of the internal urban form.

**FIGURE 12.50.4**
**Superblock Concept**




As can be seen from the illustration, the superblock, through its design, will reduce energy consumption through the following design features;

- High density residential use that is planned adjacent to major streets to reduce the length of travel time require for the greatest number of people to reach a major thoroughfare.

- Internal streets generally routed in an east-west direction to facilitate solar utilization.

- Internal streets penetrate but do not transverse the superblock. This reduces internal through traffic and encourages walking, bicycling and other modes of transportation.

- Common open space transversing the superblock provides proximal park and recreation and non-vehicular transportation opportunities.

- Internal neighborhood commercial node will encourage walking to do light shopping and reduce the length and number of shopping related vehicle trips.

- Internal location of elementary school near greenway strip will enable children to walk and bicycle to school and reduce the need for bussing.

**Transportation -** Private automobile transportation is a major energy consumer and a primary target for energy conservation practices. With the exception of the airplane, the private automobile consumes more BTU's per passenger mile than any other form of transportation. Table 12.50.5 reports the relative amounts of energy expended per passenger mile for both urban and intercity travel based on the four basic transportation modes.

**TABLE 12.50.5**
**Comparison of Energy Efficiency for Transportation Codes**

| URBAN | ENERGY (BTU/PASSENGER MILE) |
|---|---|
| Bicycle | 2000 |
| Walking | 300 |
| Mass Transit | 3800 |
| Automobile | 8100 |
| **INTER-CITY** | |
| Bus | 1600 |
| Railroad | 2900 |
| Automobile | 3400 |
| Airplane | 8400 |

Inter-city travel is typically a function of state and county government and urban travel is the primary concern of municipal government. This section will therefore concentrate on modes of travel and issues that can be affected by city government.

As reported in the above chart, the four basic modes of travel in a community, in order of energy conservation and efficiently are walking, bicycling, public transit and the private automobile. Each of these modes places a certain demand upon the roadway. In most cases the demand is conflicting, as is the case between the automobile and bicycle. In this example, both modes compete for a limited portion of the roadway surface. Ideally, each conflicting mode would be separated. However, with limited municipal budgets, separation of modes is seldom possible. In the past such conflicting demand for roadway space has typically been resolved in favor of the private automobile. Examples of this occur when a tradeoff exists between removing the parking from one side of a street to provide for a bike path. Normally, the decisions made to leave the on-street parking and find other bike path routes where the roadway surface is sufficiently wide enough to accommodate both.

The overall energy problem in conjunction with related air quality problems and the changing role of the bicycle from recreation to transportation has emphasized a need to resolve such conflicting demands more in the favor of these bicycles.

In the past, public transportation has only been successful in capturing the ridership of "transit captives," or those who are either too young, too old, disable or for some other reason have no other true transportation alternatives. Rising oil prices, vehicle maintenance cost and car prices have changed this picture somewhat, and the promise of even greater automobile operating expenses will increase the broad attractiveness of public transportation even further.

To be widely used, a public transit system requires high density living areas and high activity uses along major travel routes. Distribution of population and businesses over a large area makes public transit less convenient, inefficient and normally too costly to operate. Studies have demonstrated a direct correlation between density and public transit ridership. Typically a sharp increase in transit ridership can be expected when densities are increased to greater than seven dwelling units per acre; at densities over 60 dwelling units per acre, transit use accounts for approximately 50% of all trips.

**Solar Access -** Unless local communities begin to plan now for future development of solar energy, controlled development could make it impossible for solar utilization to take place. Protecting solar access simply means regulating development in such a way to ensure that buildings and vegetation do no block sunlight and prevent solar utilization by neighboring buildings. In short, regulating to control shadows.

In developing a solar access program, the first step is to determine the level of solar access desired. Four basic levels of solar access are possible:

1. Rooftop Protection: protects the sunlight falling on the south-facing rooftops of new developments

2. South Wall Protection: protects south walls of new buildings

3. South Lot Protection: protects part of a lot adjacent to south-facing wall

4. Detached Collector Protection: protects solar access only to part of a lot for use by detached collector systems

Once the level of solar access to be regulated is determined, the next question becomes whether to regulate buildings, vegetation, or both. Typically, programs aimed at regulating vegetation for solar access are, for obvious reasons, difficult to administer.

The third major component of a solar access program involves a determination of the regulator device to be used. Private agreements between property owners can be used to protect solar access as well as public regulation. The most common private agreement is the restrictive covenant. A restrictive covenant is a contract between two or more persons which involves mutual promises of reciprocal benefits and burdens among consenting landowners. Generally, restrictive covenants "run with the land," meaning that the covenant binds not only the existing property owners, but all future owners of the land. Should this approach prove desirable, covenants should be required during the development approval process and reviewed by the City Attorney. Easements are another type of private agreement that can be used to protect solar access. Easements are a partial interest in real property that can be separate from the property and transferred. The most common example is a utility easement that simply conveys the right of a utility company to run its lines across private property. A solar easement is a negative easement that prevents one land owner from doing something that otherwise would be allowed, such as erecting a building on a lot which can cast a shadow on the solar collector of a neighboring lot.

**Street Lighting -** Typically, municipal street lighting consumes a major share of the total annual energy expenditure. There are basically three different types of street lighting: incandescent, mercury vapor and sodium vapor. Sodium vapor is far more efficient than either incandescent or mercury vapor, although it emits a yellow rather than white light. The Pacific Power and Light company is currently replacing some fixtures with sodium vapor. The following table presents the relative efficiency (nominal lumens) versus energy requirements (watts) of the three lighting types as reported by the Portland General Electric Company.

**Street Lighting Efficiency**

| Type of Light | Watts | Nominal Lumens |
|---|---|---|
| Incandescent | 92 | 1,000 |
| | 182 | 2,500 |
| | 300 | 4,000 |
| | 405 | 6,000 |
| | 620 | 10,000 |
| Mercury Vapor | 100 | 4,000 |
| | 175 | 7,000 |
| | 250 | 10,000 |
| | 400 | 21,000 |
| | 1,000 | 55,000 |
| Sodium Vapor | 70 | 5,800 |
| | 100 | 9,500 |
| | 150 | 16,000 |
| | 250 | 25,500 |
| | 400 | 48,000 |

**State and Federal Programs -** Considering the relatively recent nature of the energy problem as perceived by state and national decision makers, there is truly and abundance of state and energy related programs. In fact, far too many to present herein and more programs are being developed all the time to aid homeowners, renters and business to conserve energy and develop more sources of energy production. By far the greatest emphasis, at least based on number of separate programs, is on providing tax incentives and low interest loans for the weatherization of homes. Most programs focus on incentives to encourage conservation either for homeowners, business or utilities. Those wishing addition information are urged to contact the Oregon Department of Energy.

## 12.50 FINDINGS

1. Nearly all citizens recognize that a problem exists regarding energy production, distribution and utilization. Although it appears several factors have been responsible for the problem, no single solution, such as solar or nuclear utilization, can be expected to return consumers to past days of abundant and inexpensive energy. In fact, most sources agree that a solution for the energy problem lies in developing all of our viable energy producing resource capabilities.

2. Locating and harnessing local, renewable sources of energy is a major area where local government can directly participate in energy generation. Opportunities exist in Grants Pass and Josephine County to utilize wind, biomass, hydro and alcohol fuels as well as solar energy. Excepting solar utilization these sources of power generation are either too land consumptive or environmentally sensitive to reasonably be located within City limits. Nevertheless, Grants Pass should assist Josephine County in developing these energy sources for the mutual benefit of both City and County residents.

3. Numerous studies have concluded that as much as 54% of all energy consumed is wasted and that the most readily usable source of new energy can be realized though conservation. When considered as a source of energy, conservation is the least costly, most flexible and most environmentally acceptable energy resource available.

4. Conservation not only relates to reduced levels of energy consumption, but also to passive means of utilizing the sun's energy for space and water heating. Typically, little consideration has been given to the physical layout of subdivisions and planned developments regarding opportunities to use sunlight for space and water heating although enough sunlight falls on the outside of homes for this purpose. Many developments have been approved locally that lack the basic orientation and design features that permit effective solar utilization either passively or with the aid of solar heating device.

   Recently there has been an increasing awareness that opportunities exist at the local level to utilize solar energy. In Grants Pass public opinion clearly supports action that facilitates solar utilization and use of other alternative energy sources.