

OREGON  
ALTERNATE ENERGY  
DEVELOPMENT COMMISSION

*Future Renewable*

**FINAL REPORT**

SEPTEMBER 1980



August 29, 1980

Governor Victor Atiyeh  
State Capitol  
Salem, OR 97310

Dear Governor Atiyeh:

Enclosed is the report of the Alternate Energy Development Commission, in compliance with Oregon Laws 1979, Chapter 329.

Preparation of the report has been an immense challenge. The report includes an estimate of the energy that could be produced in Oregon over the next 20 years by solar, wind, hydroelectric, biomass, geothermal and alcohol fuels, and an estimate of when these resources could be brought on-line. Although we realize that these are only estimates, we are sure that the contribution from renewable resources to Oregon's energy future potentially is very large. Realization of the potential will require large amounts of funding and the removal of many institutional constraints.

We do not recommend development of one renewable resource option over another. (Rather, we believe that Oregon's long-term energy interests will best be served by developing a diverse array of energy options.) The 87 recommendations in our report (pages 34 to 88) will encourage development of renewable energy, and we urge their adoption in full.

We call your attention to four groups of recommendations which we feel are of highest priority.

- ① Establishment of an energy planning body, with adequate staffing, is our most important recommendation. There must be a means of continuing and expanding upon our work, of monitoring results and recommending further actions.
- ② The State should move forthrightly to carry out those recommendations concerning the removal of institutional impediments. The Commission believes that state government must not unnecessarily impede private sector energy enterprises that are consistent with state policy and which will help meet state energy goals.

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3. The State must develop additional knowledge of resource potential, particularly for geothermal, wind and biomass resources. Knowledge about the characteristics and availability of energy resources in Oregon will help determine the long-term effectiveness of the state's energy programs.
4. The State must continue and expand its role of providing education and information to Oregonians. We believe that ready access to clear, reliable information is the cornerstone of any effort to encourage voluntary conservation and renewable resource actions.

The report discusses our rationale for establishing these priorities and identifies specific programs for priority attention on pages 89 to 91.

Our work is only the first step in what must be a program of continuing energy planning for the state. This is important for four major reasons. First, the task forces and the Commission prepared their best estimates, based on what we know today, of the potential of the resources and development strategies. We are entering a period of extremely rapid change in energy prices and technologies. We believe that private research and development, new federal incentives such as contained in the Windfall Profits Tax Act of 1980, and new local plans such as the Portland Energy Plan, will have profound effects on resource development and must be given time to work. Oregon's plan should be revised and updated periodically to account for these factors.

Second, our charter focused on renewable resources, which constitute only one facet among many which must be incorporated into a truly comprehensive state energy program. Renewable resource programs can best be assessed in the context of Oregon's energy requirements and a review of all the conservation, renewable resource, and conventional energy options available to meet those requirements. Future energy planning must include a comprehensive and ongoing review of the choices in that broader context. Similarly, a comprehensive state energy plan must also address transportation.

Third, State policy must work to assure that within the existing regional energy network, Oregon has adequate energy supplies and is not penalized for development of its own energy resources.

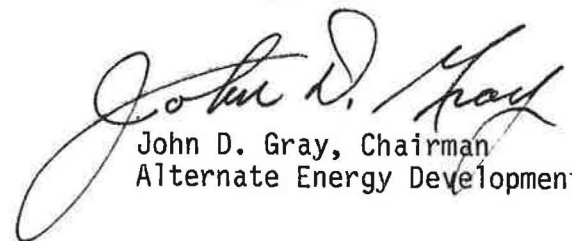
Fourth, major development of renewable resources will require tradeoffs between different social goals. Examples include the tradeoffs between hydro resources and fisheries, wind facilities and visual impact, and wood combustion and air quality. The state needs means of balancing energy production from these resources with the impacts associated with development of specific sites. This is the only way the State will be able to provide clear, early direction as to whether or not development is desired.

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We would like to thank the task forces and commend them for their comprehensive work. The Commission relied upon the task force reports for estimates of the resource potential, and almost all of the Commission's recommendations originated in the task forces. They willingly supplied additional information and patiently answered our questions. Their reports should be used as prime reference sources to provide detailed explanations of the resource potential and the recommendations.

I speak for all of the members of the Commission when I thank you, Governor Atiyeh, for the opportunity to serve on the Alternate Energy Development Commission. We have learned a great deal, we are greatly encouraged by the potential of these resources in Oregon. We will be happy to continue to serve you and the Legislature as our recommendations are considered.

Sincerely,



John D. Gray, Chairman  
Alternate Energy Development Commission

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Members of the task forces are listed in Appendix C.

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I. PURPOSE AND BACKGROUND

"The energy problem now faced by the United States began to be recognized 10 years or more ago. Still, the occasional symptoms (the oil embargo of 1973, the natural gas shortage of 1976-77, and the gasoline lines of the summer of 1979) are frequently mistaken for the problem itself. As each symptom is relieved, the public sense of crisis fades. The seeds of future crisis, however, remain."

-Energy Transition in 1985-2000.  
National Academy of Sciences, 1980.

The decade of the 1970s marked the beginning of a new energy era. Energy prices, in real terms, ceased to decline. Citizens and the U.S. economy began adjusting to both higher energy costs and diminished supplies.

The impact of the adjustment is best understood and mitigated on a national level. Energy Transition continues: "Resolution of the problem demands a systematic examination of energy supply and demand in the context of existing policies, and articulation of a coherent set of policies for the transition to new sources of energy and new ways of using it. The essential difficulty is that these policies must be as consonant as possible with other, often conflicting, national objectives -- protecting the environment and public health and ensuring national security, economic growth, and equity among different regions and classes."

Because the national energy problem will not be easily or soon resolved, individual citizens and the separate states cannot afford to await a national solution. We must assume responsibility for our own policies and our own actions.

Oregon needs a comprehensive, long-range energy plan which, in part, relies on a rekindled spirit of independence and individualism. We recognize that a State plan is necessarily limited in its effect. Oregon imports all of its petroleum, all of its coal, and most of its natural gas. Oregon's electric supply system involves complex interconnections within the Pacific Northwest region and other western states. But, renewable energy resources are available to Oregonians, and resource development can be encouraged by State action. We can, by achieving a higher level of energy self-reliance, reduce the impact on Oregon that regional and national supply shortages may bring. We can set an example.

Effective energy conservation is the first step toward balancing supply and demand. It is generally agreed that conservation is the least expensive and most immediate energy option available. In Oregon, the second step is to achieve optimal displacement of costly and diminishing supplies of non-renewable energy with our own permanently sustainable resources. However, renewables are not cheap. In most cases they will be more expensive than conventional energy supplies. Oregon must plan for the optimal balance of conventional supplies, conservation, and indigenous renewable resources. Achieving that balance involves considering such factors as costs, availability, reliability, and social and environmental impacts.

On March 16, 1979, before a joint session of the Oregon House and Senate, Governor Vic Atiyeh presented his program for renewable energy resource development, "New Energy Directions for Oregon." The Governor noted Oregon's achievements in conservation programs and added:

"Oregon has enormous and virtually untapped natural resources to which we must turn if we are to achieve a higher degree of energy independence. The program I will set forth today is an essential element of a public policy which calls for the fullest possible development of our natural energy resources..."

Governor Atiyeh's emphasis on renewable resources was approved and endorsed by the Legislature, including establishment of the Alternate Energy Development Commission (AEDC). Within this Commission, the Governor and the Legislature placed the responsibility on six task forces for the design of comprehensive resource development strategies in each of six renewable energy areas: solar/conservation, wind, geothermal, alcohol fuels, biomass, and hydro. This report will refer to these resources -- including geothermal, as renewables. The Commission's scope of work is limited to these six areas. Other energy options, such as fossil fuels and nuclear power, were not considered by the Commission, but their present importance and future possibilities must be integrated into a comprehensive State policy as it is developed.

The Governor appointed the nine-member Commission and the Oregon Department of Energy selected 78 citizen volunteer experts for the resource-specific task forces addressing each of the six areas.

In October 1979, each task force began independent assessments of the energy potentials for each resource. Barriers to resource development, whether economic, environmental, or institutional were identified. Ways by which the negative impact of those barriers can be reduced or removed were carefully examined. Finally, each task force developed recommendations to help bring renewable energy resources on line.

Preliminary task force recommendations were exposed to broad and intense public review. More than 1,000 Oregon citizens in ten communities took part in a series of public meetings conducted by the Commission and task force representatives. At the same time, the task forces continued to research and document the implications of suggested strategies: How will programs be financed? What are the appropriate roles of government and the private sector in resource development? Final task force reports were completed and delivered to the Commission in June 1980.

Based upon the preliminary task force reports and subsequent public comment, the Commission developed its own preliminary report. That draft report was taken to formal public hearings in five communities during June and July. About 300 persons attended these hearings and 100 persons testified. Five-hundred pages of written testimony were submitted by utilities, local governments, special interest groups, and citizens.

This report is the culmination of that process. It has been revised to reflect the Commission's review of the final task force reports and the public comments received. The Commission has integrated the information and recommendations for each resource into a comprehensive plan. Task force reports should be consulted for more complete background information on the issues.

The Commission believes it is important to restate an earlier point: Oregon needs a comprehensive, long-range energy plan which effectively addresses a multitude of energy-related issues. The plan must have the flexibility to adapt to ever-changing energy prices, technologies, and energy requirements, and Northwest regional supply developments.

We need to make decisions to establish a direction and then we must move in that direction. Along the way, we will need to assess our progress and make whatever changes are needed to accommodate and resolve complex and often competing criteria upon which critical energy decisions are made.

This report and decisions by Governor Atiyeh and the 1981 Oregon Legislature will establish that direction. We urge the implementation of recommendations contained in this report.

## II. ORGANIZATION OF THE REPORT

Sections III and IV of this report describe Oregon's current and projected energy requirements and projected conventional energy supplies, thus delineating the context within which renewable resources will be developed. These sections were prepared using data from ODOE's Fourth Annual Report (1980).

Section V summarizes the renewable resource options as they were evaluated by the six task forces. The Commission's report integrates recommendations from the task forces. Each resource is constrained by different factors and each requires different incentives. Each is dependent upon the efforts and involvement of different kinds of private enterprise. These summaries give some of the flavor of each resource, but we urge readers to study task force reports for more detailed information. The Commission did not accept all of the task force recommendations.

In Section VI, the Commission summarizes the potential identified by each of the task forces, and prepared a table which illustrates the contribution Oregon's renewable energy resources could make by 2000. Documentation is provided in Appendix B.

Section VII is the heart of the Commission's report. These recommendations are the Commission's response to the Legislature's mandate to develop a comprehensive plan for Oregon's renewable energy resources. Each of the Commission recommendations is explained and justified.

How the recommendations should be funded and how they should be placed in priority order is the subject of Section VIII. Estimated energy savings are also documented for recommendations that have quantifiable results. Appendix A summarizes the Commission's recommendations, includes specific program costs and indicates if legislation is required.

Finally, in Section IX, the Commission points out what Oregonians are expected to get for these recommended expenditures.

## III. PROJECTED ENERGY DEMAND THROUGH 2000

Energy demand forecasts are the basic tools used by utilities and other energy suppliers for planning investments in future capacity. Forecasts also provide government decision-makers with information upon which to base choices among different energy policy options.

Forecasts are imperfect tools. Minor changes in assumptions will produce widely disparate results over a 20-year forecast period. For purposes of examining the renewable resources in the context of future energy requirements and future supply, the Commission relied upon the State's independent energy demand forecast prepared by ODOE. The Commission is well aware that no two forecasts or forecasters are in complete harmony and that no forecast will be precisely accurate. It was fitting that the State's forecast be used by a State Commission.

ODOE's energy demand forecast to 2000 claims the middle ground among other available forecasts. It predicts slower growth than some forecasts and more rapid growth than others. ODOE's forecast, and others, will be refined, updated and revised as experience dictates. The Commission believes that differences between available forecasts would not have influenced its recommendations.

Demand for energy, excluding the transportation sector, is projected by ODOE to grow 58 percent between 1980 and 2000, or 203 trillion Btu per year by 2000. More than half of this increase, 110 trillion Btu,<sup>1</sup> will be for electricity -- about 3,700 average megawatts.<sup>2</sup> This represents a 74 percent increase in demand for electricity over the forecast period. Natural gas accounts for 58 trillion Btu of the increase, or 28 percent, representing a 62 percent increase in the use of gas. Coal and other fuels account for 15 percent of the increase -- an 85 percent increase in the use of these fuels. Petroleum products account for only 2 percent of increased demand. Not included here is demand for petroleum in the transportation sector, which is projected to increase from 227 trillion Btu per year in 1980 to 278 trillion Btu per year in 2000.

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<sup>1</sup> Energy conversion constants: Electricity = 3,412 Btu/kwh. Natural gas = 100,000 Btu/therm. One barrel of oil = 5 to 6 million Btu. Heating an average home requires 75 million net Btus or 11,000 kwh of electricity each year.

<sup>2</sup> Average megawatt (av MW) is capacity of an electrical generating plant multiplied by the percentage of time it is actually producing electricity (capacity factor). One av MW produces 8,760,000 kwh of electricity each year (1,000 kw x 8,760 hours), enough to supply the energy needs of about 400 all-electric homes.



Figure 1 depicts the mix of conventional energy resources projected between 1980 and 2000. Table 1 represents the forecast results in more detail by source and energy-consuming sector.

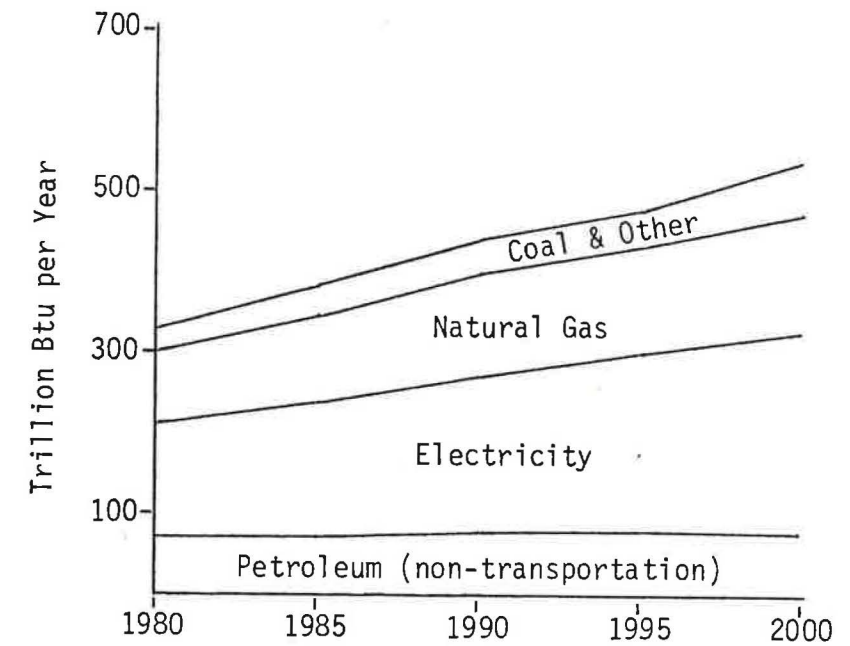
The industrial sector accounts for 72 percent, or 147 trillion Btu, of the projected increase in demand. Industrial use of electricity and natural gas is projected to double, accounting for 55 percent (61 trillion Btu) of the increased demand for electricity and 86 percent (50 trillion Btu) of the increased demand for natural gas.

This reflects the assumption that Oregon's economy will continue to grow at a steady, healthy pace, and that industry will react to energy price increases as it has in the past. While it is assumed these price increases will foster industrial conservation, no specific conservation or renewable resource programs are built into the ODOE forecast for the industrial sector. And, the bulk of wood energy use in industry, and future increases in that use, is not reflected in the forecast because only purchased energy forms are included.

The commercial sector is projected to account for 15 percent of the increased demand for energy, and the residential sector 13 percent. Electricity accounts for 80 percent of the commercial increase and 90 percent of the residential increase. The commercial and residential sectors each are responsible for more than a 20 percent projected increase in demand for electricity, and a 6 to 8 percent increase in demand for natural gas. Residential demand for petroleum is projected to decrease 17 percent.

Because energy has been inexpensive and abundantly available, energy resources historically have not been well-matched to its uses. With conventional energy resources becoming less secure and more costly, all energy resources must be used most wisely. Alternate energy resources should be used where suitable for the tasks to be accomplished. Electricity, natural gas, and petroleum should be reserved for those uses to which alternate resources are not easily matched or cost-effective. For example, solar energy is well-suited and cost-effective for some space and water heating, but is not now cost-effective for electrical generation. An important task is to find out how energy is used in Oregon, particularly in the industrial sector where little is known, to determine where alternate resources effectively can be used.

Figure 1: Total Non-Transportation Energy Demand Forecast by Source



Source: Oregon's Energy Future: Fourth Annual Report.  
Oregon Department of Energy, January 1980.

Table 1

Projected Growth in Oregon's Energy Demand Through 2000

	1980		2000		Increase 1980-2000		Percent Increase
	Trillion Btus	(1000 AvMW)	Trillion Btus	(1000 AvMW)	Trillion Btus	(1000 AvMW)	
Electricity	148.8	(43.6)	259.0	(75.9)	110.2	(32.3)	74%
Residential	52.9	(15.5)	76.0	(22.3)	23.1	(6.8)	44%
Commercial	36.8	(10.8)	61.6	(18.0)	24.8	(7.2)	67%
Industrial	55.9	(16.4)	116.7	(34.2)	60.8	(17.8)	109%
Other	3.2	(0.9)	4.7	(1.4)	1.5	(0.5)	47%
Natural Gas	92.7		150.6		57.9		62%
Residential	22.6		27.3		4.7		21%
Commercial	19.8		23.2		3.4		17%
Industrial	50.3		100.1		49.8		99%
Petroleum	76.6		82.1		5.5		7%
Residential	21.1		17.5		-3.6		-17%
Commercial	25.7		28.5		2.8		11%
Industrial	20.3		28.2		7.9		39%
Agricultural	9.5		7.9		-1.6		-17%
Coal & Other Fuels	35.8		66.1		30.3		85%
Residential	9.4		10.8		1.4		15%
Industrial	26.4		55.3		28.9		110%
TOTAL	353.9		557.8		203.9		58%
Residential	106.0		131.6		25.6		24%
Commercial	82.3		113.3		31.0		38%
Industrial	152.9		300.3		147.4		97%
Other	12.7		12.6		0.1		1%

Source: Oregon's Energy Future: Fourth Annual Report.  
Oregon Department of Energy, January 1980.

IV. PROJECTED ENERGY SUPPLY THROUGH 2000

Electricity

Until the mid-1970s, nearly all of Oregon's electricity was produced by regional federal and utility-owned hydroelectric dams. Although less than one-half of the identified hydro sites in Oregon have been developed, the Commission believes that the last of the environmentally and politically acceptable large-scale dam sites may have been developed.

Limits on the federal hydro system's capacity have had a sharper impact on Oregon than on other states in the region. Federal law mandates that public power systems<sup>1</sup> have highest priority for electricity marketed by the Bonneville Power Administration (BPA). But in Oregon, 75 percent of the electricity load (excluding direct service industries' purchases from BPA) is served by investor-owned utilities (IOUs)<sup>2</sup>. Conversely, most of Washington's load is served by public power systems.

Future availability of BPA power to Oregon consumers could be effected by federal legislation or possible implementation of Oregon's Domestic and Rural Power Authority (DRPA). Senate Bill 320, which created DRPA, was enacted by the 1977 Oregon Legislature.

The purpose of DRPA is to purchase low-cost federal power from the Bonneville Power Administration and then sell that power directly to the residential and farm customers now served by IOUs. DRPA will become operational only if Congress fails to enact a regional power bill which the Governor finds will provide equitable wholesale power rates to the Pacific Northwest, and if the Public Utility Commissioner (PUC) determines that DRPA will result in substantial benefits to the citizens of Oregon.

Until 1973, Oregon's IOUs purchased firm low-cost power from BPA. In that year, recognizing capacity limits and increasing demand from priority users, BPA cut off firm electricity supplies to the IOUs. Those utilities were obliged to turn to thermal generation which is more expensive than existing hydro. IOUs still have access to surplus BPA power. But, the higher costs of thermal generation have resulted in higher consumer prices and more rapid price increases for most Oregonians than other regional customers. Pacific Power and Light's (PP&L) rates have almost doubled since 1973. Portland General Electric's (PGE) have

<sup>1</sup>"Public power systems" in the context of this report are People's Utility Districts, municipally-owned electric supply systems and cooperatives. These systems are not regulated by the Public Utility Commissioner.

<sup>2</sup>Investor-owned utilities (IOUs) are used here as privately-owned electric utilities regulated by the Oregon Public Utility Commissioner (PUC).

more than doubled. Public power systems continue to be preferentially served by BPA. They too, however, are experiencing substantial rate increases. The higher costs result from the construction of new thermal plants needed to meet loads in excess of BPA's hydroelectric system capacity.

In 1975, 15 percent of Oregon's electricity demand was met by thermal power, most of it generated in Washington, Montana and Wyoming. By 1977, Oregon's first large thermal plant, the Trojan nuclear plant, at times supplied as much as 25 percent of the state's total electricity demand. The 530 megawatt (MW) Boardman coal-fired plant is scheduled to come on-line in Fall 1980. Eleven more thermal plants in which Oregon utilities share ownership are scheduled to come on-line over the next 12 years. Two plants, Pebble Springs I and II, have been proposed to be built in Oregon. Of the other nine, seven are to be built in Washington and two in Montana.

Aggressive conservation and renewable resource programs which are cost-effective will reduce Oregon's reliance on thermal generation and on suppliers outside the state. New thermal plants most likely will be coal-fired or nuclear facilities. Federal law restricts natural gas and oil-fired generating plants to peak use. The shift from hydro to thermal generation has major economic and environmental implications which pose different and complex decisions for Oregon and the Pacific Northwest.

Additional economic and environmental costs are not the only problems associated with growth in demand for electricity. The availability of electricity to satisfy demand growth is an overriding concern. Even with modest demand growth, power deficits are predicted for the Pacific Northwest region and for Oregon in the mid-1980s when and if critical or near-critical water conditions occur. Some forecasts predict that interruptible power supplies will have to be curtailed even if normal water conditions prevail.

The major reason for the predicted power deficits is that none of the planned 11 new thermal plants will come on-line as scheduled. There is now no way to accelerate the construction of these plants, especially over the next four years during which deficits are predicted to be most severe. Utilities and the people of the Pacific Northwest must work together to make up the projected supply shortfall regardless of whether adverse water conditions occur.

#### Natural Gas

Two-thirds of Oregon's natural gas supply is imported from Canada. The balance comes from the Rocky Mountains and the Southwest. Oregon's first discovery of natural gas at Mist provides Northwest Natural Gas Company with 2 to 3 percent of its gas supply.

The price of natural gas to residential customers is now about three times the 1973 price. Prices for firm supplies to industrial customers are more than four times higher than in 1973.

The primary reason for these price increases is the tenfold increase in Canadian export prices since 1973. Canada recently boosted its export price to \$4.62 per thousand cubic feet (mcf). In contrast, Northwest Pipeline Company pays about \$2 per mcf for regulated U.S.-produced gas.

Because most of Oregon's natural gas is imported, the State has little influence on supply or price. These decisions are made at national and international levels. The State's role is confined to ratemaking, managing shortages, shaping consumption patterns through conservation policies, and the siting of distribution and storage facilities.

The availability of Canadian natural gas to Oregon cannot be evaluated in isolation. The amount of gas available depends on how much natural gas will be sent from western Canada to eastern Canada to displace imported oil. Furthermore, it is unrealistic to assume that any single western state will continue to receive substantial Canadian gas exports if the supply of U.S. domestic gas to other states declines significantly. (To put this in perspective, imported Canadian natural gas constitutes only 5 percent of the total U.S. supply.)

The Alaskan natural gas pipeline also may bolster Oregon's supply. Even if Oregon obtains little Alaskan gas, the availability of the vast Prudhoe Bay reserves to the nation will lessen the competition between states for Canadian natural gas.

The availability of liquefied natural gas from Alaska, gas from Mexico, and discoveries of commercial quality gas in Oregon cast a favorable outlook on Oregon's natural gas supply for at least another ten years.

#### Petroleum

Oregon has no known oil resources or refining facilities. All petroleum products consumed in Oregon are imported in finished form.

Until the oil embargo of 1973, petroleum prices to Oregonians had been increasing at a rate lower than general inflation. After peaking in 1974, real prices declined again until 1979. Then, disruption of the international market brought petroleum prices to a new peak. Retail gasoline prices now exceed \$1.20 per gallon.

In 1979, imports accounted for 43 per cent of total U.S. petroleum consumption as compared to 29 percent in 1972. The total volume of imports has increased even more dramatically, from 4.7 million barrels per day in 1972 to more than 8 million barrels per day in 1979.

Changing sources of petroleum imports has compounded U.S. vulnerability. In 1972, most U.S. oil imports came from Canada and other Western countries. Since then, an increasingly larger share of our imports has come from the Middle East and other less politically stable parts of the world. If our reliance on imports continues at prevailing levels, these countries will be our primary suppliers. Some estimates say the Persian Gulf countries alone hold about 60 percent of the world's oil reserves.

Petroleum supply and price levels, in Oregon as well as the nation, will be determined by national and international political, economic, technological, and environmental decisions. Key factors include demand growth, the level of existing reserves, the level and location of future discoveries, supply reliability, and the cost of alternatives.

As is the case with natural gas, the State has little influence on the price and supply levels of petroleum products.

## V. OVERVIEW OF THE OPTIONS AND SUMMARY OF TASK FORCE REPORTS

### Scope

The Commission's focus is on solar, conservation, wind, geothermal, biomass, alcohol, and hydro. Energy conservation options in the transportation sector are addressed by a separate Governor's Transportation Energy Conservation Task Force. Their work was completed in January 1980.

The Commission does not intend to recommend development of one renewable resource option over another. Rather, we believe that Oregon's long-term energy interests will best be served by developing a diverse array of energy options. Advances in technology, economics, demonstrated reliability, and public acceptance will determine the changing mix of energy resources which will be used over the next decades. It is too early to rule out any option.

The task forces estimated the energy potential available in each of six resource areas, how much of that energy realistically can be acquired, and when. Each task force has identified major constraints to resource development and has recommended ways to eliminate or ease those constraints. Following are summaries of the work of each of the task forces. The summaries present an overview of task force emphasis and viewpoints. They do not necessarily reflect the views of the Commission. Task force reports should be consulted for more detailed discussions.

### A. Alcohol Fuels

Current Status. Fuel grade ethyl alcohol readily can be produced from a wide variety of crops and wastes using current techniques of fermentation and distillation. The scale of production is flexible, varying from small-scale farm-size units which can produce tens or hundreds of gallons per day, to large-scale units which can produce thousands of gallons per day. A by-product of alcohol production is a protein-rich substance which, when dried, can be used as an animal feed supplement. Ethyl alcohol, at 190 proof, can be used straight in gasoline engines with minor modifications, or in diesel engines as a fuel offset when added through air intake. If ethyl alcohol is purified by removal of all water it can be added to gasoline at mixtures up to 10 percent and used in unmodified gasoline engines.

Methyl alcohol or wood alcohol, of lower fuel value than ethyl, can be produced from materials high in cellulose such as straw and wood fiber as well as coal. Generally, methyl production requires large-scale facilities.

Current incentive programs to encourage alcohol fuel use are:

1. 20 percent federal investment tax credit on alcohol facilities and a 35 percent state income tax credit;
2. Exemption from property tax and state corporate and personal income tax through 1985;
3. A 40-cent-per-gallon federal income tax credit on alcohol produced at 190 to 200 proof, a 30-cent-per-gallon income tax credit on alcohol produced at 150 to 190 proof, and a 4 cent federal highway excise tax exemption on alcohol/gasoline blends. All credits and exemptions are effective through 1992;
4. Waiver of federal bonding requirements for small-scale alcohol production; and
5. Low-interest loans, loan guarantees, and feasibility study grants for alcohol production facilities.

Eastern Oregon State College alcohol fuels information center in La Grande provides both general and specific technical information on all types of alcohol fuel production.

Potential. The potential of alcohol fuels in Oregon is particularly relevant and immediate to the agricultural community. Alcohol fuel production can be integrated into agricultural operations to provide a portion of farm fuel needs at locations where the animal feed by-product can be used. Widespread farm alcohol use could provide an infrastructure sufficiently large that all farm fuels could become alcohol-based by expansion of alcohol facilities and modifications to farming practices and farm implements.

In a non-agricultural context, a 10 percent alcohol mixture can be used as an octane booster when added to gasoline. In Oregon, such use of alcohol likely will not achieve even a 10 percent contribution to the general fuel supply. Such a level would involve a major diversion of Oregon crops from relatively high-price food products to lower-price fuel products.

Constraints. Constraints to the widespread use of alcohol are economic and informational. Economic farm production of alcohol depends on an economic use for the by-product feed. The potential of producing methyl alcohol from cellulose materials such as straw, which may otherwise be waste, awaits the development of large-scale facilities. Such facilities are likely only if or when the price of oil increases to levels at which methyl alcohol can be competitively priced. That depends on the development of technological and economic methods for methyl alcohol production from cellulosic feed stocks. Widespread alcohol production will require the teaching and training of many small producers.

Development Strategy. The task force strategy for encouraging alcohol fuel use is to:

1. Increase Oregon's alcohol crop options through research;
2. Increase the market for alcohol by-product feed by testing and documenting its food value for animals. Aggressively research new markets for alcohol production by-products; and
3. Test, demonstrate, and provide information on small-scale alcohol facilities.

B. Biomass

Current Status. Biomass is plant material, such as wood and straw, and solid waste which can be used for energy production. In terms of contribution to total energy use, biomass is second only to hydro among Oregon's renewable energy resources. Biomass provides 20 percent of Oregon's energy supply on a raw Btu basis. Most of the biomass used for energy is wood. It supplies 58 percent of Oregon's total industrial process steam, primarily in the forest products industry. Cordwood supplies a growing share, now 8 to 10 percent, of residential space heating needs. Wood fuel produces about 1 percent of Oregon's electricity. Solid waste is used as a fuel in a few industrial applications.

The State encourages the use of biomass through two tax credit programs. The Department of Environmental Quality (DEQ) administers a solid waste tax credit which amounts to 5 percent per year for 10 years of the complete capital costs of equipment using solid waste fuels. Because wood residues have frequently been a disposal problem at mills where they are produced, facilities which use wood fuel, including turbine generators, are eligible for the tax credit.

The 1979 Legislature approved a 35 percent tax credit for businesses installing renewable energy systems. This credit is taken over five years and is limited to \$10 million per facility. Companies which do not claim DEQ's tax credit are eligible for the renewable energy tax credit.

When front-end financing assistance is needed, industry has used the State's Pollution Control Bonds or Industrial Development Revenue Bonds for some biomass energy systems. The Small-Scale Local Energy Project loan fund, approved by voters in May 1980, will provide an additional source of financing.

*Interview*

Potential. Use of pulping liquors, a by-product of pulp production, and wood residues for industrial process steam will continue to be the dominant use of biomass fuels in the next decade. Improvements in combustion efficiency and fuel recovery may increase the energy delivered from these fuels by as much as 20 percent. The forest products industry is also likely to escalate the replacement of remaining oil and gas-fired equipment with wood-fired equipment by 1990. With this increased use, wood will continue to supply fuel for more than half of the state's industrial process steam.

Cordwood will continue to be a fuel in the residential sector. Greater appliance efficiency and better stove operation will result in more heat delivered per cord of wood burned, and weatherization will lower heating demands in homes heated by wood stoves.

Higher electricity costs are causing industry to re-evaluate cogeneration systems. Cogeneration is the sequential production of two forms of energy, usually electricity and process steam, from burning a single fuel. Cogeneration is an efficient way to produce electricity. The task force estimates that about 400 av MW of generation capacity, primarily biomass-fired, could be brought on line by 1990.

Oregon's larger municipalities are putting in place energy recovery systems for solid waste. Most of the energy produced from burning solid waste will be delivered to the industrial sector. A small amount of energy, in the form of methane, can be recovered from solid waste landfills. Two percent of Oregon's 1990 energy demand will be supplied by solid waste.

As oil and gas prices increase, the economics become more favorable for solid biomass fuels in commercial and small industrial boilers and furnaces. These applications are ideal for using local biomass resources. For some applications, biomass fuels may be prepared by drying or densification. Commercial and light industrial use of biomass accounts for another 2 percent of Oregon's 1990 energy demand.

All of these biomass uses would comprise 29 percent of Oregon's total 1990 energy demand on a raw fuel basis.

Constraints. The major constraints on biomass energy systems are air quality, uncertainty about the supply of fuel, and high initial costs for solid fuel-fired equipment.

Development Strategy. Continued development of the biomass resource is dependent upon the private sector. The Biomass Task Force placed top priority on removing unnecessary regulatory barriers to use of biomass. Streamlining processes for emissions permits and for siting cogeneration plants are two key examples.

Government must take the lead in biomass information and education. Education directed at new users will use biomass inventory information and feasibility studies which demonstrate the economics of biomass energy systems. The State can encourage cogenerators by clarifying rates and regulatory issues. The State should continue to offer tax credits for biomass systems. Residential wood stove users need education programs for safe installation and techniques for clean, efficient operation.

### C. Geothermal

Current Status. Oregon's Department of Geology and Mineral Industries (DOGAMI) has three resource assessment programs: high-temperature geothermal assessment throughout the Cascades with the U.S. Geological Service (USGS) and US DOE; low-temperature assessments in nine direct-use target areas with US DOE; and a site-specific assessment of Mt. Hood with USGS. The Oregon Department of Water Resources (DWR) is planning its first low-temperature assessment program for direct-use and heat pump applications. Private exploration is being conducted by seven companies in as many locations throughout the state.

Geothermal energy is now used directly in Klamath Falls (a 60 MW equivalent now, increasing to a 104 MW equivalent in 1981), Lakeview, and Cove. Eleven other communities represent near-term (1982-91) targets, principally for district heating. A detailed feasibility study has been completed for Oakridge. Long-term potentials include an additional 20 communities in 17 counties.

A statewide planning program was initiated in 1978 through the Oregon Institute of Technology (OIT) Geoheat Center and will be continued through 1980 by ODOE. The OIT technical assistance program offers no-cost engineering and economic feasibility studies to prospective resource users. An OIT regional market development project is to begin in late 1980. Statewide planning assistance in late 1980 will identify constraints, develop commercialization incentives, and provide technical planning assistance to local governments in near-term target areas.

Potential. The identified thermal potential of Oregon's geothermal resources is estimated at 46 trillion Btu per year, 8 percent of Oregon's 2000 energy demand.

Thirteen cities, with a combined population of about 100,000 persons and a total heating load of 3.5 trillion Btu per year, have near-term potential for supporting urban heating districts. Eighteen other cities, with 500,000 total population, have long-term direct-use or heat pump potential.

Several areas in Oregon have potential for electrical generation from high-temperature resources, including sites near the Alvord Desert, Crump, Bully Creek, Newberry Crater, and the Cascades. Based on a development scenario of 100 MW coming on-line every two years starting in 1984, Oregon has the potential to geothermally generate 800 MW of electricity by 2000.

Constraints. Fifty-two percent of Oregon's lands are federally-owned and controlled. Most of the state's geothermal resources are within those holdings. Access to these federal lands for resource exploration and development is dependent upon federal leasing and environmental programs. Thus far, only a small portion of federal land has been made available for leasing, and lengthy delays characterize most federal leasing programs.

High costs, difficulties in financing, and the inherent risks of geothermal exploration impede resource development. Misplaced incentives focus on post-development phases and do not stimulate new discoveries or initial development.

Misconceptions of geothermal energy, and its environmental and economic impacts, hinder the initiation of small projects and the positive reception of larger projects. Technical resource expertise is in extremely short supply.

Several institutional factors likely will constrain geothermal development over the longer term. These include a lack of clarity in certain legal definitions, overlapping agency jurisdictions, lack of land-use planning coordination, and the applicability of certain public utility performance criteria.

Development Strategy. Five basic strategies have been identified to spur the development of Oregon's geothermal resources.

1. **Resource Assessment:** Expand and accelerate assessment and exploration, through enlarged DOGAMI and DWR programs and increased attention to federal programs. Particular emphasis should be given to coordinating such work with local development projects.
2. **Near-Term Commercialization:** The strategy is to focus resource assessment work on, and provide financial incentives and site-specific technical assistance for, local projects engaged in these near-term categories:
  - a. Low temperatures--ground water heat pump applications
  - b. Moderate temperatures--urban district heating and industrial process use
  - c. High temperatures--electrical generation and complementary waste heat uses.

3. **Long-Term Commercialization:** Implement measures similar to near-term actions for resources and sites with longer-range potentials. Emphasis should be on shortening environmental baseline delays, coordinating land-use planning and growth controls, siting long-distance pipelines, and demonstrating advanced technological systems such as wellhead generators.
4. **Information and Education:** Implement an aggressive program for local or community-based action. Objectives include creating public and potential user awareness and local expertise in resource development techniques.
5. **Institutional:** Develop a closely coordinated network of institutions working towards consistent and specific goals. Emphasize lead action by local entities and technical and financial support from state and federal agencies.

#### D. Hydro Power

Current Status. Hydro currently produces 80 percent of Oregon's electricity, or 20 percent of the energy used in the state. However, the capacity of the Pacific Northwest's large-scale hydro system is almost fully developed. Existing non-power dams, irrigation ditches, and municipal water storage are being reassessed for the addition of power facilities. Many Oregonians are interested in micro-hydro plants suitable for residences and individual farms and businesses.

State incentive programs were enacted by the 1979 Legislature. These include:

1. Residential tax credit of 25 percent, \$1,000 maximum;
2. Business and industry tax credit, 35 percent over five years;
3. Utility purchase of power at reasonable rates from on-site producers; and
4. Public education and information.

Potential. The Hydro Task Force concluded that approximately 9,000 MW could be developed in Oregon if there were no economic, environmental, or legal constraints. However, they estimated the realistically achievable potential to be 1,243 MW of installed capacity, equivalent to 410 Av MW.

Constraints. Many prospective developers of hydro power plants believe three constraints that must be addressed if hydro is to be developed in the shortest time possible.

1. High front-end costs, and the loss of money spent on feasibility studies and licensing procedures if the plant is unfeasible or cannot be licensed.
2. Uncertainty about regulatory requirements is particularly acute given the trade-off between fisheries, stream recreation and hydro development.
3. Lack of information. A developer needs help in assessing the site for power and in identifying where to sell power, where to buy equipment, and how and where to get licenses.

Development Strategy. The Hydro Task Force recommended those programs which would be the most helpful to individual developers. The highest priority is to develop and distribute technical information through state Watermasters and other groups. The second priority is that matching grants be directed to persons interested in feasibility studies of new small hydro sites. Third, the State should develop an information program to assist Oregon developers of small hydro sites.

The task force believes that the following strategies would be cost-effective and useful:

1. The State needs to keep abreast of federal hydro inventory studies by the U.S. Corps of Engineers.
2. The State can and should be involved in identifying the best opportunities to develop power and in identifying projects which are unacceptable.
3. As license applications increase, state regulatory agencies must provide resources to avoid unnecessary misunderstandings or delays.

#### E. Solar/Conservation

Current Status. There are a number of programs in Oregon to promote the use of solar and conservation. Energy suppliers in Oregon are required to provide energy conservation audits to their space heating customers. IOUs are also required to arrange financing for the measures recommended by the audits. PGE, PP&L and CP National offer no-interest, deferred-payment loans for weatherization measures. These voluntary weatherization financing programs have proven to be the most successful in the state. Natural gas utilities offer 6-1/2 percent weatherization loans. The legality of public power systems offering similar programs is being tested in the courts.

The State offers 25 percent tax credits for weatherization (\$125 maximum credit) and alternate energy devices (\$1,000 maximum). The value of a residential alternate energy device is exempt from property tax assessment. The State also offers a 35 percent tax credit to business and industry for installation of renewable resource and waste heat recovery equipment.

Legislation enacted in 1979 and a 1980 constitutional amendment (Ballot Measure 3) authorizes the State to sell up to \$300 million in General Obligation Bonds to make low-interest, long-term loans for small-scale renewable energy projects.

To qualify for a Department of Veterans' Affairs (DVA) loan, a home must meet minimum weatherization standards, the cost of which can be added to the principal of the loan. Up to \$3,000 can also be added to the principal of a DVA loan for the installation of a residential alternate energy device.

Information, workshops and assistance are offered through ODOE, the Energy Extension Service (EES), the Western Solar Utilization Network (Western SUN), resource centers in Oregon schools of higher education, industry, trade associations, and community groups.

Local governments have also been developing energy programs. Portland has approved a mandatory weatherization program and plans to establish a one-stop energy center and a financing package to implement the program. City councils in Eugene and Albany, among others, are considering energy packages. Several communities have developed or are developing solar easement or solar access ordinances.

Because of the nature of solar and conservation and the newness of the programs, it is difficult to quantify what their effectiveness has been or may be. ODOE is increasing its capability to quantify their effectiveness.

Potential. The potential energy savings which the task force estimates economically could be achieved is about 41 trillion Btu annually each in the residential and commercial sectors and 49 trillion Btu annually in the industrial sector -- about 132 trillion Btu annual total. Programs recommended by the Solar Task Force would achieve energy savings of 84 trillion Btu per year. This represents about 40 percent of the projected increase in demand for energy through 2000. The savings in the residential and commercial sectors combined represent 100 percent of the projected demand increase in these sectors by the ODOE forecast.

Constraints. Most conservation and solar measures involve off-the-shelf technologies. Conservation is generally more cost-effective than solar. Both, however, face many of the same constraints.



Consumers, lenders, builders and others often lack information and technical assistance. In particular, they are unaware of the opportunities available and of the long-term savings that are possible. Heating systems are already in-place and provide the necessary energy, often at an averaged low cost that consumers can continue to afford. Thus there is not yet compelling economic reasons for typical property owners to invest in conservation or solar measures.

Initial capital costs pose a significant constraint to solar and conservation. Many lenders are also reluctant to finance solar measures, in part because of unfamiliarity with the products. Landlords and developers often fear that solar or conservation measures will increase the costs of their units and make them less competitive. Finally, many solar measures are not yet cost-effective. They need financial incentives to make them more competitive.

Development Strategy. The basic strategy is to encourage the maximum development of cost-effective solar and conservation measures. There are three primary programs to help achieve this goal.

1. Provide financing and incentives to all of Oregon's citizens and businesses to overcome initial capital requirements.
2. Adopt, revise or improve codes, the code adoption process, and relevant local ordinances such as solar access, to ensure that cost-effective solar and conservation measures are incorporated into new structures.
3. Provide information, training, and technical assistance to lenders, builders, inspectors, and other professionals necessary to carry out successful projects.

#### F. Wind

Current Status. Current research indicates that approximately 4,500 square miles of Oregon land has usable wind resources. Field measurements at more than 70 locations have indicated that the Columbia River Gorge and the entire coastline have good wind resources. Other areas have been suggested as well, but broad areas of the State have not been studied for wind potential.

Smaller-sized wind energy conversion systems (WECS) may be suitable for residential use while larger systems may be used by industry and utilities in clusters or farms to take maximum advantage of a windy site. The most widespread applications for WECS are for generation of electricity directly into the utility line and to supply on-site loads.

Oregon's most widely used incentive for WECS is the homeowner's income tax credit program. By August 1980, 38 tax credit applications had been received by ODOE. There has also been one application for a WECS tax credit under the state's 35 percent business and industry tax credit program.

The state-operated anemometer loan program, with 35 wind instruments, has more than 200 names on the waiting list. Oregon State University (OSU) and EES agents provide field service to applicants under the program.

The federal government has a number of programs which affect WECS development:

- Income tax credits for individuals and investment tax credits for businesses.
- WECS technology development of small- and large-scale systems.
- A Field Evaluation Program which includes two small WECS installed in Oregon.
- A wind characteristics and various applications-oriented programs.

Potential. The Wind Task Force estimates that two percent of the state's electric energy demand could be supplied by WECS in 1990, increasing to 6½ percent by 2000. This would be supplied from 365 MW of WECS in 1990, and 1,396 MW (400 avMW) in 2000. Because the population is not concentrated in areas of usable winds, residential applications are estimated to be limited to about 5,500 installations. More than 90 percent of the potential is estimated to be for large-scale wind farms which would add to the utilities' supply. Approximately 440 large-scale WECS would be required to meet the estimate for 2000.

Constraints. Numerous constraints inhibit the use of WECS, some of which may not be resolved until the mid-1980s. While there is plenty of land with good wind resources, much of it is either unavailable or unsuitable for siting. Before a WECS is installed, one to three or more years of wind data must be recorded. Necessary permits may be difficult to obtain because most local jurisdictions have not considered WECS use in comprehensive land use plans or local ordinances.

Although large WECS are available for experimental purposes now, no low-cost larger units are commercially available in any quantity. Industry is not yet geared up to mass produce WECS. Mass production is expected to occur in the mid-1980s. WECS are expensive, and although there are several dozen manufacturers of small WECS, most of their systems are either poorly distributed or lack a history of use and performance.

Utilities and others are waiting results of field-tested WECS designs for performance and durability before adding wind to their supply systems.

Individuals acquiring small WECS are discovering conflicts with the State Electrical Safety Law and height restrictions imposed by some local jurisdictions. The state code results in increased inspection costs, and the Department of Commerce is re-examining the code's applicability. Because of height restrictions, some installed WECS are too low for satisfactory performance.

The lack of good wind data across the state does not permit well-founded estimates of future potential. Potential users must take year-long measurements at their site without any assurance of positive results. Better data are needed for planning purposes by utilities and local planners.

#### Development Strategy.

Because of pre-existing technology development programs and their cost, the task force strategy for accelerating the development of WECS emphasizes other techniques. These involve removing institutional barriers, assessing the resource, information transfer, and modest economic incentives.

Removing institutional barriers includes establishing "wind rights" regulations, increasing ODOE's ability to analyze the use of WECS, the introduction of new planning mechanisms, and ensuring the inclusion of wind energy in local comprehensive plans. Additional work should be done so that codes properly address wind. Local governments should adopt height restriction exclusions for WECS. Goals or priorities should be set for WECS development.

An intensive program to find and measure the state's wind resources would result in identified sites for WECS farm development and would provide a data base.

Economic incentives could be enhanced by increasing the tax credit, making potential users eligible for special financing programs, and allowing Industrial Development Revenue Bonds to be used for acquiring WECS. Implementing reasonable purchase rates by utilities for electricity supplied by interconnected WECS will increase their economic feasibility of wind energy systems.

## VI. AEDC AND TASK FORCE ESTIMATES OF RESOURCE POTENTIAL

The task forces' estimates of resource potential that could reasonably be developed through 2000 are summarized in Table 2. This is a major reduction from the theoretically possible after factoring in the many constraints. Table 3 details the potential, costs, and key constraints to development (see Appendix B for more detailed documentation). Figure 2 graphically summarizes Table 3 and compares resource costs with the cost of the Boardman coal-fired plant.

ODOE's forecast, described in Section III of this report, predicts non-transportation energy demand to grow by 3700 AvMW of electrical energy and 93 trillion Btu per year of thermal energy through 2000. Although the estimates would seem to suggest that alternate energy sources could more than meet Oregon's requirements, the costs and constraints convince the Commission that no single renewable resource option could be expected to contribute a substantial share of projected demand. Collectively, however, the contributions from all these resources can meet a significant portion of future energy demand.

Table 3 and Figure 2 show clearly that most of the renewable resource options will be at least as expensive as, or more expensive than, conventional resource development. This point, more than any other, supports the inescapable conclusion that we are not running out of energy--we are running out of cheap energy.

The Commission cautions that the estimates for the various resources are not necessarily cumulative. In some cases, the estimated potential resources could displace energy without displacing the need for peak capacity. Also, development of some resources will displace the potential and need for other resources -- this is particularly true where geothermal direct use is involved. However, the aggregate total gives a rough idea of the magnitude that is possible.

The task forces' combined estimates for physical energy potential in 2000 is approximately 3,700 AvMW of electricity (not including 884 AvMW potential from photovoltaics), the equivalent of 10 Boardman coal-fired plants operating at 70 percent capacity factor; and 203 trillion Btu per year of thermal energy from solar, biomass, conservation, and geothermal direct heat. This potential represents 100 percent of projected new electrical demand and over 200 percent of new thermal demand, or 150 percent of total combined new demand projected in 2000. That also represents 50 percent of the 2000 projected total demand for energy, excluding transportation. Using the coal reference in Figure 2 and the low range of costs, the technical economic potential of conservation and renewable resources is large enough to provide 100 percent of the demand growth between 1980 and 2000. Assuming the high range of costs, these resources have the potential to provide 75 percent of energy demand growth in this period.

The Commission emphasizes that this potential is based upon estimates of what the task forces believe potentially can be developed by 2000. It does not suggest that it will, in fact, be developed. Neither is it the maximum theoretical potential, which is much larger.

This potential is subject to many uncertainties and constraints. For example, to achieve the massive geothermal potential will require an equally massive effort of exploration, drilling, and establishing facilities to recover the resource. Some of the geothermal resource areas are scenic or ecologically fragile, and many are far from population and industrial centers. Other equally complex constraints hamper the development of hydro, biomass, and wind resources. The task forces addressed these and other considerations in developing their estimates.

What ultimately happens will be influenced by market forces, which programs are undertaken, and the ease -- or lack of it -- by which constraints are removed. Much of the potential may be realized or even exceeded if the costs of these alternate resources decrease, as could result from mass production or technological improvements, or if the cost of other resources increases faster than projected. Conversely, a smaller portion of the potential will be developed if the cost of the alternate resources proves higher than assumed or if the cost of competing energy sources is lower, as could result if regulatory proceedings were shortened.

Decisions must be made on several tradeoff issues. Many of the resources, particularly conservation and small on-site renewables, can be developed in the near-term -- far sooner than some types of conventional resources. Questions of availability, national and international policies and markets, security and reliability of supply, environmental impacts, and regional economics and jobs associated with all the various alternatives must be considered in determining the appropriate mix of conventional and alternate energy supplies for Oregon. For example, potentially adverse environmental impacts of new large hydroelectric facilities may limit their development. On the other hand, local employment benefits of some solar and conservation measures could dictate stronger programs in those areas than cost comparisons alone might imply. In some cases, Oregonians may be willing to pay more for the energy from a particular resource because its adverse impacts may be less severe than those of other options.

Oregonians must decide how much they are willing to pay, socially, environmentally and economically, for each of the resources. As more is learned about the costs and impacts of the various options, programs will have to be revised. The energy planning body recommended by the Commission should be charged with monitoring programs and recommending changes based on thorough and ongoing evaluations.

Table 2  
Theoretical Cumulative Development Schedule for Renewable Resource  
Electrical Generation and Thermal Energy<sup>1</sup>

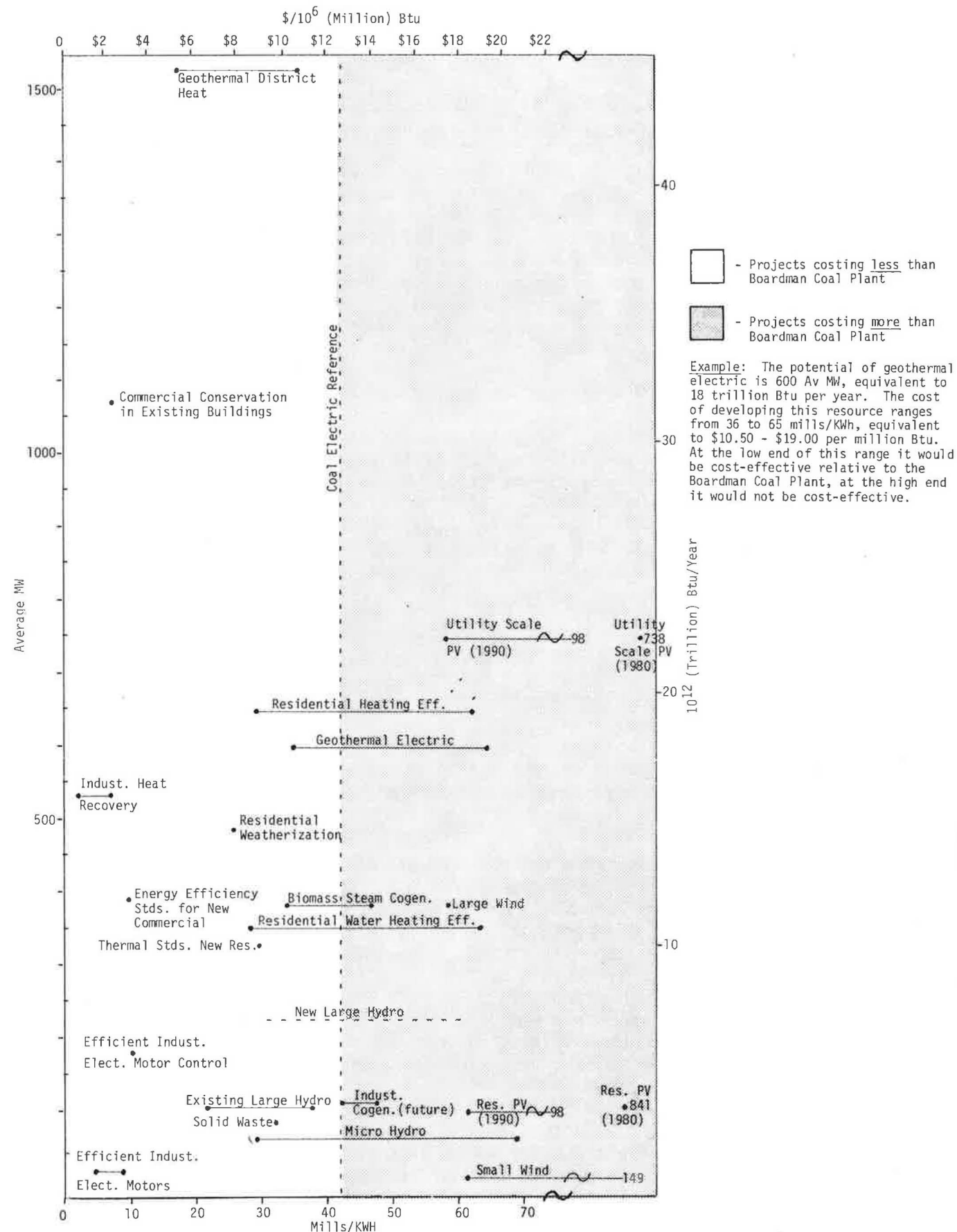
Electric Power	Average Megawatts (av MW) <sup>2</sup>			
	1985	1990	1995	2000
Wind <sup>3</sup>	5	110	267	423
Geothermal	38	225	412	600
Hydro	102	205	307	410
Biomass	160	405	405	405
Displaceable MW (Conservation/Solar) <sup>4</sup>	468	935	1402	1870
TOTAL	773	1880	2793	3708 <sup>5</sup>

Thermal	Trillion Btu per Year <sup>2</sup>			
	1985	1990	1995	2000
Conservation/Solar <sup>6</sup>	20	40	60	80
Geothermal <sup>7</sup>	6	33	43	46
Biomass	51	77	77	77
TOTAL	77	149	180	203

Alcohol Fuels	Million Gallons per Year	
	2000	
Ethanol	20	
Methanol	50	

1. See individual task force reports for assumptions used in making these estimates and development schedule. The development schedule for hydro and solar/conservation is assumed constant for 1980-2000.
2. For conversion to common units: 1 trillion Btu = 33.4 av MW.
3. Assumes 30 percent capacity factor. The Wind Task Force Report used a 40 percent capacity factor.
4. Identified by the Solar/Conservation Task Force as electrical demand, such as electric space and water heating and industrial electric motors, that could be displaced by a combination of conservation and direct use solar measures. Does not include electricity that could be generated by solar.
5. Does not include 884 av MW estimated from the Solar/Conservation Task Force as the 1980-2000 potential for photovoltaics.
6. Identified by the Solar/Conservation Task Force as the energy from a combination of conservation and solar measures that could displace the need for thermal energy produced from natural gas and oil.
7. Some of this geothermal direct-use energy may displace the need for electric heating as well as the thermal energy produced from natural gas and oil.

Figure 2 Oregon's Renewable Resources:  
Realizable 2000 Energy Potential & Costs\*



\*Does not include  $77.5 \times 10^{12}$  Btu per year of wood fuel.  
Does not include alcohol fuels.  
PV--Photovoltaics. Numbers listed for photovoltaics and small wind are mills/KWh.

TABLE 3

Inventory of Alternate Energy Options<sup>1</sup>

Alternate Energy Options	Reasonable Year 2000 Maximum <sup>2</sup>	Cost <sup>3</sup>	Key Constraint
Small-Scale Wind	23.7 average MW	62-149 mills/kWh	Financing, suitable residential & commercial sites
Large-Scale Wind	399 average MW	57 mills/kWh (1980)	Land use planning, demonstration
Geothermal Electric	600 average MW	36-65 mills/kWh	Access to geothermal lands, resource assessment, environmental
Geothermal District or Industrial Heat	46 trillion Btus	\$5.69 to \$10.30 /million Btu	Resource assessment, financing
Micro-Hydro Residential Size	70 average MW	29-68 mills/kWh	Financing, remote sites
Large-Scale Hydro	110 average MW on existing dams	22-37 mills/kWh on existing dams	Impacts on fish and recreation
	230 average MW new dams	Not estimated for new dams	Same as above

1. See Appendix B for more detailed documentation.
2. Best estimate of how much of the theoretical potential could reasonably be achieved by 2000 after factoring in costs and the many constraints.
3. Costs (mills/kWh and \$/MBtu) includes construction, operating and maintenance, and fuel costs. These are levelized costs in 1980 constant dollars, determined by summing the stream of expenditures over the expected lifetime of the resource and spreading it evenly over the resource's lifetime.

<u>Alternate Energy Options</u>	<u>Reasonable Year 2000 Maximum</u>	<u>Cost</u>	<u>Key Constraint</u>
Residential Wood Heat	Not quantified	8.50-25.00 \$/million Btu	Environmental, safety, forest management
Solid Waste	100 average MW	32 mills/kWh	Resource collection and separation
Biomass, Wood Fuel	Quantification incomplete	No	Logistics and continuity of supply
Biomass Steam Cogeneration (existing installations)	405 average MW	35-46 mills/kWh	Logistics and continuity of fuel supply, power sales contracts
Ethanol <sup>14</sup>	20 million gallons/year	\$2/gallon equivalent in value to \$3.20 per gallon gasoline	Net energy cost of feedstock
Methanol <sup>14</sup>	50 million gallons/year	Equivalent to \$2.95 per gallon gasoline	Net energy cost of feedstock
Residential Weatherization	122 average MW plus 11.2 trillion Btu/yr. oil & gas	25 mills/kWh or \$5.48/million Btu	Financing
Residential Heating Efficiency (including solar)	271 average MW plus 13.7 trillion Btu/yr. oil & gas	28-62 mills/kWh or \$10.60/million Btu	Financing

4. These have been calculated on an equivalent Btu basis.

<u>Alternate Energy Options</u>	<u>Reasonable Year 2000 Maximum</u>	<u>Cost</u>	<u>Key Constraint</u>
Residential Water Heating Efficiency (including solar)	271 average MW plus 2.1 trillion Btu/year gas	28-62 mills/kWh or \$6.10-13.60/million Btu	Financing
Thermal Standards, New Residential Buildings (including solar)	235 average MW plus 3.3 trillion Btu/year gas	29 mills/kWh or \$6.26/million Btu	Homebuilder acceptance
Conservation Retrofits in Existing Buildings	377 average MW plus 20.59 trillion Btu/yr. oil & gas	7.4 mills/kWh or \$1.60/million Btu	Financing, building operator incentive
Energy Efficiency Standards New Commercial (including solar)	342 average MW plus 1.42 trillion Btu/year gas	9.6 mills/kWh or \$2.10/million Btu	Education, acceptance by building owners and designers
Efficient Industrial Electrical Motors	42 average MW	7-9.6 mills/kWh	Motors frequently chosen on basis of other factors
Efficient Industrial Electric Motor Control	173 average MW	10 mills/kWh	Product development education and acceptance by process designers
Industrial Cogeneration (future)	115 average MW	43-46 mills/kWh	Cogeneration-- process match
Industrial Heat Recovery	16 trillion Btu/yr.	\$1-2/million Btu	Front end costs

<u>Alternate Energy Options</u>	<u>Reasonable Year 2000 Maximum</u>	<u>Cost</u>	<u>Key Constraint</u>
Utility-Scale Photovoltaic	750 average MW	738 mills/kWh (1980) 58-92 mills/kWh (1990)	Costs; lack of mass production
Residential Photovoltaic	134 average MW	841 mills/kWh (1980) 62-98 mills/kWh (1990)	Costs because of lack of mass production
For Reference: Coal-Electric Generation		42.1 mills/kWh (1980)	

VII. RECOMMENDATIONS

A. Overview of the Commission Program

Recommendations by the Commission simultaneously will work to reduce energy consumption and create new supplies through the development of cost-justifiable conservation and renewable resource measures. Initially, conservation provides the least expensive and most immediately available energy option. As the amount of energy required to do a particular task is reduced, new energy supplies will become more cost-effective and important. Implementation of conservation measures is necessary for obtaining the maximum benefit from energy supplies from both renewable and conventional resources.

Two general principles have guided the Commission's consideration of its recommendations. First, voluntary programs should be used wherever possible. Mandatory programs should be considered only after voluntary programs have been given adequate time to work and then failed to achieve the desired goals. Second, the implementation of all programs should be tested for cost-effectiveness.

In defining "cost-effective", the Commission believes that the cost of energy should include all economically quantifiable social and environmental costs. Furthermore, we believe that the lowest dollar cost option should not always be considered the most cost-effective. Social preference and other intangibles should be recognized and accommodated by a weight factor assigned to preferred options. Public debate will help define and establish these factors.

The potential supply, barriers and program needs of conservation and renewables are quite different among the various economic sectors. For example, the type of incentive or educational programs will be quite different in the residential and industrial sectors, even though each sector needs both incentives and information.

The Commission believes that conservation programs are most easily organized by economic sectors: residential, commercial, and industrial. The residential and commercial sector is further broken into existing and new building. Each sector has unique characteristics which must be acknowledged if specific recommendations are to achieve desired results. The Commission finds that programs to develop renewable resources are best organized by program function rather than by target area.

Regardless of the manner in which the recommendations are ordered, the Commission strongly emphasizes the crucial interdependence of a given set of recommendations. For example, a resource development incentive will not be effective if information services do not aggressively reach out to potential developers. Similarly, measures

to promote geothermal development cannot succeed without comprehensive resource assessments. In the context of the Commission's recommendations, all program components must be in place if the effort is to be viable.

Our 87 recommendations are presented and discussed in the following pages.

B. Energy Planning Body

Recommendation 1 - Charge a single public body with responsibility for developing and implementing an Oregon energy supply plan that is consistent with state energy policy.

This plan would identify Oregon's energy needs and how those needs will be met by conservation, renewable resources, and conventional facilities. Plan implementation would require the energy planning body to evaluate the effectiveness of public and private programs in providing these resources, and to recommend necessary changes to the plan or to state programs to meet the state's energy needs. The Commission believes that the state Energy Facility Siting Council (EFSC) may now have the necessary authority and direction to be Oregon's energy planning body. If EFSC is unable or unwilling to carry out this charge, then we recommend that a new public body be formed and authorized to carry this responsibility.

The establishment of an ongoing State energy planning body is our most important recommendation. Three important tasks must be accomplished by this body: 1) integration of the Commission's alternate energy program with conventional resources to comprise a comprehensive state energy plan, 2) refinement and modification of the plan as needed to reflect changing state, national, and international energy developments, and 3) implementation of state energy policy by reviewing and, if necessary, revising state programs to expedite the development of needed energy sources.

Our report provides a still picture taken in 1980 of resource potential and program needs. In a rapidly changing energy arena it is impossible to accurately forecast energy cost, energy availability, or the development of new energy technologies. A vehicle must be established for reviewing state energy policy direction and modifying it as needed. Oregon has little control over these factors, yet state policy direction must evolve with and respond to these and other unpredictables.

By reporting what potentially is available through development of Oregon's renewable resources, we have made an important start. But, Oregon's energy policy must be implemented in a manner which assures that energy needs are met with an optimal mix of conservation, renewable resources, and conventional resources. Consistent with our charge, the Commission has focused on conservation and renewable resources. We have not explicitly addressed the role of conventional resources.

The energy planning body should identify, weigh, and balance all of Oregon's energy options and coordinate the development of a plan by which Oregon's energy needs can be met. Any state program to develop these energy resources must be considered in the context of the costs and desirability of all available conventional and renewable resources.

Implementation of the Commission's recommendations will have impact on the energy needs and supply options of Oregonians. The need for future energy generation will be influenced by the success of these programs and others being implemented concurrently by utilities and local, state, and federal governments.

The energy planning body should review the effectiveness of existing programs and, if necessary, recommend stronger action to achieve desired goals.

The energy planning body would assure that utility supply programs provide appropriate emphasis on conservation and renewable resources. Further, the body would provide important review of state programs such as code requirements, the need for mandatory programs, and the utility financing programs.

To perform these functions, the planning body needs legislative authority to:

1. Obtain the information necessary to develop an estimate of Oregon's energy demand and the resources available to meet that demand.
2. Evaluate how or if existing state and utility programs are working to make the resources available when needed.
3. Work with other state agencies to assure that energy resource development is consistent with protecting public health and safety and in compliance with Oregon's energy policy as well as air, water, solid waste, land use, and other environmental protection policies.
4. Arbitrate and balance competing interests and concerns with the need to develop additional energy resources.

5. Represent Oregon's energy policy direction in other state and federal proceedings.

The Commission, and citizens who testified at our public hearings, do not want to create a new state Commission unless it is necessary. ODOE, the EFSC and the Energy Policy Review Committee (EPRC) may already have the broad statutory authority to offer energy policy direction.

ODOE is charged with developing a forecast which provides an estimate of energy demand and the resources available to meet that demand. It is charged with quantifying the impacts of conservation and new technology, increased efficiency of present energy facilities, additions to present facilities, and construction of new facilities, on the availability of energy in Oregon. Further, the ODOE Director is empowered to obtain all necessary information from producers and suppliers in Oregon, including sales volume, forecasts of energy resource requirements, and inventories of energy resources.

The EPRC presents to ODOE public concerns on contingency or curtailment planning, reviews conservation programs and recommends ODOE public information policies, advises the Director on areas of needed research and development, and comments on the ODOE energy forecast.

The AEDC has been advised that EFSC has the remaining authority necessary to carry out the responsibilities of the energy planning body. The EFSC is charged with insuring that the siting, construction and operation of major energy facilities is consistent with the protection of public health and safety and in compliance with state energy and environmental protection policies. It provides a "one-stop" siting authority which can give State approval to facilities needed to carry out state energy policy, and withhold State approval from actions inconsistent with that policy. Further, each State agency proposing to adopt, amend, or rescind a rule relating to energy facility development first must file a copy of its proposal with EFSC. EFSC may order such changes as it considers necessary to conform to state policy.

Although EFSC has no direct jurisdiction over conservation programs or small-scale renewable resource projects, it must consider both -- in addition to the need for energy -- in assessing the need for a major new energy facility.

The preferred option would be to consolidate the responsibilities of the EPRC and the EFSC in a single public body, staffed by the ODOE, which could provide needed consistent and comprehensive policy direction. The single public body should be appropriately titled to reflect its broad responsibilities. The Commission is aware of the manner in which EFSC has functioned in the past, and is not confident that it can or will fill this broader role without stronger executive or legislative guidance.

In the past, the State has operated in a reactive rather than a prospective mode. EFSC has not addressed the question of Oregon's overall energy policy direction, including the issue of preferred energy options.

If the functions of the proposed energy planning body cannot be accommodated by a consolidation of the responsibilities of ODOE, EFSC, and EPRC, then we believe a new planning body should be created.

Recommendation 2 - Provide adequate staff to the ODOE to compile known resource inventory data, analyze the energy supply potentially available through conservation and renewable resources, evaluate state energy programs, develop accurate energy supply projections for Oregon, and provide for other general support for the planning body.

Substantial resource data are now available. These data should be collected and analyzed by the State to determine the impact of proposed state programs, to focus state programs in priority areas, to assist local land use planners in developing inventories of local resources (LCDC Goal 5), and to help potential developers bring specific resources on-line. Analysis of energy available as a result of conservation and renewable resources requires the development of an understanding of energy use in the residential, industrial, and commercial sectors. It requires an understanding of how the availability of energy, or energy offsets from these sources, mesh with the demands on existing utilities. Some analytical tools are available to do these tasks and should be used wherever possible. All of this material then should be compiled into an accurate energy supply projection to accompany ODOE's annual energy demand forecast. We believe that ODOE should have adequate staffing for these functions. That is not now the case. We believe this is essential if the energy planning body is to be successful.

## C. Energy Conservation

### 1. Overview

Recent studies by the National Academy of Science, Harvard Business School, and the Ford Foundation concur with the commonly-held belief that energy conservation is cost-effective and the only major new energy source that can be brought on-line quickly. Conservation consists of diverse strategies to reduce energy waste and loss and to improve the efficiency with which energy is used. The conservation recommendations are grouped by user sector, and subcategorized by program function.



2. Existing Residential

Sixty-nine percent of Oregon's projected housing stock in 2000 has already been built. Primary barriers to the implementation of cost-effective residential conservation measures are:

- The up-front capital requirements.
- Lack of information on the opportunities available;
- Lack of understanding of the long-term savings that can be accrued; and
- The inconvenience of shopping for products and services;

The Commission strongly believes that voluntary programs should be tried first. Mandatory requirements should be considered only if voluntary strategies are unsuccessful. In presenting a voluntary program, the Commission believes that the availability of conservation financing to all Oregonians to help overcome the initial cost barrier, and information for consumers and lenders, are the two key ingredients necessary to achieve increased residential energy conservation.

a. Residential Weatherization Financing

Recommendation 3 - Require, through the PUC, that all regulated utilities offer appropriate cost-effective incentives for conservation and weatherization. The Energy Planning Body should review the aggressiveness with which these programs are pursued and seek legislation to remedy ineffective programs. If utility financing is not adequate, the feasibility of State bonding should be examined.

The Commission believes that to succeed, a full-scale voluntary weatherization program must be accompanied by strong financial incentives. We believe that the best examples of strong financial incentives are the no-interest, deferred payment loan programs offered by PP&L and PGE. It is the Commission's goal to have similar financing available to all residential customers in Oregon, regardless of their energy supplier.

These programs are cost-effective to the electric utilities, given the large differential between the average power cost paid by the electric utility customer and the cost of new sources of electricity. When an electric utility can avoid building new generation by financing cost-justified conservation actions by its customers, all ratepayers of that utility save money.

The same justification, however, does not apply to natural gas utilities. Natural gas rates more fully reflect the utility's replacement costs than do electric rates. Investment in the distribution system represents the major portion of the natural gas utility's rate base, and already is in place. Drilling and production are done by independent production companies. Consequently these production costs are expensed, not rate-based, by natural gas utilities. Future rate increases are not directly avoided by investment in energy-conserving equipment now.

About 26 percent of Oregon's residences were heated with natural gas in 1979. Natural gas utilities in Oregon have actively been offering state-subsidized low-interest loans to customers to help finance their weatherization. These utilities have not, however, been able to justify no-interest, deferred-payment loans on a cost-effective basis.

A further difference between the electric and natural gas utilities has been the respective levels of capital investment. This is important since the more capital investment that has been made by the utility, the more capital it can borrow to finance the loans. IOUs, because of large capitalization in electrical generation facilities, are able to borrow large sums of money that can, in turn, be loaned to help support weatherization actions of their customers. Natural gas utilities, whose investments are largely in the distribution pipelines, do not have nearly as large a capital pool against which to borrow money to finance loans to customers.

Heating oil dealers do not have a rate base through which these loans could be financed, and have been unable to offer similar programs. Extending no-interest, deferred payment loans to oil heat customers will be discussed further under Recommendation 10. Restrictions bar similar programs by public power systems. This will be discussed further in Recommendation 5. A more detailed discussion of this issue is on pages 30 through 36 of the Solar/Conservation Task Force Final Report.

Recommendation 4 - Require, through the PUC, similar no-interest, deferred-payment loan programs from all of the regulated electric utilities in Oregon and to extend those programs to as many customer classes as can be cost-justified.

For example, PGE offers a no-interest, deferred-payment loan for multiple-unit structures. The Commission believes that this financing opportunity should be extended to similar customers of all Oregon IOUs. Recognizing that the cost-effectiveness of these actions for natural gas ratepayers is different than that for electric utilities, the Commission does not believe similar programs should be required from the natural gas utilities. But the Commission encourages the PUC to require programs from the natural gas utilities which are as close to the no-interest deferred-payment programs as can be economically justified.

Recommendation 5 - Refer to the voters a constitutional amendment to permit public power systems to finance conservation loans.

Public power systems may benefit from a proposed change in BPA's statutory authority to allow BPA to finance conservation. However, if BPA's authority is not extended, a state constitutional amendment may be necessary to permit public power systems to make conservation loans. The Commission believes that the state should not wait for a federal resolution of this issue, but should push immediately for the necessary state constitutional amendment. When it is clear that the public power systems can make conservation loans, we believe they will voluntarily adopt cost-effective programs to do so.

Recommendation 6 - Amend the existing state-subsidized low-interest loan program for residential weatherization to allow for higher interest ceilings.

The program has faltered because bank interest rates exceeded the program's 12 percent interest ceiling. This legislation should be amended so that similar fluctuations in interest rates will not hamper the program.

The Commission also believes that longer-term loans are beneficial and should be encouraged by this program whenever possible. With long-term loans, the monthly payment will be less than the money saved by implementing cost-effective actions.

Recommendation 7 - Establish a quality control program for weatherization installations which includes a reasonable rate of post-installation inspections by either energy suppliers or local building officials. Inspections should be available upon request to those homeowners who have concerns about the quality of the weatherization they received.

The State and recommended utility conservation programs would promote, finance, and in some cases require the weatherization of homes. There is an implied responsibility to protect consumers against faulty products and workmanship. Furthermore, the investment by the utility ratepayers is predicated on the actual energy savings which will come about only if the weatherization has been installed properly. To assure that this comes about, the Commission recommends the adoption of programs for adequate post-installation inspections to assure proper installation and to inspect those installations questioned by a homeowner.

Recommendation 8 - Amend the state tax credit program for residential weatherization to increase the maximum tax credit of \$125 to \$500 and limit the items eligible for tax credit to basic weatherization.

Oregon's weatherization tax credit program is more reward than incentive. We believe the amount of the credit should be increased to \$500 to be an attractive incentive. Homeowners would have a choice between the tax credit and the no-interest or low-interest loans. The credit offers homeowners an alternative to a no-interest, deferred-payment loan. The credit should be amended to focus on the most basic weatherization including insulation, double-glazing, weatherstripping, and caulking. A separate credit should be established to encourage heating system efficiency improvements (see Recommendation 10).

Recommendation 9 - Adopt legislation providing a personal income tax credit of 25 percent to a maximum of \$125 per housing unit for the cost of installing certain space and water heating system improvements.

The Commission believes that Oregon's weatherization tax credit program does not adequately encourage heating efficiency improvements. Individuals tend to use all of the tax credit to offset weatherization costs. An increase in this tax credit would not change that pattern. A separate tax credit focused on heating system efficiency improvements will draw homeowners' attention to another opportunity to conserve energy and money.

Recommendation 10 - Implement state-subsidized financing for consumers not eligible for utility-sponsored programs.

Homeowners who heat with oil are not eligible for utility-sponsored financing programs. In addition, heating oil dealers do not have a rate base from which to recover the cost of a weatherization financing program. Given the high cost of heating oil, the expectation that oil costs will increase, and the uncertainty of future oil supplies, a majority of the Commission believes it is appropriate to develop a state-sponsored financing package for heating oil customers. Conservation in oil-heated homes is as important as it is in other homes, and it will work to the general public benefit. Furthermore, many oil-heated homes likely will switch to other energy sources in the future, which would place a burden on utilities if these homes are uninsulated. We believe that it is appropriate for a loan program to be financed by the sale of State General Obligation Bonds.

The Legislature should set a subsidized interest rate low enough to be attractive to large numbers of homeowners. An interest subsidy could be provided through an assessment on heating oil, from the General Fund or both. To make the loans comparable to the no-interest, deferred-payment loans available to electric space heating customers, an assessment on heating oil of 10 to 25 cents per gallon would be necessary. We believe that an assessment of this magnitude would be unacceptable. The interest subsidy should therefore be set high enough to avoid large assessments. For example, a 6 percent interest subsidy financed equally by the General Fund and an energy use assessment would imply an assessment on heating oil ranging from about 2 to 15 mills (1.5¢) per gallon (1980 dollars).

b. Information and Education

The Commission believes that ready access to clear, reliable information is the cornerstone of any effort to encourage voluntary conservation and renewable resource actions. Individual homeowners need to know how to reduce energy consumption. They need information on what actions they can take, the value of those actions in saving energy and money, where to find the necessary materials, and how to contact a reliable contractor.

Two major challenges confront weatherization information programs. First is the number of the potential beneficiaries. All 2.5 million Oregonians should have easy access to information. Second, the information needs to be tailored to individual and local needs and local services and materials.

Recommendation 11- Utility audits should be available to all residential customers throughout the state. Oregon law should be amended to require public power systems to provide audits to their non-space heating customers.

After consideration of several options, the 1977 Legislature made a policy decision that energy suppliers, rather than government, should be the primary source of information on weatherization and general conservation for their customers. The federal Residential Conservation Service (RCS) has established a similar program nationwide. RCS has also expanded the role of utilities to include providing information on certain renewable resource measures. While there are problems and limitations involved with any delivery mechanism chosen for these purposes, the Commission believes that the utility audit program is one of the few that can meet the challenge of serving all homes in Oregon with the site-specific information that is required.

Federal law requires IOUs to provide audits to their non-space heating customers for a maximum fee of \$15. Utility ratepayers must pick up the difference between that fee and actual audit costs. The Commission believes that, in principle, this approach is inappropriate.

Oregon law should be amended to require public power systems to provide audits to their non-space heating customers. Rather than condone what we believe to be an inappropriate federal policy, the State should develop an equitable means of financing audits for non-space heating customers of public power systems.

Recommendation 12 - Amend the State Unlawful Trade Practices Act (ORS 464.605-652) to authorize ODOE to adopt rules and impose civil penalties regarding the conduct of state-sanctioned energy audits. Auditors who provide false or misleading information or who sell weatherization services at the time of the audit would also be subject to being removed from the list of eligible auditors.

It is important that information provided by utility-sponsored auditors to homeowners is reliable. In some cases, particularly with oil heat dealers, the auditors implementing the heating suppliers' program have also been weatherization contractors. Given the potential conflict of interest, it is particularly important that the State take adequate measures to assure that information is accurate.

Recommendation 13 - Support expansion of the Energy Extension Service to all Oregon counties.

The Energy Extension Service (EES) is a major new federal program in Oregon implemented by Oregon State University's Extension Service. EES closes many of the gaps left by the utility audit programs. EES provides information for small businesses and the construction industry and conducts special public workshops on topics not covered by utility audits, such as woodstove safety. Most of the state is not served by EES. But in the six counties served by EES, public demand on the agents has been overwhelming. Extending public information services statewide was one of the major points raised in public testimony at Commission hearings on its draft report.

c. Voluntary/Mandatory

Recommendation 14 - The Energy Planning Body periodically should review the effectiveness of voluntary programs and the potential

for additional energy savings from conservation. It should be prepared to recommend to the Legislature mandatory programs if it appears that voluntary measures will not achieve the appropriate levels of conservation.

The Commission is unanimous in its belief that voluntary programs should be tried before mandatory programs are established. It is divided, however, on whether the foundation for a potential future mandatory program should be established now.

The majority of Commission members believe that mandatory programs are undesirable. They also believe Oregonians will, by choice, take the desired actions. A truly attractive voluntary program has yet to be tried. They believe it would be difficult to implement a mandatory program with flexibility sufficient to require actions appropriate to a particular homeowner's situation.

Public testimony at the Commission's hearings was overwhelmingly opposed to mandatory weatherization. Most citizens said they believed that the public will respond favorably to incentives and educational programs.

Some Commission members believe that the Legislature should establish a goal, which if not met would trigger mandatory programs at a future date. These members believe that the mere existence of legislation establishing a potential future mandatory program would provide a "stick" that would make the incentives that much more effective. They believe that such legislation is the only effective way to achieve a significant portion of the energy savings possible and that those savings would happen sooner.

The Commission's recommendation is a compromise between these opposing views. It recognizes that time is needed to see if people will respond to both the rising cost of energy and the new incentives proposed by the Commission, the State Legislature, and the Congress. We do not believe, however, that the possibility of mandatory controls should be dismissed. As follow-up to the Commission work, the impact of existing and proposed incentive programs should be monitored, a mandatory program be considered only if the voluntary programs fail.

3. New Residential

New housing will be with us long into the future, and new energy-efficient housing will reduce future energy demands. The least costly time to install cost-effective conservation options is when a structure is designed and built.

Many of the barriers to conservation in existing structures apply to new structures as well. Two barriers are lack of consumer knowledge and, in some cases, financing. The major difference, however, is that most new homes are constructed by a builder for an unknown buyer. The builder is often reluctant to build more expensive energy-efficient homes, which can be less competitive in the market. Homebuyers are wary of higher initial costs, often without considering or understanding the long-term savings that will accrue from an energy-efficient home.

The Commission's objective is to insure that all new structures are as energy-efficient as is cost-effective. This objective can be achieved through the building code. The builder's decisions on energy-efficiency may not always be in the best long-term interests of the buyer who must pay the energy bills. In the broader public interest, reduced energy demands of new structures reduce the burden on the supply system, lessen the need for new facilities to meet demand and benefit the energy supplier's other ratepayers.

The codes process is in place and provides an easy method for administering changes in building standards. Measures that are cost-effective over the life of the dwelling can be financed through normal home mortgages. Lower energy bills should offset higher mortgage payments which might result from the higher initial costs of an energy-efficient home.

There are four key problems in the current code process:

- a. The code adoption process is cumbersome, inefficient, and lacks accountability;
- b. The Building Codes Division lacks adequate technical staff and expertise in energy conservation and renewable resources;
- c. Additional responsibilities to enforce the code's energy requirements have been imposed upon local governments without commensurate additional resources; and

- d. The energy conservation elements of the building code are, for the most part, confined to the structural code. There is virtually no entry for organized, formal energy conservation expertise in the development of mechanical, plumbing or electrical codes.

Recommendation 15 - Restructure each building code advisory board to address energy considerations related to their area of expertise.

Awareness of energy impacts and technology must be an integral component of each code. To achieve this, the membership of advisory boards which review each of the building codes must include knowledgeable persons who understand and can advise the board on how the code impacts energy-related technologies and energy requirements. The Energy Conservation Board (ECB) was by statute established within the Building Codes Division of the Department of Commerce (DOC) to advise the Structural Code Advisory Board (SCAB) on energy-related matters in the building code. The Commission prefers instead the appointment of energy representatives on each of the code advisory boards which deal with energy-related matters.

Recommendation 16 - Revise the code adoption process to place sole adoption authority in the Director of the Department of Commerce.

The authority to adopt codes is split between the DOC director and the advisory boards. The Commission has been advised that this shared authority has led to significant problems during the past three years when the boards and/or the director have been unable or unwilling to act. For example, we are told that in 1977 the revision of the residential energy code was delayed for several months and the adoption of a Commercial Energy Code for more than a year because the director and SCAB could not agree. Neither could act without the other's concurrence. There were other similar disagreements which confused builders and code enforcement officials. The Commission strongly believes that an advisory board should not have a controlling interest in code adoption. We strongly recommend that clear and sole authority for adoption of all codes be placed with the Director of the Department of Commerce.

Recommendation 17 - Establish and provide adequate staff to an Energy Codes Section within the Department of Commerce to ensure that energy concerns are adequately addressed in code language and enforcement. The staff should also be charged with responsibility to educate the construction industry and other code

officials on energy requirements in the code and to develop a licensing or certification program for wind and solar installers.

The Building Codes Division lacks adequate technical staff and expertise in energy conservation and renewable resources. Objective, adequate research is essential if meaningful codes are to be adopted which reflect cost-effectiveness, and to provide consumer protection without unnecessarily inhibiting product development or increasing consumer costs. This requires expert staff and time and cannot rely solely on the volunteered time and expertise of advisory board members. Creation of a Technical Energy Code Section within the Department of Commerce would provide a resource that could initiate code changes, evaluate code changes proposed by others, provide training, develop education materials, and stimulate increased energy awareness among the Building Codes Division staff.

Recommendation 18 - Revise the 1973 Building Permit Fee Schedule which governs local and state permit fees to reflect the additional demand created by energy conservation requirements, inspections, and code enforcement.

Increased state funding for local code officials and building inspectors is needed if they are to take on more responsibility. The 1973 Legislature adopted a permit fee schedule in the Uniform Building Code which, with the exception of an inflation factor, has not been updated. As a point of comparison, the fee schedule suggested by the 1979 Model Code is more than 50 percent higher than the 1973 schedule because of energy conservation and removal of architectural barriers to the handicapped.

Recommendation 19 - Provide sufficient building inspectors to insure that energy requirements are enforced.

The code is only as good as the delivery and enforcement mechanism. The Building Codes Division is concerned about problems with enforcement of the existing code standards for energy. New, more complex standards must be accompanied by increased funding for enforcement. Enforcement of the standards will probably require state and local building officials to increase staffing for on-site inspections. Funding would come from implementation of Recommendation 18. Code enforcement is particularly important because installation quality is crucial. For example, it is not enough to merely install insulation in a wall cavity because even minor gaps result in significant heat loss. A 10 percent void area in an insulated wall will result in a 33 percent greater in heat loss than if it were properly installed.

Recommendation 20 - Provide sufficient personnel to the Department of Commerce to follow the implementation of the energy codes and spread ideas and programs which are working well throughout the energy codes process.

The Department of Commerce needs adequate staff to evaluate the building codes adoption and enforcement program and to implement changes for its improvement.

Recommendation 21 - Establish a goal for energy savings to be achieved through code revisions for new home construction, heating system performance efficiency, and water heating efficiency. The goal is to reduce energy consumption significantly when compared to similar homes built to 1980 standards. The goal should take into account the cost-effectiveness of potential weatherization and heating efficiency options and should be reflected in code modifications.

Based upon the work of the Solar Conservation Task Force, the Commission believes that there are a number of actions which would lessen the energy requirements of a dwelling and improve the efficiency with which energy is used. If these measures are adopted in the existing building code, the Solar/Conservation Task Force believes that energy savings of 50 percent may be possible, as compared to homes built to the 1980 code. Space heating efficiency improvements suggested by the task force included electric and gas heat pumps, passive, active or hybrid solar systems, and increased insulation with an infiltration barrier and air-to-air recuperator. Water heating improvements suggested include solar water heaters with conventional back-up sources, heat pump water heaters, and improved water heating conservation techniques. Opportunities for cost-effective energy savings should aggressively be pursued by the DOC and incorporated in the codes covering new structures.

Recommendation 22 - Request the Governor, Oregon's Congressional Delegation, and the Legislature to encourage US Department of Housing and Urban Development (HUD) and US Department of Energy (US DOE) to strengthen the energy efficiency standards for new mobile homes.

Mobile homes now constitute one-third of Oregon's annual new single-family housing starts. As the cost of new housing increases, there may be an even greater increase in the number of mobile homes. For improved standards to have the desired

impact on residential energy consumption, mobile home energy efficiency standards should be comparable to those of new homes. The State administers federal standards for mobile homes, but does not have authority to adopt more stringent standards. The Commission is concerned that federal standards for mobile home construction are inadequate and should be strengthened.

4. Existing Commercial and Industrial

Energy conservation considerations in the industrial sector have been described by US DOE as follows:

"Private industry, on its own, has taken and will take significant energy conservation actions. There are many categories of activities, however, that the private sector will not expeditiously pursue alone for a variety of basic reasons which vary from industry to industry. Even in the most energy-intensive industries, energy is a small fraction of product cost. This fact, coupled with the technical and economic risk in major production facilities, provides little incentive for private sector pursuit of high-payoff, high-risk energy conservation technology development, especially in the presence of higher priority demand (such as OSHA and EPA requirements, product improvement and market expansion) for the limited capital available. (US Department of Energy Conservation Objectives, Calendar Year 1980, Office of Conservation and Solar Energy, US DOE, January 1980. pages 29-30.)

The state offers few conservation programs for the commercial and industrial sectors. The Commission proposes financial programs to provide low-interest loans to help finance the capital required for conservation actions, tax credits to help encourage and improve the cost-effectiveness of the actions, technical assistance and information, a mandatory lighting standard, and an energy management and funding program for public facilities.

a. Financial Incentives

Recommendation 23 - Establish a loan fund to finance conservation projects which cost less than \$500,000 in the commercial/industrial sector.

We recommend that this loan program be financed through sale of state bonds. Eligibility should be extended to both large and small industries.

While substantial energy savings from efficient operations and maintenance are possible in most commercial buildings, additional savings usually require large investments, and interest paid is tax deductible. It is not uncommon for an energy conservation retrofit project in larger commercial buildings to cost \$100,000 or more. Financing is more critical in the commercial sector than in the residential sector.

However, the interest rate for conservation financing in the commercial sector might not need to be as attractive. Business looks for good investments. Financing for conservation or renewable resource investments at an interest rate slightly less than the commercial bank rate likely would attract project applications from the commercial sector.

The Commission recommends a \$500,000 project limit because projects costing more likely would be financed through Industrial Development Revenue Bonds (IRDBs) as proposed in Recommendation 24. The Commission believes that loans for energy conservation and renewable resource projects are particularly important for smaller businesses. Investment tax credits accrue only to those who already have, or can obtain, investment capital.

Electric utilities, because of the substantial difference between their average cost of power and the cost of power from new generation sources, will find it more economical to invest their own dollars in commercial conservation options. The Commission anticipates that the electric utilities will, for electrically-heated buildings, find it cost-effective to offer a no-interest, deferred-payment loan program to the commercial sector.

Recommendation 24 - Adopt legislation requiring that eligibility standards for Industrial Development Revenue Bonds be revised, where reasonable, to require projects to meet an energy efficiency standard, and to extend eligibility of the bonds to energy conservation and renewable resource projects.

IDRBs are a good source of financing for large (\$500,000 or more) conservation and renewable resource projects. IDRBs were authorized by the Oregon Legislature to promote economic development. The bonds, which are sold by the state, can help new or existing businesses to finance or refinance acquisition of property, construction/reconstruction, and improvement or extension of facilities. The state sells bonds to finance the project, assumes project ownership and leases the facility to the borrower/operator until the bonds are paid off. Bond interest and principal are paid from the businesses' gross revenues. Although energy efficiency is not among criteria for determining "project eligibility", IDRBs can finance facilities which incorporate energy efficient structural design and components as well as new equipment and equipment improvements which increase productivity. The Commission believes it is appropriate that a state-backed project use energy-efficient equipment which can be justified on a cost-effective basis.

The Commission recognizes that a bonding program designed specifically to finance non-utility electrical production requirements, energy-efficient process equipment, equipment modifications, replacement, and structural components, departs from the "project eligibility" requirements for IDRB financing. Changes to these eligibility standards to recognize the value of energy efficiency improvements in improving productivity and profits could make IDRBs attractive for financing energy conservation and renewable resource projects costing \$500,000 or more.

Recommendation 25 - Amend the existing Business and Industry Tax Credit program to include conservation measures, extend its sunset to 1985, and raise the investment ceiling from \$30 million to \$50 million.

Oregon businesses and industries can claim a 35 percent tax credit over five years for investments in equipment using renewable resources including waste heat recovery systems. Standard energy conservation measures and energy-efficient equipment do not qualify for the tax credit. Energy savings from these measures can be significant and should be encouraged. The Commission believes that making these actions eligible for the Business and Industry Tax Credit would be such an incentive.

This credit was adopted by the 1979 Legislature and includes a 1983 program sunset. Industry needs adequate time both to find out about a program and to incorporate the availability of the credit into their new construction plans. The Commission believes this is a good program and that its sunset should be extended to 1985.

Facilities qualifying for this credit are limited to a maximum cumulative investment of \$30 million any given year. This ceiling will likely be exceeded if conservation measures are included among eligible projects. The Commission recommends that this ceiling be raised to \$50 million.

b. Information and Education

Recommendation 26 - Adopt legislation requiring all IOUs, natural gas utilities, and public power systems to provide energy audits to all their commercial customers.

Recent federal legislation requires IOUs and natural gas utilities to provide audits to commercial customers whose average monthly energy use in 1980 is less than 4,000 kWh or 1,000 therms. Oregon should seek legislation consistent with but expanding on federal law and require IOUs, natural gas utilities, and public power systems to provide audits to all their commercial customers, regardless of size.

Recommendation 27 - Expand ODOE's Energy Conservation Clearinghouse program to provide up-to-date financial information on state and federal financing mechanisms, tax advantages in energy conservation investments, and the general economic advantages of energy conservation investments to Oregon firms. The program should be expanded to teach about conservation techniques and corporate energy management programs.

As a part of the Governor's 1979-81 Energy Package, the Energy Conservation Clearinghouse for Commerce and Industry was established to promote the cooperative exchange of energy information in Oregon's business community and between business and state government. The initial program for the Clearinghouse includes information dissemination, regional energy workshops, demonstration projects, and legislative policy development to increase energy efficiency in the commercial and industrial sectors.



While technical education efforts should continue and should be more industry-specific, the Commission believes a broader range of information is needed. Of particular importance is up-to-date, factual, easy-to-understand information on financial incentives and mechanisms. Energy investments in industry are more likely to be discretionary rather than essential, unless they relate to continued energy supply or survival. Additionally, decision-makers often require a much higher return on these investments because of the associated risks. It is extremely important that these decision-makers be fully aware of all incentives, grants, and loans that can be used to offset the capital investment in energy projects. Incentive programs adopted by the State will not be effective without an aggressive information effort. The Clearinghouse is an excellent communications tool and the program's capabilities should be expanded.

Recommendation 28 - Identification by ODOE of specific administrative requirements which frustrate business participation in various related financing programs; action by ODOE to propose more efficient administrative procedures for its own programs and for other state and federal programs.

The applications process for state and federal energy incentives for business are complex, and in many instances one set of regulations may void an applicant's eligibility for other incentives. The Commission believes that the specificity and complexity of federal and state rules are a significant barrier to business's use of these incentives.

Recommendation 29 - Conduct annually the Governor's Energy Management Conference as a forum in which the private sector can describe its successes and constructive failures. Among other topics, the conference should present the most current and authoritative information available on future energy supplies and forecasted energy prices.

Annual energy savings of up to 20 percent or more are possible through operations and maintenance actions alone. Much of this potential has already been achieved by many firms, but constant attention is required to maintain it. Many firms, especially smaller ones, have not yet fully implemented operations and maintenance measures with an

effective energy management program. An annual forum would highlight actions which have been successful in one industry and could be applied in another. The Commission believes such actions will pay large dividends in cost-effective energy savings. Industry needs the best information available on energy supplies and forecasted prices to effectively plan future operations and strategy. The Commission believes that this forum provides for effective information transfer and can help industry anticipate and respond to energy supply and cost trends.

c. Mandatory Lighting Standards and Commercial Code Revisions

Recommendation 30 - Adopt legislation to require the Department of Commerce to develop and enforce maximum lighting power standards for existing commercial buildings. The standards should govern all commercial buildings above a specified size or connected lighting load and built before July 1, 1978, when lighting standards for new buildings became effective. The Legislature should require that the standards become effective by January 1983.

More lighting not only requires more power, but often increases energy demand and costs for cooling. The Commission believes that the standard adopted should substantially reduce wasted energy through lighting. The standard should be easily understood and applied by building owners and operators. The standard should require only those measures which are cost-effective. We believe that Oregon should avoid complex standards which require a business to hire a lighting consultant to develop a lighting budget and to recommend a means of compliance with the lighting standards. For more discussion, the reader is referred to pages 74 through 79 of the Solar/Conservation Task Force Final Report.

Recommendation 31 - Establish a goal for energy savings to be achieved through code revisions for new commercial construction, heating and cooling system performance efficiency, and water heating efficiency. Code revisions should serve to reduce energy consumption significantly when compared to similar

buildings constructed to 1980 standards. The goals should be set taking into account the cost-effectiveness of potential weatherization, cooling, and heating efficiency options. Goals should be reflected in code modifications.

This recommendation is similar to Recommendation 21.

While new commercial buildings are covered by lighting standards and energy requirements in the Commercial Building Code, the Commission believes that substantial energy savings, perhaps 20 percent, could be achieved through more stringent and cost-effective code standards. Possible measures include lower lighting levels, daylighting, passive cooling, more efficient air-handling equipment, heat recovery devices, wide-deadband thermostats, infiltration controls, and light switching triggered by solar intensity. The Commission believes that the modifications to the code adoption process and the additional technical support for the DOC (see Recommendations 16 and 17) should address commercial codes as well.

The Commission recognizes that large commercial and industrial structures are more complex than small commercial or residential buildings. Structural defects are the main cause of energy waste in homes. Mechanical systems are the most important in large commercial buildings. Energy use in smaller commercial buildings is more predictable. Smaller buildings have less internal heat-creating equipment, and their energy demands are more similar to residences. These factors should be taken into account by the Department of Commerce in adopting the new code provisions.

d. Public Facilities

Recommendation 32 - Implement a corporate style energy management program for State buildings.

The State, through agencies which manage its facilities and through ODOE's Industrial/Commercial Clearinghouse, can provide a model energy management program similar to programs in the private sector. For example, many industrial corporations now have a full-time energy manager at the executive level. These managers have authority which crosses corporate management lines. This business approach can be adapted to improve government's energy

management and to reduce energy costs. The Commission strongly believes that such measures to make State actions consistent with government policy are extremely important.

Recommendation 33 - Appropriate money from the State General Fund to provide a 50 percent match for energy conservation and renewable resource measures implemented by local governments and public care institutions; replenish the State Building Retrofit Fund to continue conservation projects in State buildings.

Institutional buildings (schools, hospitals, government offices, and public care facilities) comprise a significant portion of the commercial sector. A federal program, the Institutional Buildings Grant Program ("Schools and Hospitals Program") provides 50 percent federal matching funds for energy audits, technical assistance studies, and installation of energy conservation measures for public and non-profit schools and hospitals. Local government buildings and public care institutions are eligible only for federal aid for audits and technical assistance and must pay all retrofit costs. Schools and hospitals have actively participated in this program. Local government and public care institution have not shown such interest because they must pay all retrofit costs.

Expanding the program to use state General Funds to provide a 50 percent state match for local governments and public care institutions' retrofit costs likely could induce wide-spread participation by those institutions. It should be noted that substantial state General Funds likely will be returned to local government for property tax relief by the 1981 Legislature. Since local government buildings' energy costs are financed by property taxes, state general funds appropriated for energy conservation in those buildings would be a form of property tax relief. The Commission believes that these actions will reduce the long-term operating costs for local buildings and should be supported.

Similarly, the State owns and operates a large number of commercial size office buildings. The 1979 Legislature appropriated \$1.5 million to retrofit state buildings. The amount of savings available through retrofits is proportional to the funding available. State agencies have been reluctant to transfer funds from fuel budgets to capital improvements. Over the long-term these

improvements will save energy and tax dollars. If state government expects private industry to take similar action, government must set an example. The Commission believes that additional funding should be set aside to replenish the State Building Retrofit Fund.

#### D. Energy Production - Renewable Resources

##### 1. Overview

As the amount of energy needed to perform a particular task is reduced, the amount of energy that can be saved by further conservation actions decreases and cost of saving increases. Conservation options offer the fastest, lowest-cost option for increasing energy supplies. However, even as Oregonians use energy more efficiently, total energy demand will increase and that demand growth will be met by new renewable and conventional energy sources.

The overall objective of the Commission's recommendations for renewable energy resources is to increase the development of those resources to help meet future energy needs. Such development is taking place in three different modes. First is the displacement of conventional loads by direct use of renewable resources. Examples include use of geothermal waters to pasteurize milk, woodstove space heating, solar domestic water heating, or using windmills to replace electric water pumps.

Second is the on-site use of local resources which displace the need for conventional energy supplies. Important examples include power generation by Oregon's forest product industries, residential wind electric generators, and producing natural gas substitutes from wood residues. These applications are characterized by users who have the necessary resources close to where the energy is needed.

In the third general mode, utilities or other private energy suppliers produce energy in facilities fueled by renewable resources. These facilities can be built at the best resource sites and the energy can be delivered to users via utility transmission systems.

Until recently, opportunities for developing local energy resources have not been pursued because utility-supplied energy was cheaper. As energy costs increase, more emphasis is being placed on on-site energy options by individuals and industries. This is in part due to a desire for independence and for control over costs and over energy production. In other cases, low-cost fuel sources or increased fuel-use efficiency, such as co-generation, make energy generated on-site less expensive than energy available from energy suppliers.

Diverse renewable resource technologies include chemical processes (alcohol fermentation and wood gasification), thermodynamic processes (geothermal heat exchangers and solar heating), and mechanical systems (wind and hydro generation). System size and design parameters will differ between typical residential, commercial, industrial, and utility systems. However, constraints, information needs, and technology for these processes are similar.

The Commission's recommendations for renewable resources address three overall goals.

1. Create a state climate conducive to the development of diverse, locally-available energy supply options.
2. Speed market development of affordable renewable resources and help create a larger market to reduce costs and bolster consumer confidence.
3. Remedy institutional barriers which unnecessarily constrain the development of Oregon's renewable energy options.

The Commission's program includes recommendations which address institutional barriers, resource assessment, information and education, financial and mandatory incentives, consumer protection, research, and utility programs.

##### 2. Institutional Issues

Laws and regulations designed to achieve a particular and worthy goal often unintentionally impede other actions. Such laws can be remedied and still accomplish the original purpose. The task forces have identified situations in which state and federal laws and regulations are unnecessarily strict or inappropriate. This was not unexpected. In most cases, lawmakers did not consider the impact of regulatory measures on renewable resource development.

The Commission believes that State government must not unnecessarily impede private sector energy enterprises that are consistent with state policy and which will help meet state energy goals. The Commission believes that its recommendations for addressing institutional issues are, in order of importance, second only to its recommendation for an Energy Planning Body and staff. In general, these recommendations are low-cost and would ease constraints on private project development while maintaining adequate state regulatory controls. The Commission endorses several recommendations offered by the task forces for state action to remedy state and federal laws and regulations which unnecessarily inhibit resource development. Other recommendations strengthen regulations to enhance resource development.

The Commission's institutional recommendations have been organized by resource: alcohol fuels, biomass, geothermal, hydro, and solar and wind. Some generation recommendations apply to all resources.

a. General

Recommendation 34 - PUC should prepare buyback and wheeling tariffs for the purchase and distribution of power from cogenerators and small power producers. These tariffs should comply with the federal Public Utility Regulatory Policies Act (PURPA) regulations and should be clear and easily understood. Such rates and the federal PURPA legislation should be reviewed no later than 1990 to assure that the difference between utilities' avoided costs and the actual cost of production of power from such sources does not result in an unreasonable windfall for those producers.

The recent enactment of PURPA and passage of Senate Bill 638 by the 1979 Legislature encourages energy facilities of less than 80 MW using cogeneration, solar, wind, hydro, biomass, geothermal and municipal waste. Both state and federal rules will require utilities to purchase electricity from these plants at prices based on the utilities' avoided costs. Rules will allow a non-utility company to own, operate and interconnect to the utility grid without being subject to utility regulations.

The ability to sell electricity is a major incentive for the development of renewable resource options in Oregon. The Commission's task forces reported that 75 percent of capacity projections could be built by non-utilities under PURPA guidelines. The effectiveness of PURPA-inspired generation will be determined by how well PURPA is implemented by IOUs and Oregon's public power systems.

The Commission believes that rules defining how PURPA will be implemented in Oregon should be clear and easily understood by non-utility personnel and should be explained to industries which can be directly benefited.

The Commission is concerned that over the long-term the cost of producing power at PURPA facilities may be less than the avoided-cost-rate utilities must pay. This could happen because the rate utilities will pay for power

purchases under PURPA is tied to the utility's avoided cost and not to the power producer's actual cost. In order to avoid a major cost disparity, the Commission recommends that PURPA buyback rates be reviewed no later than 1990.

Recommendation 35 - ODOE should review comprehensive land use plans for elements that unnecessarily restrict potential energy facilities; ODOE should work with appropriate agencies to implement necessary revisions.

Geothermal, wind and hydro resource facilities must be installed at the resource site. Those resource task forces reported that some proposed local comprehensive land use plans significantly restrict development with blanket prohibitions or by ignoring resource development possibilities. Wind resource development has been restricted by height restrictions in some communities. Such restrictions can inhibit development when, in fact, such development would have no measurable adverse impacts. We believe that unless a local community has carefully studied and evaluated all potential sites for development acceptability, energy resource development should not automatically be precluded. No comments directly addressed this recommendation during the public hearings process.

b. Alcohol Fuels

Recommendation 36 - To prevent alcohol produced in small stills from being used in human consumption, the State should license all stills sold in Oregon that are manufactured exclusively from stainless steel, glass, copper, or any combination thereof.

Federal licensing of small alcohol-producing stills has been a major impediment to the development of alcohol fuels. The federal government recently has relaxed regulations regarding small alcohol stills. The Commission believes that state regulation of such stills is appropriate and that potential sources of drinking alcohol must be licensed and regulated.

c. Biomass

Recommendation 37 - Eliminate duplication and delay in Prevention of Significant Deterioration and New Source Review matters by seeking delegation of authority to the State by the U.S. Environmental Protection Agency (EPA).

This recommendation urges DEQ to assume as much local control over air quality permits as federal law allows to expedite the review and permit process. The 1977 Federal Clean Air Act requires best available control technology or lowest achievable emissions rate. By definition of these terms, the law results in everchanging standards for emissions control devices. Oregon has three critical (air quality) non-attainment areas, Eugene, Medford and Portland. Large boilers and any biomass facilities in or impacting these airsheds are subject to review by both EPA and DEQ. This double review procedure can take a year or longer. The business legally cannot place orders for emissions control equipment during the review process. Meanwhile, the "best available" clause makes control device standards an illusive target.

Recommendation 38 - Establish state-wide uniform code enforcement for wood stove installations.

Most wood stove-related fires are caused by faulty installation, not defective stoves. Confusion about proper wood stove installations stems, in part, from different requirements imposed by different jurisdictions. Some requirements, in fact, increase wood stove installation costs but do not provide increased safety. The Department of Commerce should continue to address these issues with uniform enforcement of codes covering wood stove installation.

Recommendation 39 - Amend ORS 469.320(3) to clarify provisions exempting cogeneration facilities from the need to obtain a site certificate from the Energy Facility Siting Council.

Under law, electric generating facilities of more than 25 MW require a site certificate. ORS 469.320(3) exempts some facilities from this requirement if they "generate electricity from heat produced as a by-product of the normal industrial processes at an existing industrial facility." The Commission believes that this language does not adequately describe which facilities do and do not require a site certificate.

Further, we believe that when electrical generation which uses renewable resources is installed at an existing industrial facility, the major land use impact has already occurred and a site certificate should not be required. This issue is particularly important to the forest products industry which operates most of Oregon's cogeneration.

Recommendation 40 - Request the Governor and Oregon Congressional Delegation to push for adequate forest management funding for the US Forest Service and the Bureau of Land Management.

Fifty-two percent of the land in Oregon is managed by federal agencies. The long-term availability of wood for both Oregon's forest products industry and for energy supplies largely will depend on how these lands are managed. A federal commitment to manage the federally-owned forests for long-term productivity is critical to Oregon's economy.

d. Geothermal

Recommendation 41 - Request that the Governor, the Oregon Legislature, and the Oregon Congressional Delegation ask the federal Interagency Geothermal Coordinating Council (IGCC) to investigate and report on how their 1978 streamlining recommendations have been applied to Oregon's federally-managed lands. IGCC also should promptly determine what specific additional actions are necessary for a rapid expansion in Oregon energy resource exploration and leasing activities.

This recommendation addresses specifically the need to make federally-owned geothermal lands in Oregon available for leasing. Leases must be issued before resource exploration companies can quantify geothermal potential. Companies are reluctant to explore until they own resource development rights. Without such rights, they must finance exploration and, if a finding is made, must then bid against others for development rights. Expediting federal leasing is, according to the Geothermal Task Force, one of its most important recommendations.

Recommendation 42 - Refine the Energy Facility Siting Council's (EFSC) 1974 Site Suitability Study specifically to evaluate crucial geothermal areas identified by the Department of Geology and Mineral Industries, Department of Water Resources, and the Oregon Department of Energy.

The 1974 site suitability study used a relatively broad brush approach when EFSC judged significant areas of Oregon as unsuitable for geothermal development. In general, specific sites were not reviewed for their geothermal compatibility. This deters further consideration and exploration of these sites. The Commission recommends that a site-specific review be made so that the suitability/unsuitability concept will provide good guidance without unnecessarily prohibiting development and exploration.

Recommendation 43 - Adopt legislation to establish provisions for the management and operation of a geothermal reservoir to assure that it is developed for maximum benefit.

As with oil and natural gas, the rights to geothermal resources may be shared by a number of owners. Under this recommendation, instead of each owner drilling a well and producing the resource as rapidly as possible, the reservoir is treated as a whole and a management program is designed for maximum yield. All owners share benefits of the development although the wells recovering the resource may not be on their property. This concept, when applied to geothermal, is complicated by the dual status of geothermal as both a "mineral", susceptible to managed development, and "water", which is developed under a "first come, first served" priority basis. With carefully considered definitions, we believe that geothermal resources can be developed under such management plans without interfering with existing water rights.

Recommendation 44 - Develop a program to directly involve local geothermal heating districts in the management of their geothermal reservoirs.

Several geothermal heating districts are being developed in Oregon. In general, these districts serve and benefit a specific local community and are controlled by that community. These districts need authority to help manage the local resource so that both geothermal development and other water uses are consistent with state water policy and maximum local benefit. These dual goals can be achieved if state resource management agencies clearly spell out their respective standards which must be met by the geothermal heating district. Local heating district managers could then prepare a plan satisfying state requirements in their specific community and explain how the resource will be managed. We do not believe that such a program would in any way infringe upon the State's responsibility for allocating water use or any water rights.

Recommendation 45 - Notify heating districts of any well drilling notices for wells that are in the vicinity of the heating district.

The availability of fluid and heat for a heating district may depend, in part, on the development of other water or geothermal uses in the vicinity. Implementation of this recommendation would assure that geothermal heating districts will be notified of actions which potentially could impact the district's resource.

Recommendation 46 - Exempt geothermal pipelines less than 16 inches in diameter and less than five miles long, or which are distribution lines for a heating district, from the Energy Facility Siting Council site certificate requirement.

The impact of these pipelines is similar to that of pipelines for city water and sewer services. Nevertheless, under law, it is possible that a site certificate from EFSC would be required for a new geothermal heating district or expansion of an existing district's distribution system. The Commission believes that a certificate should not be required and that such a requirement poses a barrier to and increases the cost of district heating development. We believe that our recommendation adequately protects Oregon's environment by requiring a site certificate for major geothermal pipelines while exempting those for heating districts.

e. Hydro

Recommendation 47 - Require all state agencies with relevant authority to clearly delineate requirements that must be met by hydro permit applicants. Agency criteria for licensing hydro projects should be developed as expeditiously as possible and should include established time lines within which applications will be processed. Adequate staff should be provided to the Oregon Department of Fish and Wildlife and the Oregon Department of Water Resources to enable those agencies to be responsive to hydroelectric application reviews.

Hydro site developers perceive that the requirements they must meet change after they make initial contact with the regulatory agencies. The Department of Fish and Wildlife is most frequently charged with causing licensing process delays. Developers need to know at the outset what the requirements are to determine if they can meet requirements.

The Commission recognizes that the development of clear prospective standards requires a significant effort by the resource agencies. Furthermore, if the recommendations of this Commission and related state and federal incentive programs are successful in speeding development of small hydroelectric sites, agencies involved with the regulation of dam safety and protection of fish and wildlife resources will have a heavier workload. If fish, wildlife, and water resources are to be adequately protected without unreasonable delays in project development, agencies involved with review and enforcement must have adequate staff.

Recommendation 48- Continue and expedite action by the Water Policy Review Board to reduce extensive prohibitions against hydro development larger than 7.5 hp in water basin plans.

Blanket restrictions discourage hydro development in many areas in which it would be compatible. Unless the areas so restricted have been well studied, we recommend that blanket restrictions not be imposed. The Oregon Water Policy Review Board is reviewing water basin plans and is eliminating restrictions wherever appropriate. The Commission believes this review should continue statewide as expeditiously as possible.

Recommendation 49- Review for duplication the jurisdiction of the Water Policy Review Board and the Energy Facility Siting Council for licensing hydroelectric sites. Eliminate any avoidable duplication.

Proposed hydroelectric sites in Oregon are reviewed by the federal government and both the Water Policy Review Board and the Energy Facility Siting Council. In many areas, the scope of the three reviews is similar and duplicative. We believe that the licensing of hydro-electric sites can be expedited without sacrificing environmental protection.

Recommendation 50- Require that all dams more than 25 feet high, on a regular water course, and at which power production may someday be practical, be equipped with a penstock/drain that can be used with generating equipment.

Adding generation capacity at existing dams has, in general, minimal environmental impact. The flexibility to add turbines should be included in the construction of new dams. Inclusion of a penstock or drain is not expected to add significantly to construction costs. Furthermore, the ability to drain the dam is a justifiable safety measure.

f. Solar and Wind

Recommendation 51 - Adopt legislation to require cities and counties to revise local land development standards to provide solar and wind access to the extent feasible given the constraints of latitude, topography, micro-climate, permitted uses and densities, and existing development patterns.

Wind and solar access is essential if these resources are to be effectively developed now and in the future. In the absence of adequate planning, land areas which now have access to solar and wind resources may forfeit those resources because of actions in neighboring areas. Furthermore, citizens who invest to meet their own energy requirements run the risk of seeing a neighbor's action cancel the benefits of that investment. The mandatory solar access recommendation in the Commission's report received several comments at our public hearings. Most comments supported adoption of the recommendation.

Recommendation 52 - Revise the building codes covering the installation of solar and wind devices to assure adequate consumer protection without unduly inhibiting construction of these systems or increasing system costs.

In general, Oregon's building codes were designed without consideration of solar and wind energy systems. The unintentional consequence is that codes limit beneficial design options and/or unnecessarily increase system costs. In addition to the Commission's other code recommendations, these codes should be revised to facilitate on-site energy

equipment and to protect consumers and public safety. All public comments supported the Commission's adoption of this recommendation.

Recommendation 53 - Adopt a licensing or certification program through the Department of Commerce for residential solar and wind technicians who install complete solar and wind systems.

The installation of a solar hot water system can require the services of several different licensed specialists including an electrician, a plumber and/or a sheet metal worker because none may have multiple skills and licences. This requirement increases system costs and dilutes quality control. The Department of Commerce should establish programs to license or certify installers of residential solar and wind systems. This would assure better qualified technicians and lessen system installation costs.

Recommendation 54 - Require the recording of all leases, options, and rentals of sites for wind project developments with county recorders and ODOE. Provide information through ODOE on wind access agreements to land owners in wind areas, and adopt rules of leasing state-owned lands for wind resource development. Lease agreements to develop wind resources on state-owned land should require the leasee to make reasonable efforts to develop the site's wind potential or lose the lease.

As Oregon's wind industry develops, more information on the location and extent of development efforts, resource exploration and possible siting impacts will be needed by governments and individuals. The State needs to track acquisition of development rights to monitor the possibility of speculators tying up sites indefinitely without any real plans to install wind turbines. The Commission is concerned that speculators could tie up all the areas with good wind resource potential.

Private Oregon land owners in wind resource areas are being approached by wind resource companies which want to acquire right to develop wind resources. Landowners need to understand such agreements, their potential impact on wind development, and provisions that will protect landowners' rights.

Provisions, including "use it or lose it", should be enacted for leasing of wind development rights on state and federal lands. The Commission believes that lease requirements to use a geothermal resource should be reviewed and similar wind leasing regulations be adopted.

### 3. Resource Assessment

Knowledge about the characteristics and availability of energy resources in Oregon will help determine the long-term effectiveness of the State's energy programs. Decision-makers must be aware of available options. A viable and aggressive State energy policy depends on accurate knowledge about long-term resource availability in specific areas and development costs. Lack of resource base information is a particular deterrent to development of biomass, wind, and geothermal. The energy potential in Oregon's wind and geothermal resources is substantial. Neither resource, however, will be developed until quantified. Once quantified, both could be developed relatively soon.

There are two general types of resource assessment. Broad scope "prospecting" studies identify the best sites for a particular type of facility. These studies are needed to help focus state energy actions and to identify the best sites for utility-sponsored facilities. The second type of assessment is site-specific and serves the interest of an identified end user who needs to quantify the resource to determine development feasibility.

The Geothermal, Wind and Biomass task forces recommend three resource assessment-related roles for the State: (1) compile resource data that are available through ongoing resource studies; (2) provide incentives for increased private exploration; and (3) undertake some State-sponsored resource assessment studies.

Testimony at the Commission's public hearings supported state adoption of a more active resource assessment program.

The Commission makes the following recommendations for an effective resource assessment program in Oregon.

Recommendation 55 - Create a \$2 million fund to be used by ODOE to contract for appropriate resource assessment studies. ODOE would review available data and fund additional studies.



The Commission assigns a high priority to this recommendation. Specific studies we have considered for State support include a major geothermal resource assessment program by the Department of Geology and Mineral Industries, a comprehensive state wind resource assessment, quantifying site-specific biomass and wind resources for which data are not available, and an evaluation of Oregon's thermal groundwaters to identify sites with geothermal potential.

Uncertainties about the long-term availability of forest residues, municipal solid waste, and agricultural residues are major constraints to increasing their use for energy production. To be economically justified, a facility must have economic fuel sources for an expected 30-year power plant life. Potential fuel (residue) suppliers are reluctant to make long-term fuel supply guarantees because market demands may make the material more valuable for non-energy use. One method to help assure adequate fuel supplies is to design facilities that can operate on different solid fuels, including coal. The availability of resource assessment data for specific locations and a diverse supply of biomass fuels will help investors document their long-term fuel supply.

The development of dependable wind resource data is a lengthy process. Given wind variations in different seasons, quantification of a utility scale wind site requires measurements over not less than three years. Hills, trees, buildings and other surface variations all influence wind speed at a specific site and elevation. In areas of changing geography, such as Oregon's coast and the Columbia Gorge, accurate measurements of a potential wind power site requires data gathered from numerous locations. While measurements have been taken at more than 70 sites in Oregon, the current level of resource information is inadequate for most wind energy purposes. Much more must be learned about the resource before confident predictions can be made about wind system economics and performance, siting locations and potential. If potential power producers are to be ready to site, install, and understand the potential impacts of utility-size wind generators when they become commercially available, then an accelerated wind resource assessment effort must begin now.

Resource assessment is the most important action the State can take to further geothermal development. Verification of a geothermal resource requires measurement of water availability and temperature thousands of feet underground. Even so, new wells drilled near successful hot ones can be dry or cold. In addition to the high cost and financial risk involved, geothermal exploration has been inhibited by the inability of exploration companies to gain access to lands of potential

geothermal interest. This delay has been caused, in part, by insufficient resource knowledge which precludes accurate assessments of potential environmental impacts.

Recommendation 56 - Adopt legislation providing a refundable state income tax credit for wind measuring instrumentation and supporting structures. Persons who claim this credit should be required to submit their wind data to the State to expand the resource data base. Claiming this tax credit should not reduce the tax credits available to homeowners who subsequently install a wind generator. The tax credit should be 50 percent of the first \$500 of actual costs. The business tax credits should be 25 percent of the first \$2,500 of actual costs.

A potential wind generator owner cannot determine cost effectiveness without site-specific wind resource measurements. Residential wind measuring equipment typically costs \$200 to \$300 to purchase and install, and commercial equipment \$200 to \$2,000. If measurements prove that the site does not have sufficient wind, this investment will be lost. ODOE has 35 wind measuring devices which are loaned to homeowners. This program has been costly because of equipment maintenance and the distance between measuring locations. The Commission believes that a tax credit for wind measurement devices will cost less and be more effective than the equipment loan program.

#### 4. Information and Education

Power generation by end-users requires the action of persons who traditionally have not been involved with the design, installation, operation and maintenance of energy facilities. Additionally, there is a dearth of counsel experienced in resource technologies to whom a potential generator can turn for investment decision advice. Oregonians need a credible source of reliable information about energy alternatives.

Although public interest in renewable resources is widespread, the size of the potential audience varies by resource type. Solar and woodstove options have significant potential for most of the residential sector. Geothermal, hydro and wind facilities are of interest to homeowners, business and industry, and communities. Use of these resources is limited to areas with specific resource potential.

The technical expertise required for resource projects often is more complex than for conservation measures. Architects, builders, lenders, engineers and educators need information and training. Individual homeowners need information about and assistance with specific strategies and problems. Finally, there is need for trained personnel who can work for and with government agencies, utilities and private industry to help bring renewable resources on-line.

During the public hearings the need for additional information and education received as much or more support as other proposals in the Commission draft report. Spokespersons agreed that renewable resource information should be locally available throughout the state.

The Commission's recommendations propose to strengthen the state's renewable resource information and education network by increasing support for resource-specific education and training centers, citizen volunteer groups, strengthening ODOE's information clearinghouse role and State-supported technology demonstrations.

Recommendation 57 - Direct ODOE to coordinate the state's information and education functions to ensure effective efforts and to avoid unnecessary duplication.

The Commission believes that the information/education efforts of utility programs, citizen volunteer groups and state government should be well-planned and coordinated. We believe that is an appropriate function for ODOE. The agency should have lead responsibility for coordination, efficiency and effectiveness of the state's energy-related information/education programs.

Recommendation 58 - Provide additional training and technical information/assistance staff for renewable resource services at four higher education institutions. We recommend that one professional and one clerical assistant be added to the staffs of the University of Oregon Solar Energy Center, the Oregon Institute of Technology's Geo-Heat Center, Oregon State University's Energy Research Institute and Eastern Oregon State College's Alcohol Fuels Clearinghouse. This supplemental service should be assured of continuing state support.

Although these centers are established, their future ability to provide education and resource-related technical information is tentative because of federal funding uncertainties. The Commission's recommendation, if implemented, would provide base funding to assure at least a minimum level of continued service.

These resource centers have demonstrated the long-term importance of such programs to resource development in Oregon. They have assisted in developing state resource plans and in implementing new resource-related legislation. They have provided a base of state-specific resource information, and have been a source of technical assistance for resolving complex issues. The centers are responsible for a significant share of our resource knowledge. They have been actively involved in and responsible for some of Oregon's earliest resource activities. Much of the state's expertise in the public and private sectors was developed from the training and drawing power of these centers. The need for their services surely will increase. We believe that the centers' continued service to Oregon should be assured.

Recommendation 59 - Strengthen ODOE's programs to assure the availability of independent and objective statewide information on renewable resource options and financing incentives, to act as a central source of technical assistance and financing for energy buyers and fuel suppliers, and to help facilitate projects through the State's permit processes.

ODOE is an important contact for individuals, businesses and industries interested in state incentive and assistance programs. ODOE does not provide the direct technical assistance available through others (EES, Resource Centers, volunteer groups, and utilities), but should create a forum in which public and private agencies can contribute to and benefit from a bank of accurate and reliable information.

ODOE is in a unique position to be an effective "sympathetic" third party in assisting renewable resource projects through state and federal regulatory requirements and in assisting projects to qualify for different funding opportunities.

Specific tasks which the Commission believes should be carried out by ODOE include:

- An aggressive program to help potential cogenerators and other small power producers find energy buyers, fuel supplies, technical assistance and financing;

- Publication of a cogeneration handbook by ODOE which provides biomass inventory information, fuel backup options, and clarification of state laws, regulations and permits;
- An expanded and targeted wind information dissemination and assistance program which includes information on wind siting, wind generator evaluation, state incentive programs, and zoning and legal information; and
- State-specific informational materials on small hydro and a technical assistance program using the statewide network of Watermasters.

Recommendation 60 - Support efforts by Oregon's active citizen volunteer groups to provide information on local resource availability, technological options and "how to" information to individuals and local communities.

Oregon has volunteer groups which have sponsored workshops and fairs and have provided information services on conservation/solar and other local technologies throughout the state. Oregon needs a comprehensive information program that will be available and responsive to the needs of all citizens. Volunteer groups have played and should continue to play a key role in that effort.

Recommendation 61 - Establish an ODOE technical assistance program to help local governments include resource inventories and ordinances in comprehensive land use plans. These ordinances should allow continued land development in a manner which preserves, wherever possible, its potential and value for future energy production from renewable resources.

ODOE's quantification of resource potential (see Recommendation 55) will make the agency a central source for resource information. Local land use planners need this information to help protect resource availability. Local jurisdictions lack experience in developing ordinances which protect wind, solar or geothermal resource and allow development to meet other local needs. ODOE should develop model ordinances to help planners and local decision-makers choose effective strategies to protect energy resource areas.

Testimony at the public hearings indicated that local jurisdictions are willing to provide for renewable resources in comprehensive land use plans. Witnesses emphasized the need for technical assistance to local communities.

Recommendation 62 - Conduct an aggressive state-wide education program for proper wood stove installation and operation.

More and more Oregonians are using wood stoves as their primary source of home heat. Unfortunately, many wood stove owners know little about the proper installation and safe, efficient operation of their stoves. This knowledge is essential, not only in the context of safety and air quality, but also to extend firewood supplies. More than 250 wood stove-related fires occur in Oregon annually. If this information/education effort reduces the number of fires by 2 percent, it will have more than paid for itself. Information provided by this program should discuss available equipment, operating characteristics, installation safety and consumer protection.

The Commission agrees with public hearing comments that local fire departments participate in this program as much as possible.

Recommendation 63 - Develop model collection and disposal ordinances for local governments to encourage recycling. The Department of Environmental Quality should have lead responsibility and have adequate staff to provide technical assistance for resource recovery and recycling projects.

Oregon recovers no energy from mixed waste. Increasingly, however, communities such as La Grande, Eugene, Portland, and Salem are installing or plan to install resource recovery equipment. The non-recyclable portions of most solid waste streams are used for direct combustion. Recycling materials from solid waste streams results in significant energy savings for end users. The implementation of these programs requires special assistance because the effort involves new kinds of relationships among waste collectors, recyclers and potential end users. From both the standpoint of energy supply and energy use, the Commission believes resource recovery is an extremely important target area.

Recommendation 64 - Fund ODOE research and demonstration projects to promote consumer confidence in and acceptance of new technologies.

State-supported "model projects", however, can be an important information tool, illustrating available technology. State-supported demonstrations, such as the solar heated showers at two Oregon state parks, are convincing displays. Examples of projects suggested by the task forces include clean-burning woodstoves, wind generators on state lands, well head geothermal electrical generators, and residential-size photovoltaic systems. The task forces also identified some research priorities which address local problems. These include a wind equipment market study, engineered feasibility studies for new potential biomass users, and testing of local feedstocks for alcohol production.

However, the Commission believes that demonstrating "first of a kind" technology, as well as research, is primarily the responsibility of the federal government and private industry, not state government. The Commission also believes that market development will provide the public with working examples of the technology, and that the State need not heavily invest in demonstration projects.

5. Financial Incentives

Decisions to install a renewable resource device are influenced by initial equipment costs, the availability of financing, and the perceived long-term operational costs. Oregon and the federal government offers an impressive array of incentives to encourage renewable resource development. Incentives include state and federal tax credits for renewable resource equipment installed by homeowners and businesses, state-subsidized low-interest commercial loans and the Small Scale Local Energy Loan Fund supported by the sale of state bonds.

Most of the Commission's incentive recommendations do not propose new incentives, but do propose improvements in existing programs. New incentives have been proposed for areas missed by existing programs and to overcome industry and community reluctance to take certain actions.

The recommendations are presented in residential and industrial/commercial categories.

a. Residential Incentives

Recommendation 65 - Increase the interest ceiling and length of loan terms available under the state-subsidized low-interest loan program (ORS 1979 Chapter 483).

The 1979 Legislature authorized commercial lending institutions to make 6 1/2 percent interest loans for residential solar, wind, geothermal and hydroelectric devices. The state grants a tax credit to lenders amounting to the difference between 6 1/2 percent and the going interest rate (up to 12 percent). No loans have been made under this program because the going interest rate for commercial loans exceeded the program's 12 percent interest ceiling in 1980. Lenders could make loans at interest rates as high as 19 percent. Also, a sunset clause in the legislation denies tax credits to lenders for loan balances outstanding after January 1, 1985. The Commission recommends legislative amendments to increase the program's interest rate ceiling and to extend the period in which lenders can claim tax credits.

With necessary changes, this program will be a good companion to the Small Scale Local Energy Development Loan Fund. The Commission believes that small loans will more appropriately be accommodated by commercial lenders than by the Small Scale Loan Fund program. The high initial cost of many resource options makes the availability of attractive long-term financing through these loan programs particularly important.

Recommendation 66 - Modify legislation for the residential renewable resource tax credit program to make the credit refundable, to extend the sunset clause to 1991, and increase the tax credit for wind devices to 25 percent of the first \$28,000.

Oregon's tax credit programs help offset investment risks in renewable resource options. Incentives improve the cost effectiveness of these devices and symbolize the State's commitment to renewable resource development. Incentives have helped finance innovation and lessons learned from these examples will provide important guidance for future consumers.

Recent federal legislation has increased the federal tax credit for solar, wind and geothermal devices to 40 percent of the installed cost up to \$4,000. The Commission believes the federal tax credit limits are adequate for residential solar devices. However, Oregon's tax credit for wind devices (25 percent up to a maximum credit of \$1,000) encourages purchases of small systems costing no more than \$4,000. Smaller wind machines are not as cost effective as larger machines and contribute only 10 to 25

percent of the energy used by a residence. A larger tax credit for wind energy devices would encourage the installation of larger turbines which produce more energy. The approximate cost of a wind machine large enough to provide all the energy for an electrically-heated home is about \$28,000.

The state tax credit is to sunset in 1985. By then the market for wind machines is expected to be in a state of rapid development. To suddenly discontinue the tax credit could seriously deter further market expansion. An extension of the tax credit until 1991 with a stepped phase out would allow the industry to grow without any immediate deadline.

Allowing the entire tax credit to be claimed in the first year as a refundable credit could alleviate some of the financing problems faced by individual purchasers. Individuals with little or no taxable income and/or tax liability would have equal access to the incentive.

Recommendation 67 - Amend the rules governing the residential and business/industry tax credit program to include groundwater heat pumps.<sup>1</sup>

Groundwater heat pumps use groundwater as an energy source for heating and cooling. Because groundwater stays at a relatively constant temperature, these heat pumps are extremely energy efficient. For example, a normal air-to-air heat pump will function as an electric resistance heater when outside temperatures drop to near 32°F. A groundwater heat pump in the same environment, however, would continue to operate efficiently because the temperature of the groundwater resource typically is near 50°F.

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<sup>1</sup>Groundwater heat pump - a device which extracts heat from a groundwater source at a constant temperature, upgrades it and delivers it to the structure for space or water heating. Because the ground temperature is higher than the average air temperature during the winter heating season, groundwater heat pumps are more efficient than air-to-air heat pumps.

ODOE rules for the residential geothermal device tax credit program define "geothermal" to mean groundwater sources which are 65°F or more. This definition excludes heavily populated areas of the Willamette Valley in which these devices could save significant amounts of energy. We recommend that ODOE amend the rule to eliminate any groundwater temperature limitation.

Recommendation 68 - Adopt legislation to make residential hydroelectric devices eligible for the Department of Veterans' Affairs Loan Program.

Oregon veterans can add up to \$3,000 on DVA home loans to help finance solar, wind and geothermal devices. Small-scale residential hydro systems are not eligible under this program. The Commission believes small hydro systems should be eligible for DVA loans.

Recommendation 69 - Request Oregon's Congressional Delegation to work to make residential hydro facilities eligible for federal tax credits.

Residential hydro was apparently inadvertently omitted from the federal tax credit program. The Hydro Task Force recommends that Oregon's Congressional Delegation work to include hydro in this program. The Commission concurs.

Recommendation 70 - Prohibit the use of conventional energy resources for new residential swimming pool heating.

A substantial amount of energy is required to heat swimming pools. Because of the relatively low temperatures involved (50-108°F), the energy can be supplied relatively easily and inexpensively by solar collectors.<sup>1</sup> At appropriate sites, geothermal or wood resources can provide all or part of the heating required. With the extremely good match between pool heating energy demand and solar equipment, the Commission believes that conventional fuel should not be used to heat pools if renewable energy resources are available and feasible at the site.

In adopting this recommendation, the Commission believes it can easily be enforced by amending ORS chapter 456 to provide that no building permits may be issued for new residential swimming pool heaters. By tying the requirement to the pool heater and not the pool, individuals could still install unheated pools.

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<sup>1</sup>Because of the relatively low temperatures needed, unglazed, plastic collectors can be used.

We considered but did not recommend a similar mandate for larger community pools, although solar, geothermal and other renewable resources are equally applicable to these pools, and would set a good example for the private sector. We also considered requiring hot tubs to use solar energy, but decided this should be considered as more information becomes available.

b. Commercial/Industrial Incentives

Recommendation 71 - Amend DEQ rules to limit municipal solid waste low-interest loan/grant program funds to incinerators equipped with heat recovery systems.

All private sector incinerators are equipped for heat recovery. This recommendation applies primarily to municipalities which could use the DEQ program to help subsidize the installation of solid waste incinerators. These should be equipped with heat recovery systems.

Recommendation 72 - Extend the eligibility of biomass-fired facilities, including cogeneration equipment, under DEQ's pollution control tax credit program.

DEQ offers a state tax credit of 5 percent per year for ten years for investments in pollution control equipment. Measures to reduce volumes of wood residue, such as hogged-fuel boilers, have in the past qualified for this program because wood residue was considered solid waste. With demand for wood residues increasing, DEQ is considering declaring such boilers and cogeneration equipment ineligible for the tax credit program. We recommend that biomass-fired boilers and cogeneration equipment continue to qualify for the credit under DEQ eligibility rules. This will be a clear signal of State support for these actions taken by business and industry and will help offset high initial project costs.

Recommendation 73 - Adopt a new tax credit program to provide a 10 percent investment tax credit for the cost of equipment purchased for and dedicated to recycling. State agencies such as DEQ and the Department of Economic Development should work to bring industries that use recycled materials to Oregon.

Equipment such as trucks which collect recyclable materials do not qualify for any state investment tax credits. We concur with the Biomass Task Force that an incentive for such equipment would encourage the development of resource recycling in Oregon.

Recommendation 74 - Adopt legislation establishing a Geothermal Development Fund to be administered by ODOE and used for cost-sharing of pioneer direct-use projects.

The State receives revenues from federal geothermal energy leases. Oregon will also earn royalties when geothermal projects on federal lands begin producing energy. The Commission recommends that these funds be dedicated to and re-invested in publicly-owned geothermal projects. Initially, the Commission believes that municipalities need assistance with initial capital investments for heating districts.

Recommendation 75 - Establish a 20 percent state income tax credit for geothermal end-use industries which establish operations in geothermal areas of the state.

Most of Oregon's best geothermal areas are sparsely-populated and under-industrialized eastern portions of the state. We recommend that geothermal end-use industries be encouraged to locate in areas where these resources can and will be used by providing an additional 20 percent tax credit.

6. Consumer Protection

Most renewable resource markets are new. Faulty products, fraudulent advertising and poor workmanship can dampen consumer and lender confidence and stifle the market by causing a consumer "backlash." The problem is particularly acute when state incentives or mandatory measures encourage or require consumer investments beyond those which natural market forces could induce. There is a particular need for product quality control and consumer protection for small-scale, dispersed technologies. At the same time, consumer protection standards must not restrict new technology, discourage innovation, or permit market monopolization. Proper installation is essential for effective solar and wind energy systems. To help assure adequate consumer protection, the Commission is making recommendations to assure that both the quality of the equipment and the installation will provide the expected energy savings.

Recommendation 76 - Provide consumer guidance through the ODOE based on a quality and performance review of installed systems. ODOE should monitor the testing of renewable resource equipment at accredited testing facilities and determine if product testing should be a tax credit eligibility requirement.

The Commission considered but did not adopt a recommendation to require testing of products in order to qualify for state tax credits. Some of the Commission members believe this requirement is probably inevitable, but the Commission as a whole is not convinced it is needed now. Solar equipment testing concentrates on individual system components whereas the performance of solar depends on the whole system -- collectors, piping, controls and tank. Some testing facilities are beginning to assess durability. Test results will provide useful information to consumers.

Oregon's tax credit and low-interest loan programs have helped finance hundreds of installed systems. We recommend that these systems be reviewed to develop performance information that would help future consumers, and to determine if product testing should be a tax credit eligibility requirement.

Recommendation 77 - Require commercially-installed solar and wind systems to be installed by a certified solar or wind technician in order to be eligible for the state tax credit program.

This recommendation requires a licensing or certification program. The Commission believes that this program would provide an important method for documenting installer competency and assuring quality workmanship in installation. Although the skills needed for solar and wind installations are not difficult to learn, they are significantly different from skills required in ordinary construction.

7. Research

The Commission has concluded that the technology is available to capture useful energy from all the renewable resources. The more important questions are costs and long-term reliability of available equipment.

Newer technologies include binary geothermal electric generation facilities, photoelectric cells for solar electric production, heat pump water heaters, wind generators, and alcohol production from cellulose materials. Because of rapid product improvements in these newer technologies there is a lack of information on their costs and durability.

Although costly, further refinement of emerging technologies, such as photovoltaics, benefits wide geographic areas. The Commission recommends that in general, funding for technology development be left to federal and private funding sources. The State can and should, however, take action to speed the use of these technologies as they become commercially available. Resource knowledge is needed to focus State programs and product marketing on those areas where action can have the most impact. Demonstrations will promote public acceptance and understanding of new products. Market studies and feasibility studies will produce information on costs and site-specific development. Early environment review will facilitate development where resource discoveries are made. Analyses of weather conditions, wood species, or agricultural crops will develop data on the performance and desirability of different energy options.

Funding for the next four research projects (Recommendations 78 through 81) is included in Table 5 with demonstration projects (Recommendation 64).

Recommendation 78 - Fund environmental baseline studies of areas having a potential for geothermal development.

Data on the environmental quality of areas with geothermal potential should be collected by the State before geothermal exploration begins.

This information is needed to reduce the time necessary to perform environmental reviews that must be conducted after a geothermal discovery and before production commences. Environmental baseline information can expedite early development if the data show that development would not alter environmental conditions.

Recommendation 79 - Fund a market study of wind energy applications, economics, and incentives. This would include a detailed study of wind energy users and their responsiveness to incentives.

Oregon needs to identify its most promising wind power sites, quantify the impact of incentives on resource development, and identify other state programs that may be needed. The Commission believes this study would focus state wind programs and incentives where they are most effective, and would prepare the state for the availability of commercial wind generators.

Recommendation 80 - Fund cost-shared feasibility studies for representative model projects using forest and agricultural residues.

Such studies are needed to demonstrate the economics and engineering of solid fuel applications for on-site commercial, light industrial, and farm purposes. Because of high capital costs, solid fuels have not been economically used for light-industrial applications. Now, higher costs of oil and gas combined with federal and state tax credits have changed the economics of these systems. The feasibility studies will provide this new information to potential users.

Recommendation 81 - Fund OSU's Agricultural Experiment Station to research fermentation technology, evaluate alternate crops, conduct an economic analysis of Oregon-specific alcohol production and analyze the quality of by-product materials as animal feed.

There is a high level of interest in Oregon in the commercial production of alcohol from cellulosic sources. Oregon has a large volume of cellulose (wood residues, solid waste, grass straw) and a relatively small volume of grains and corn. To date, cellulose has been used on a laboratory scale for alcohol production. Efforts are needed to determine if this technology is commercially viable in Oregon.

Further, information should be developed to assess the role alcohol can play in Oregon's energy future. This includes research to identify the best alcohol crops based on equivalent alcohol production per acre, the feed qualities of alcohol by-products, and an evaluation of distillation equipment. Information obtained from this research would be distributed through the Alcohol Fuels Clearinghouse at EOSC and through the Cooperative Extension Service. This project is important if Oregon is to make alcohol farm fuels a reality.

Recommendation 82 - Research methane recovery from Oregon landfills.

Methane is not recovered for use from Oregon landfills although passive recovery systems are in place at many sites to prevent explosions. Methane is recovered for use in landfills in California and elsewhere and recovery of usable methane from some of Oregon's landfills may be possible. We recommend that the Department of Environmental Quality's solid waste section investigate that possibility.

Recommendation 83 - Continue review of improved systems for energy storage and ocean wave generation in Oregon.

Oregon's coast is one of the best areas in the United States for producing power from ocean wave motion. The availability of energy storage is extremely important for the availability of reliable power produced from sun, water, wind, and other energy sources which vary by day and season. Both technologies are experiencing rapid advancement. They are important to energy development in Oregon and should be followed by the ODOE.

#### 8. Utility Renewable Resource Programs

Historically, the role of the Pacific Northwest utilities has been to distribute hydroelectric energy or natural gas to meet customer demand. In response to Oregon's increasing energy needs, electric utilities have also become energy producers. Several utilities are taking a lead in developing renewable resource programs.

Oregon's utilities have evolved as Oregon's needs have evolved. Increasingly, utilities are becoming energy service companies which strive to meet consumers' energy needs through a variety of resources including conventional plants, conservation, solar, and power purchased from others. The Commission believes this trend is both desirable and inevitable.

In the future, as in the past, the role of the utilities in developing renewable resources will be an important one. Storage and back-up systems are available through the existing utility network. These systems improve the reliability and cost-effectiveness of many renewable resource projects. Utilities provide a transmission network capable of balancing energy excesses and deficiencies throughout the region. This allows utilities or private business to develop energy from site-specific renewable resources in remote regions for use in densely populated areas. Energy developed at a home, business, or industrial site can be delivered to markets.

Utilities are in a position to collect and devote large amounts of capital to renewable resource projects. The value of a homeowner or industry reducing electric demand through installation of an on-site renewable resource option may be greater to the utility and other ratepayers than to that individual or business. That is why it is often cost-effective for utilities to sponsor incentives for the development of non-utility on-site energy resources.



The Commission believes that all cost-effective renewable resource and conservation programs should be implemented by the utilities before they build new conventional generation facilities. That policy can be implemented by the Energy Planning Body, the Public Utility Commissioner and the Legislature.

The Commission makes the following recommendations to assure that public power systems are not penalized for developing renewable resource options. The recommendations provide further incentives and a clear direction for public power system and IOU renewable resource efforts.

Recommendation 84 - Request the Oregon Legislature to memorialize Congress and BPA to guarantee that the development of renewable energy resources by a public power system in Oregon will not reduce that system's allotment of low-cost federal power.

Public power systems serve about 22 percent of Oregon's rural and domestic customers. Allocation formulas being proposed by BPA are intended to assure that public power systems will not be penalized for developing higher cost energy from renewable resources or conservation. However, there is no assurance that the final allocation formulas adopted will achieve that end.

Public power systems which reduce loads through conservation or development of locally-available power sources may lose some of their low-cost federal hydropower as a result of allocation formulas that BPA ultimately might adopt. The development of on-site generation sources are often more costly and less reliable than the federal hydropower that they might displace. The Commission believes that Oregonians who have taken action to meet projected energy deficits should not be penalized for those actions.

Recommendation 85 - Adopt legislation to allow the cost of construction for renewable resource projects to flow immediately into the utility rate base.

The Commission recognizes that this will require changing the voter-approved law which prohibits the inclusion of construction work in progress (CWIP) in the utility rate base. We believe that voters intended this prohibition to apply to large conventional facilities and not to utility investments in renewable resource projects.

Because of the relatively short lead time for the construction of most renewable resource projects, we do not believe that allowing CWIP in the ratebase will in itself be a significant inducement for utility investments in renewable resources. It would be, however, a demonstration of Oregon's commitment to the development of conservation and renewable resources.

Recommendation 86 - Adopt legislation delaying the assessment of ad valorem property taxes on utility renewable resource projects until energy from the project comes on-line.

Oregon law now exempts such facilities from property taxes completely unless they are owned by a utility. If taxes on utility projects are delayed until power comes on-line, revenue earned by the project will help pay property taxes. This recommendation would give utilities equal advantage with other energy producers.

Recommendation 87 - Encourage the utilities, through the PUC, to conduct more state-related renewable resource demonstration and resource assessment studies. We believe that the cost of these actions should be allowed to be passed through to the utility's ratepayers as an expense. In addition, the PUC should review the cost of generation from on-line renewable resource projects and allow unanticipated cost variances for these projects to flow rapidly into the ratebase.

Utilities can and do play an important role in research and development. Utilities in Oregon are national leaders in their efforts to develop geothermal, wind, and biomass resources. The issue raised by this recommendation is not whether utilities can do research and development projects financed as an expense, but whether they are spending enough. Many of Oregon's utilities have the expertise and ability to accelerate research, development, demonstration, and implementation of Oregon's renewable resource options. Most also have excellent access to private research sponsored elsewhere.

Utilities currently pass through many development costs to their ratepayers. The level of these expenditures and their relevance to increased energy supplies from renewable resources in Oregon should be reviewed. Utilities should accelerate their effort to develop Oregon's indigenous resources whenever and wherever they become cost-effective.

Many of the resources which utilities are being asked to develop are new. If a utility installs a wind generator and later discovers that the best available information on resource availability or equipment reliability was inaccurate, the utility should be allowed to make appropriate adjustments to the cost of power to consumers.

## VIII. PRIORITIES, ENERGY SAVINGS AND FINANCING

### A. Priorities

Recommendations made by the Commission are interdependent. Probably no single recommendation can be fully effective unless other related recommendations are also adopted. Commission projections of the potential of renewable resources are based on the entire complex of programs. The Commission therefore urges that adoption of its total program be given serious consideration.

However, the Commission, recognizing the possibility that only portions of the system may be adopted, felt an obligation to offer guidance in establishing priority rankings for the various recommendations. At two separate work sessions, and by two different processes, the Commission reviewed its recommendations to establish some priority order.

The Commission is in unanimous agreement on its highest priority. The establishment of an ongoing State energy planning body is the Commission's most important recommendation. Furthermore, the Commission believes that to do its job effectively, the planning body must have adequate staff. Thus, Recommendation 2, staffing the planning body, is also of top priority.

The Commission chose six criteria by which it ranked the remaining recommendations. This ranking reflects the Commission's best judgment on how effectively the recommendations will meet the six criteria.

- Does the recommended program provide near-term energy?
- Is it cost-effective?
- Does the program have significant energy potential?
- Does it supply needed information or education?
- Does it remove an unnecessary institutional constraint?
- Must the program be started now to avoid losing an important opportunity?

The Commission found ranking its recommendations to be a difficult task, and acknowledges that the ranking process was imperfect and subjective. Hence, the order in which recommendations are presented here is a rough guideline. Some recommendations were considered by category. Other recommendations with budget impacts were reviewed individually.

The recommendations which address institutional constraints that impede renewable energy resource development do not, in most cases, cost money. The Commission urges that all recommendations addressing institutional constraints be adopted (Recommendations 15, 16, 28, 34-54, 84).

Recommendations which were ranked next include various education, institutional and incentive recommendations which will encourage renewable resources. These include:

- Recommendation 44 - Development of geothermal heating district reservoir management plans.
- Recommendation 59 - Strengthen ODOE's programs to assure independent and objective statewide information.
- Recommendation 85 - Allow expenses for utility renewable resource projects to flow immediately into the rate base.
- Recommendation 58 - Support resource centers at four higher education centers.
- Recommendation 67 - Extend tax credits to groundwater heat pumps.
- Recommendation 17 - Establish energy codes section in DOC.
- Recommendation 19 - Insure that energy code requirements are enforced.
- Recommendation 24 - Establish energy efficiency standards for IDRb eligibility, and extend IDRb's to conservation and renewable energy projects.
- Recommendation 30 - Adopt maximum lighting standards for existing commercial buildings.
- Recommendation 47 - Adequately staff DWR and Fish and Wildlife to delineate water power licensing requirements.
- Recommendations 72 - Extend the eligibility for wood-fired facilities under DEQ's tax credit.
- Recommendation 25 - Extend the sunset and eligibility for ODOE's tax credit for business and industry.

All recommendations in the report have the support of the majority of the Commission. The ones discussed above have the broader support of the Commission. The Commission chose not to rank every recommendation. We are satisfied that public debate through the legislative process will help identify the relative importance of the various elements of the Commission's program.

#### B. Energy Savings

The Commission's program includes resources which produce energy as well as resources which reduce requirements for conventional energy. The results of many of the recommendations in the program cannot easily be quantified. For example, few would question that better

The Commission believes that programs for information and education are particularly timely and an appropriate role for State government. No single concept in the Commission's draft report received more support in the public hearings. The Commission's recommendations that ODOE coordinate state information and education programs (Recommendation 57) and that the Energy Extension Service (Recommendation 13) be expanded are two high priorities.

Resource assessment must be done now if renewable energy systems are to come on-line as needed. Recommendation 55, which describes resource assessment for biomass, wind, hydro, and geothermal, is a high priority.

Programs which encourage residential conservation have the potential of rapidly reducing energy requirements. The Commission chose several of these recommendations for high priority attention. These are:

- Recommendation 3            Require, through the PUC, that all regulated utilities offer cost-effective incentives for conservation and weatherization.
  - Recommendation 5 -        Amend the Oregon Constitution to permit public power systems to make conservation loans.
  - Recommendation 6 -        Raise the interest ceilings for state-subsidized low-interest weatherization loans.
  - Recommendation 8 -        Increase the weatherization tax credit from \$125 to \$500.
- Programs to encourage conservation in industry are more difficult to quantify than residential programs. But, potentially they could save more energy. The Commission selected three of these recommendations for high priority consideration.
- Recommendation 27 -        Expand ODOE's Energy Conservation Clearinghouse to provide financial information and corporate energy management techniques.
  - Recommendation 32 -        Implement a corporate-style energy management program for State buildings.
  - Recommendation 23 -        Establish a loan fund to finance conservation projects which cost less than \$500,000 in the commercial/industrial sector.

Recommendations which were ranked next include various education, institutional and incentive recommendations which will encourage renewable resources. These include:

- Recommendation 44 -        Development of geothermal heating district reservoir management plans.
- Recommendation 59 -        Strengthen ODOE's programs to assure independent and objective statewide information.
- Recommendation 85 -        Allow expenses for utility renewable resource projects to flow immediately into the rate base.
- Recommendation 58 -        Support resource centers at four higher education centers.
- Recommendation 67 -        Extend tax credits to groundwater heat pumps.
- Recommendation 17 -        Establish energy codes section in DOC.
- Recommendation 19 -        Insure that energy code requirements are enforced.
- Recommendation 24 -        Establish energy efficiency standards for IDR eligibility, and extend IDRBs to conservation and renewable energy projects.
- Recommendation 30 -        Adopt maximum lighting standards for existing commercial buildings.
- Recommendation 47 -        Adequately staff DWR and Fish and Wildlife to delineate water power licensing requirements.
- Recommendations 72 -        Extend the eligibility for wood-fired facilities under DEQ's tax credit.
- Recommendation 25 -        Extend the sunset and eligibility for ODOE's tax credit for business and industry.

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B. Energy Savings

The Commission's program includes resources which produce energy as well as resources which reduce requirements for conventional energy. The results of many of the recommendations in the program cannot easily be quantified. For example, few would question that better

geothermal resource assessment data are required before maximum new geothermal development can take place. The recommendation for the assessment, however, does not directly result in the 600 average MW of geothermal electric and the 46 trillion BTU of geothermal direct heat that the task force identified as resource potential.

Table 2 from Section VI is here reproduced because the energy production and savings listed in Table 2 are not, for the most part, attributable to any one recommendation. These resources will be installed when factors such as economics, the institutional regulatory framework, resource data, and public acceptance form the right climate for the private sector to act. The Commission's program is designed to help create that climate.

Other Commission recommendations effect a measurable energy savings which can be directly attributed to the program. Table 4 below shows energy savings from these recommendations. This table must be read with caution. First, it shows energy savings only for the year 2000. Many of these recommendations will take effect immediately and will accumulate energy savings each year between now and 2000. Second, the savings shown are those which can be directly attributed to a recommendation. For example, the energy savings shown for Recommendation 8, residential heating system retrofit, do not represent the total energy savings for investments of this type. They are only the additional savings motivated by the proposed tax credit.

Table 2  
(Reproduced from page 27)

Theoretical Cumulative Development Schedule For Renewable Resource  
Electrical Generation and Thermal Energy<sup>1</sup>

<u>Electric Power</u>	<u>Average Megawatts (av MW)<sup>2</sup></u>			
	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>
Wind <sup>3</sup>	5	110	267	423
Geothermal	38	225	412	600
Hydro	102	205	307	410
Biomass	160	405	405	405
Displaceable MW (Conservation/Solar) <sup>4</sup>	468	935	1402	1870
<b>TOTAL</b>	<b>773</b>	<b>1880</b>	<b>2793</b>	<b>37085</b>

<u>Thermal</u>	<u>Trillion Btu per Year<sup>2</sup></u>			
	<u>1985</u>	<u>1990</u>	<u>1995</u>	<u>2000</u>
Conservation/Solar <sup>6</sup>	20	40	60	80
Geothermal <sup>7</sup>	6	33	43	46
Biomass	51	77	77	77
<b>TOTAL</b>	<b>77</b>	<b>149</b>	<b>180</b>	<b>203</b>

<u>Alcohol Fuels</u>	<u>Million Gallons per Year</u>	
		<u>2000</u>
Ethanol		20
Methanol		50

1. See individual task force reports for assumptions used in making these estimates and development schedule. The development schedule for hydro and solar/conservation is assumed constant for 1980-2000.
2. For conversion to common units: 1 trillion Btu = 33.4 av MW.
3. Assumes 30 percent capacity factor. The Wind Task Force Report used a 40 percent capacity factor.
4. Identified by the Solar/Conservation Task Force as electrical demand, such as electric space and water heating and industrial electric motors, that could be displaced by a combination of conservation and direct use solar measures. Does not include electricity that could be generated by solar.
5. Does not include 884 av MW estimated from the Solar/Conservation Task Force as the 1980-2000 potential for photovoltaics.
6. Identified by the Solar/Conservation Task Force as the energy from a combination of conservation and solar measures that could displace the need for thermal energy produced from natural gas and oil.
7. Some of this geothermal direct-use energy may displace the need for electric heating as well as the thermal energy produced from natural gas and oil.

Table 4  
Energy Savings Directly Attributed to Selected  
Commission Programs

<u>Recommendation No.</u>	<u>Program</u>	<u>Energy Savings<sup>1</sup> in 2000 (Trillion BTU/yr)</u>
15-21	Revise Codes for New Residences	7 - 10
23	Loan Program for Commercial and Industry Sectors	5 - 8
24	Revise Industrial Development Revenue Bond (IDRB) Eligibility Standards	2 - 6
10	State Bond Fund Residential Loan Program for Oil-heat Customers (1983-2000)	2 - 3
15-20, 31	Commercial Code Changes	1 - 3
30	Maximum Lighting Power Standards for Existing Buildings	.5 - 1.5
65	State-Subsidized Low-Interest Loan Program (SB 517)	.5 - 1.5
66	Renewables Tax Credit Changes	.7 - 1.1
8	Extension of Weatherization Credit to \$500	.4 - .6
	Existing Weatherization Tax Credits	.3 - .55
71	Heat Recovery Incinerator	.4
10	Interim Residential Weatherization Program (1981-83)	.2 - .3
9	Residential Heating System Retrofit Tax Credit	.1 - .25

33	Local Government and Public Care Institution Conservation and Renewable Resource Measures and State Building Retrofit	.1 - .2
70	Mandatory Solar Swimming Pool Heaters	.08 - .18

FOOTNOTES

1. This value does not reflect the benefits of a faster rate of adoption.

C. Financing

Oregonians will spend approximately \$3 billion for electricity, natural gas, and petroleum in 1980. This is exclusive of any investment to create any new energy source. Financing aggressive new programs to conserve energy or develop renewable resources will require a substantial financial commitment.

The following overview of the major sources of financing the Commission considered illustrates the nature and limitations of these different sources. The Commission has suggested the use of specific financing options for some of the recommendations. These suggestions shown are on Table 5, at the end of this section. Other recommendations are shown financed by either an energy use assessment or by the General Fund. The Commission has prepared two possible plans for financing these programs.

State energy programs are now financed by six general sources: (1) the State's General Fund (through appropriations or revenue foregone), (2) use of the State's bonding authority, (3) federal funds, (4) assessments on energy suppliers, (5) user fees and (6) the utility rate base. Financing energy programs at the level recommended by the Commission with complete reliance on any one source would be undesirable and probably impossible.

1. State General Fund

General Fund revenues primarily are derived from personal income and corporate excise taxes. General Fund revenues may be appropriated by the Legislature for State programs, including grants to local jurisdictions or individuals. State tax credit programs for renewable energy and weatherization actions by homeowners are currently financed through General Fund revenue foregone.

The Commission recognizes that all of its recommendations cannot be funded with the General Fund because of competing interests for other worthy programs. We feel, however, that the General Fund is the most equitable way to finance programs which benefit all Oregonians.

2. Bonding

Bonding is not a source of revenue. Selling bonds provides "front end" money which must be repaid with interest by borrowers. Thus, it can help overcome one of the principle constraints to renewable resources -- high front-end costs. Money for state programs can be raised by selling general obligation or revenue bonds.

General obligation bonds can finance loans or grants. They are backed by the State's credit and the commitment to use tax revenues to retire bonded indebtedness, if loan repayments are insufficient or if bond revenue is used for grants. Both constitutional and statutory authority are required to issue general obligation bonds.

The sale of revenue bonds is a standard technique used to amortize major public investments. Revenue bonds are backed solely by loan repayments. Since the State's credit is not involved, constitutional authority is not required to issue revenue bonds, but legislative action is required.

Bonds issued by government are exempt from state and federal taxes if the proceeds primarily are used for projects by governmental or non-profit organizations.

Bonding through the Department of Veterans' Affairs (DVA) is used to finance the DVA's weatherization program. Voter approval of Ballot Measure 3 authorized increasing the State's bonded indebtedness up to one-half of one percent of the true cash value of all taxable property in the state. These bonds will finance long-term, low-interest secured loans for small-scale energy projects. According to 1980 assessments, the State can issue up to about \$300 million in general obligation bonds for this program. However, these bonds would not finance conservation or many other programs currently being considered by the Commission.

The Commission has suggested new bonding for programs which have an equitable means of repaying loans.

3. Federal Funds

Financing elements of a State energy program with federal funds requires careful scrutiny. Federal funds have strings attached in recognition of federal goals which may not coincide with State goals. Usually the ways in which federal funds can be spent are restricted. For example, federal energy conservation funds may not be used for capital outlay (the Schools and Hospitals Program is a recent exception). And, Congress' attempt to balance the national budget could result in diminished federal energy funds.

The Commission has suggested federal funding for only those programs which historically have received federal funds or which can be incorporated in an existing federally-funded state program.

4. User Fees

User fees, such as building permit fees, have been used to finance specific, related energy conservation actions. For example, insulation inspections have been financed in part by building permit fees. Clearly, however, user fees are limited in scope and higher fees are unpopular.

Fees are the suggested funding source for recommendations which affect a current fee-collecting program.

5. Use of Utility Rate Base

Utility rates are now being used to finance energy conservation programs. All utilities must provide energy audits, financed through rates, to residential space heat customers. IOUs in Oregon have gone beyond the legal requirements and provide no-interest, deferred-payment weatherization loans to their space heat customers. The amount of the loan is placed in the rate base until it is repaid when the house is sold.

These same types of programs are suggested for continued finance through the utility rate base.

6. Energy Use Assessment

ODOE is funded in part by an energy use assessment (\$1.2 million in 1979) on energy suppliers in Oregon. All electric (IOUs and public power systems) and gas utilities and certain petroleum product wholesalers pay the assessment on an equivalent Btu basis. Suppliers pass this tax on to consumers.

Energy suppliers dislike the current assessment and are likely to actively oppose a larger one. Suppliers want assurance that benefits to themselves and their customers are commensurate with the assessment they pay.

Such an assessment may offer the most equitable means to pay for major new conservation and renewable resource energy programs that directly benefit energy consumers. To the extent that an energy supplier is already assessing its customers for the cost of energy conservation or renewable resource programs, these expenses should be deductible from any energy use assessment that would otherwise apply.

Consumers will pay for new energy and replacement energy through higher prices in one form or another. An energy assessment, however, offers a return. Energy assessment revenue could be returned to consumers in the form of programs to promote cost-effective conservation and renewable energy resources, and to speed their deployment. Consumers would benefit from lower long-term energy costs and increased supply reliability.

For illustration, an energy assessment (which exempts gasoline and diesel fuel) to raise \$100 million annually would increase consumer energy prices about 5 percent. This would increase the average residential consumer's annual energy bill \$30 to \$40. The typical consumer would pay one-tenth of one cent more per kilowatt hour for electricity, 4.6 cents more per gallon for all petroleum products (except gasoline and diesel fuel), and 3.2 cents more per therm for natural gas. An assessment this large would not be needed even if all of the Commission's programs (except loan programs) were to be financed with an energy use assessment.

How much the energy use assessment should be increased will depend upon the magnitude of the overall program as determined by the Governor and the Legislature, and the extent to which General Fund revenue is available and appropriate. There is also a question of whether energy suppliers should be taxed equally, or whether certain suppliers should bear a heavier share, depending on the use to which the money is put and who benefits.

Appendix A summarizes all of the Commission's recommendations with their associated costs to State Government.



IX. SUMMARY: A CALL TO ACTION

We believe all the programs recommended in this report are worth funding. The total cost to the State, over \$66 million, is large, and we recognize that funding these programs will compete with other priority needs of the State. We have attempted to provide guidance by identifying what we judged to be priorities.

Again, we urge that the energy planning body and all institutional barriers with relatively low costs be implemented at once, and that close attention be given to other high priority recommendations.

The major cost to the State of the overall package is to fund the proposed tax credits, \$59.3 million. Because of the cost of the credits, we expect that they will receive particularly close scrutiny. Some of these credits, however, have been identified by the Commission as priorities. Tax incentives are expected to have a more immediate effect than most of the other programs in stimulating homeowners and businesses to invest in conservation and renewable energy sources.

The remainder of the programs cost about \$7 million. Most of these are for planning, resource assessment, educational programs, codes and other institutional measures. These programs lay the foundation for future energy savings, which we believe will be significant.

We believe these programs are worth the investment. We have reviewed the projected demand for energy in Oregon, and the role that conservation and renewables potentially could play. Some of the Commission members remain skeptical that we can achieve all of the identified potential. But none of the Commission members doubt that renewables can play a large role in our energy future.

There are numerous constraints to the development of conservation and renewable resources, and the potential certainly will not be achieved unless we begin to undertake strong measures now. We have presented programs we believe are now appropriate. These and other ongoing programs will need to be evaluated and modified to ensure that the optimal level of conservation and renewables is identified and attained.

The total biennial cost of the recommended programs is about two percent of the \$3 billion Oregonians will spend for energy in 1980 alone. Annualizing this, we are asking the State of Oregon to spend of its own funds an amount equivalent to one percent of our current annual energy bill.

For this investment we are gaining more control over our own future. Energy prices will continue to increase. We can manage those increases or be controlled by them. The latter is no choice at all.

The benefits of these conservation and renewable energy programs go beyond merely saving energy.

- By acting now we will ease the inevitable transition away from scarce fossil fuels, whether that be in the next 20, 50, or 100 years.
- Dollars will stay within the state rather than being exported for fuel purchases. This should enhance economic activity, create jobs and help to build a larger tax base in Oregon.
- Renewables will diversify and enhance the security of the state's energy supplies, and relieve dependence on sources of energy and events beyond our control.

We can continue to set a model of wise energy planning for other states and the federal government, as Oregon and its utilities have already done with their audit and loan programs.

Tradeoffs must be made. We know there are many other necessary and worthwhile State programs. But we believe that energy is primary to the state's economy, and that these recommended programs will help strengthen and stabilize it, making future tradeoffs and sacrifices less severe. To ease the burden of current or future tradeoffs, we ask that serious consideration be given to all the recommended programs and the financing options. We ask Oregonians to weigh the required investment against the possible long-term benefits to the state's economy.