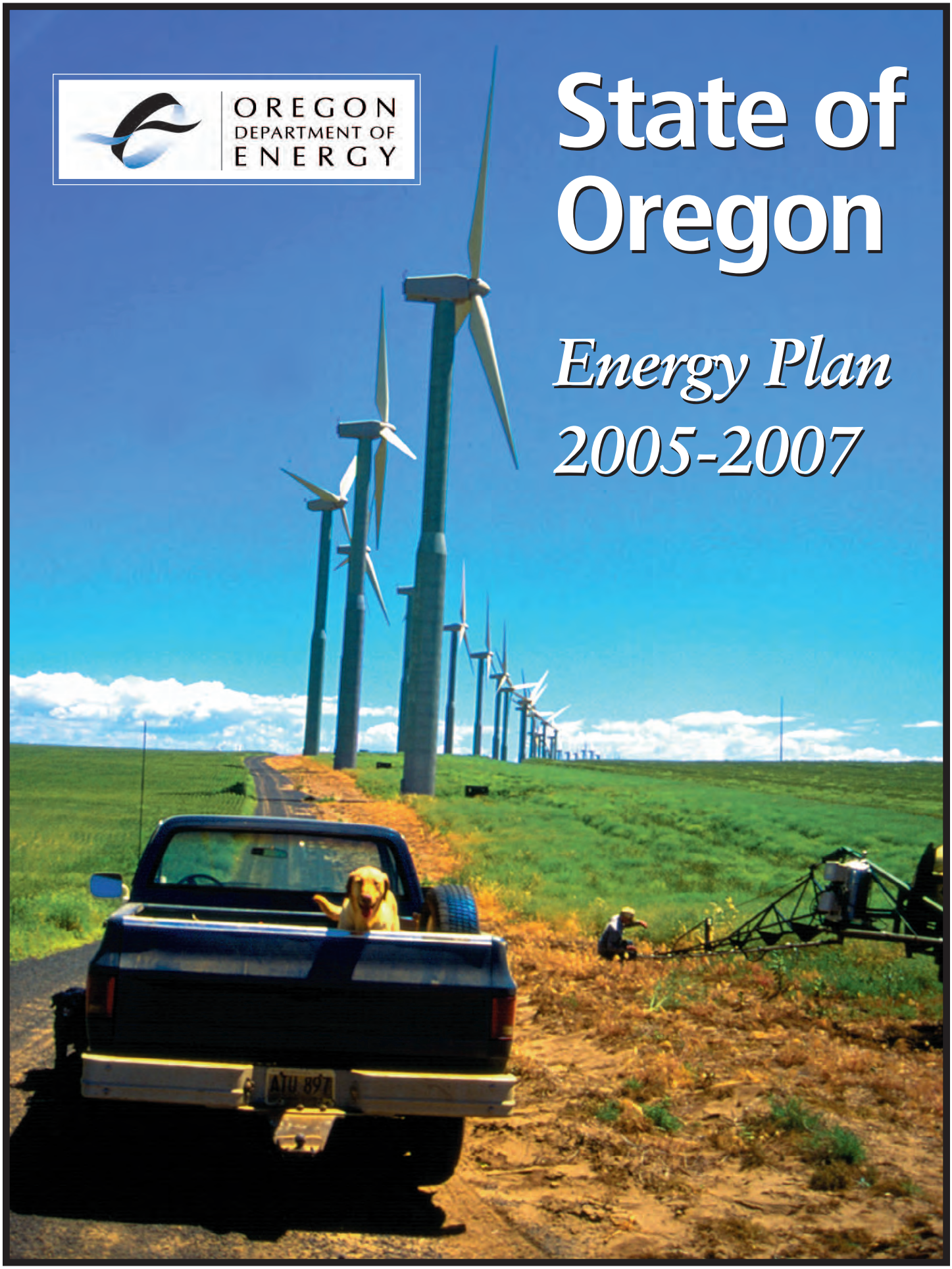

OREGON
DEPARTMENT OF
ENERGY
State of
Oregon
Energy Plan
2005-2007

From the Director

An adequate, affordable supply of clean energy is critical for Oregon's continued economic recovery. This Biennial Energy Plan outlines actions the Oregon Department of Energy is taking to help the State achieve this goal. Our programs encourage Oregonians to invest in energy efficiency and develop renewable energy.

As staff to the Energy Facility Siting Council, the Oregon Department of Energy ensures that an energy facility built in Oregon is safe and meets state environmental standards. A one-stop siting process means those facilities are sited efficiently.

Security of our energy facilities has become important since 9-11. We have worked with utilities, energy suppliers, and federal, state and local officials to upgrade the security of our energy system. We also plan and prepare for supply disruptions from accidents, bad weather or terrorism.

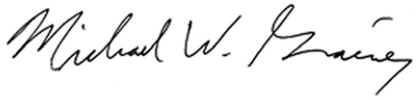
The Oregon Department of Energy works to protect Oregonians and the Columbia River from the radioactive wastes at the U.S. Department of Energy's Hanford site in Washington. We have increased our efforts to remove that threat and are seeing some results.

Energy-efficiency and renewable energy development are the foundation for Oregon's energy future. Saving energy saves money by enabling us to use less power in meeting our everyday needs. It will help our businesses operate more efficiently and more competitively. Saving energy also helps provide Oregonians with more disposable income to boost the local economy, and it benefits Oregon's environment.

Combine energy efficiency with renewable energy development and Oregon has a powerful tool to not only protect the environment, but to create new jobs and new industries. Oregon is rich in renewable resources. Investments in renewable energy will stay in Oregon, creating jobs, particularly in rural Oregon, and growing a "second crop" for farmers, ranchers and forest landowners.

Please take the time to read about energy efficiency, renewable energy, protecting the Columbia River by cleaning up the Hanford nuclear site and other efforts of the Oregon Department of Energy. This 2005-2007 Energy Plan is not only a look at past influences, but also a window into the future of energy in Oregon. I hope you find this plan helpful and informative.

Thank you,



Michael W. Grainey

BIENNIAL

Energy Plan

625 Marion Street NE, Salem, Oregon 97301

(503) 378-4040
1-800-221-8035 in Oregon
www.oregon.gov/energy

JANUARY 2005 **ODOE-003**

Biennial Energy Plan

Table of Contents

Introduction

Energy powers our way of life and Oregonians spend about $7.6 billion a year for energy in all its forms.

Oregon's economy is driven by affordable, reliable energy, but energy prices and availability can fluctuate. One such event was the gasoline shortage of 1973-1974, which led to the creation of the Oregon Department of Energy (ODOE) in 1975.

Energy use and production also have a significant impact on the environment. ODOE plays an important role in the State's efforts to provide a stable energy supply while promoting the environmental benefits of developing renewable energy and improving energy efficiency.

To help Oregonians meet future energy challenges and current energy needs, ODOE works with businesses and trade associations, homeowners and renters, schools and governments. The message is spread through personal contact, the agency Web site, conferences and trade shows.

Another avenue of outreach is this Biennial Energy Plan. The Plan identifies trends in energy supply and use, conservation and renewable energy, nuclear safety, and the maintenance of a healthy economy.

This 2005-2007 Plan begins by explaining the Oregon Department of Energy's role in the state's economic recovery. Oregon is rich in the renewable resources of wind, solar, geothermal, and biomass, which can reduce price volatility and cut greenhouse gas emissions. Developing them here in Oregon, along with related research and development, and manufacturing capability, presents a substantial economic opportunity for the state.

The Plan then presents background information on the sources and uses of Oregon's energy; important energy issues for Oregon; ODOE's action plan for 2005-2007; and the state's accomplishments in conservation, new energy resources and nuclear safety.

A number of appendices accompany the plan. Of special note is the summary of various documents related to energy, including the Oregon Renewable Energy Action Plan, the Oregon Strategy for Greenhouse Gas Reductions, and the Sustainability Plan.

Energy's Role in the Economic Recovery

The beginning of the 2003-2005 Biennial Energy Plan summarized the impact of the energy crisis of 2000 and 2001. That crisis has passed, but in this plan, the discussion centers on moving Oregon out of the economic downturn. Outlined below are Oregon Department of Energy efforts to help individuals and businesses spend less on energy and turn investments into jobs.

Help in recovering from the electricity crisis came from the Energy Facility Siting Council, which since 2000 has approved site certificates for eight electric generation facilities consisting of 16 power plants. From the mid-1990s through 2000, the Council approved 12 power plants at nine sites. This, combined with the energy efficiency measures Oregonians have taken and a slower economy, has helped provide a cushion of electricity supply. In fact, the Northwest Power and Conservation Council projects a surplus of electricity at least until the end of the decade, even in a drought.

Whether electricity and other energy prices will be affordable is uncertain. Oregonians can weather price increases by improving efficiency and developing renewable energy options. The Oregon Department of Energy (ODOE) has played and will continue to play an important role in the state's economic development in the following ways.

1. Maximize energy conservation and efficiency
With the Business Energy Tax Credit and Energy Loan programs, the Oregon Department of Energy has helped businesses reduce energy use by investing in energy efficiency. This frees up dollars to be spent in ways that improve our economy. Greater use of high efficiency appliances has reduced energy use and stimulated economic activity. By the end of 2003, more than 125,000 Oregonians had used ODOE's Residential Energy Tax Credit to buy refrigerators, clothes washers, and dishwashers that meet Oregon's high standards. Governments and schools also use ODOE incentives to retrofit their buildings and take advantage of the agency's technical advice to save energy. Building commissioning is promoted as standard practice in new buildings to ensure energy-saving performance over the decades.

2. Support a stable energy supply for Oregon
ODOE operates a streamlined siting process for major energy facilities. In addition to issuing site certificates for power plants and a 142-mile natural gas pipeline, utilities have been encouraged to invest in renewable energy. ODOE will continue to promote a diversity of renewable energy generating resources to meet 10 percent of Oregon's electricity load by 2015. Solutions to the transmission capacity bottleneck between eastern and western Oregon are also part of ongoing efforts.

3. Support renewable energy development and technology companies in Oregon
ODOE has used the Business Energy Tax Credit and the State Energy Loan Program to encourage large-scale renewable energy systems. Those incentives have enticed solar photovoltaic and manufacturers of other renewable resource equipment to consider locating in Oregon. The Oregon Department of Energy offers incentives for Oregonians to buy their solar components for use on public buildings or land as well as private sector facilities. Examples of large solar installations include Kettle Foods in Salem and the Pepsi-Cola facilities in Klamath Falls and Lakeview.

Developing the state's renewable energy resources, related manufacturing, research and development presents an economic opportunity, particularly in rural parts of the state. Renewable energy investments stay in Oregon, creating jobs and growing a "second crop" for farmers, ranchers and forest landowners.

Oregon's universities and scientists are a resource for technology and information to the benefit of Oregon's economy. The combination of scientific expertise and state incentives positions Oregon businesses to export technologies such as micro-electronics, fuel cell applications, power controllers, and renewable resource technical services.

Oregon has earned acclaim for its sustainable development and energy resource programs, leading to a demand for Oregon-based green products and services. With its many incentive programs, ODOE is in a unique position to be aware of and assist companies.

The Oregon Department of Energy has consulted with or provided incentives for smaller companies that are bringing next-generation technologies, services, or products to market. Examples include:

- Abundant Renewable Energy of Newberg with its wind turbine controller,
- PV Powered of Bend and its inverter for small renewable electric generation,
- Energy Outfitters of Grants Pass with its solar photovoltaic system package,
- Osmotek of Corvallis and its membrane technologies for evaporation,
- Beaverton's Beta Control Systems equipment that makes industrial acids re-usable, and
- GMV Industries of Arlington with its solar-powered center pivot irrigation assembly.

Central Oregon serves as an example of an efficiency and renewable energy development cluster. The nine-county central Oregon corridor possesses diverse renewable resources including solar, wind, geothermal, and biomass. The corridor can build around several dozen renewable energy-related companies manufacturing fuel cell applications, photovoltaic system inverters and other technology.

4. Promote alternative fuels to protect Oregonians from petroleum price increases
Through incentives, the Oregon Department of Energy continues to encourage alternative fuel production and fueling stations, such as SeQuential Biofuels of Eugene and Portland. Oregon's Renewable Energy Action Plan recommends that gasoline sold in Oregon should contain 2 percent ethanol by 2006.

ODOE tax credits encourage purchase of hybrid vehicles, which provide a cushion against future price increases. More than 1,000 Oregonians had taken the credit for hybrid vehicles by the end of 2003. ODOE also is providing incentives for two projects to reduce diesel truck idling. One provides electric hook-ups for long-haul trucks in the I-5 corridor and the other provides auxiliary power units for trucks idling in the Lane Regional Air Pollution Authority region. This will save truckers fuel and reduce emissions.

5. Clean up the Hanford site
ODOE will work to ensure sufficient cleanup and proper management of radioactive waste to protect the Columbia River. Hanford cleanup is essential to preserve Oregon agriculture and fisheries. The Columbia River is vital to irrigation and the region's inland commerce. The Columbia fishery is an important economic and cultural resource and the river is a valuable recreational asset. Cleaning up Hanford is a $2 billion a year business just 30 to 50 miles across the Oregon border. ODOE will continue to encourage Hanford officials and contractors to actively solicit business in Oregon.

Oregon's Energy Demand and Supply

Overview

Trends Since 1990

Oregonians spent $7.6 billion on energy in 2000, the last year for which figures are available. This does not include energy used to generate power or to transport natural gas in pipelines. Total energy use was 773 trillion British Thermal Units (Btu–a measure of energy consumption), up 15 percent from 1990. However, the per capita energy use in Oregon fell by 4 percent between 1990 and 2000, primarily because ocean vessels purchased less fuel in Oregon and factories decreased their use of wood waste.

The use of taxed gasoline increased by 13 percent between 1990 and 2003, while per capita use declined by 4 percent. The per capita decline was largely because of the higher efficiency of new vehicles, relative to the fleet of existing vehicles. The number of miles driven per capita was about the same for both years.

Overall Energy Use

Nearly half of the energy Oregon uses is from petroleum products and is used primarily for transportation (Figure 1).

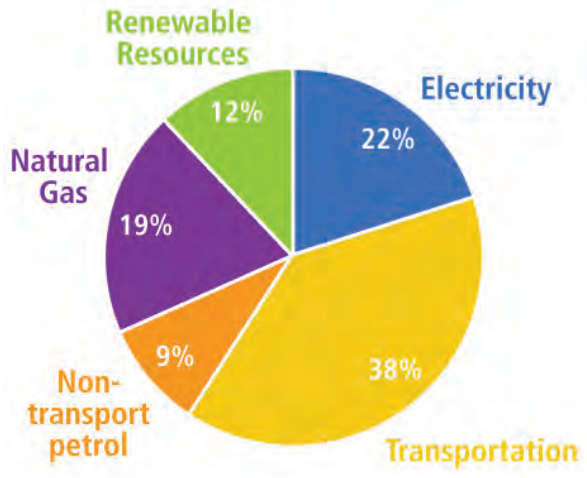


Figure 1: 2000 Oregon energy end uses
Forty-seven percent of the energy Oregon uses is from petroleum products, primarily for transportation. Direct-use renewable resources include geothermal, hogged fuel (bark, sander dust and other wood-related scrap), pulping liquor and wood burned in homes.

The Impact of Energy on the Economy

As shown in Figure 2, money spent by Oregon households, businesses and governments on energy as a percent of total Oregon personal income has changed significantly since 1970. This shows how dependent Oregon's economy is on the cost of energy.

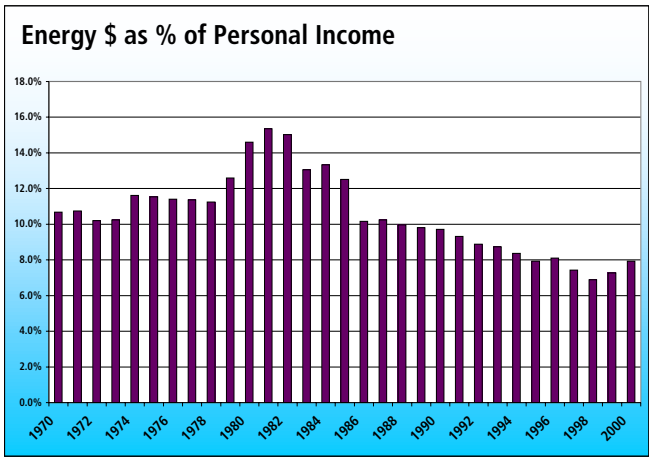


Figure 2: Energy expenditures as a percent of income.
With increased emphasis on energy conservation following the energy crises in the 1970s and 1980s, consumers were cushioned against price spikes starting in the 2000-2001 energy crisis.

The percentage declined from about 15 percent in 1981 to 10 percent in 1985. This was largely due to a drop in petroleum and natural gas prices. From 1985 to 1998, the percentage declined to about 7 percent, largely due to economic growth in less energy-intensive sectors, such as retail sales and electronics manufacturing. Since 1998, the percentage has grown due to rising energy prices. Energy use is falling, but not as fast as prices are rising.

The money Oregonians spend to import natural gas and oil is drained from the economy. In 2000, Oregon business, households and governments spent 1.2 percent of total personal income on natural gas and 3.8 percent on petroleum prod-

ucts. This does not include natural gas used for electric generation. Natural gas and oil price spikes tend to harm the Oregon economy more than the U.S. economy because Oregon imports 100 percent of its natural gas and oil compared to 15 percent and 56 percent, respectively, for the U.S. Areas of the U.S. that produce natural gas and oil see increased employment when prices spike, but Oregon does not.

Fuel Price and Use Changes — 1999 to 2003

Petroleum

From 1999 to 2003, petroleum prices for residential heating oil, on-highway diesel and regular gasoline increased 39, 25 and 30 percent, respectively (prices include taxes). Taxed gasoline use rose by 0.5 percent for this period. From 1999 to 2001, distillate sales (both highway diesel and heating oil) were down 0.1 percent.

In 2004, the combined effect of high oil and natural gas prices was especially hard on industry. Often, if one fuel rose the other did not, enabling factories to switch to a cheaper fuel. That was not possible in 2004 because they both rose.

Figure 3 shows the Oregon retail prices for regular gasoline and residential heating in dollars per gallon, without tax for 1999 through part of 2004. These prices have not been adjusted to remove the effects of general inflation.

Oregon prices have followed national trends. Regardless of U.S. crude oil production levels, Oregon retail prices will continue to be linked to world oil prices.

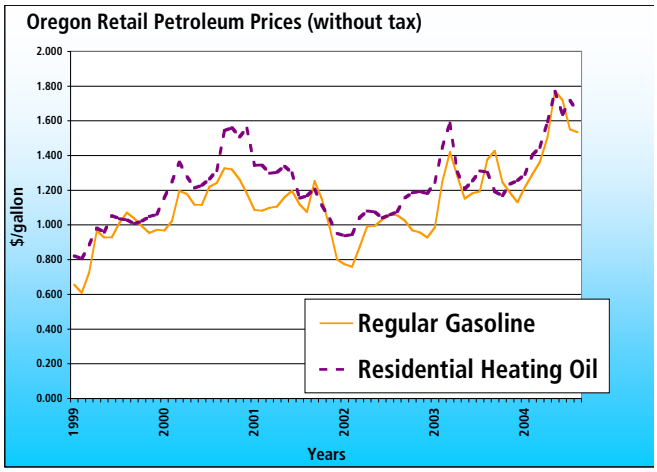


Figure 3: Oregon retail petroleum prices, without taxes included

This shows the volatility of retail gasoline and home heating oil prices.

Natural Gas

Oregon wholesale natural gas prices rose 168 percent between January 1999 and July 2004. Over the same period residential rates rose 94 percent. These prices have not been adjusted to remove the effects of general inflation. The percentage increases for commercial and industrial customers fell between the wholesale and residential price increases.

Figure 4 shows the price of wholesale gas purchased by Oregon gas utilities from January 1999 through July 2004 and average residential retail rates. While natural gas distribution and transport costs are regulated, wholesale gas costs are passed through to retail customers.

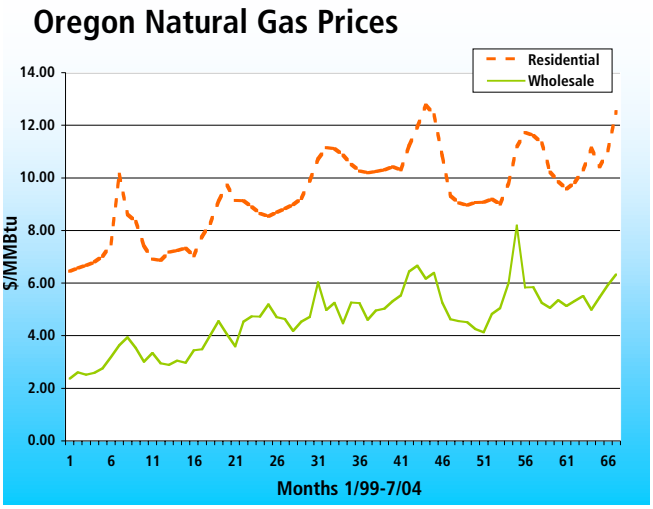


Figure 4: Oregon natural gas prices
After falling in the late 1980s, Oregon's natural gas prices spiked in 2001, declined and then rose again in 2004.

Electricity

Between 7 and 15 percent of the Oregon's electricity is generated from natural gas, depending on snow and water conditions. The share of gas-fired generation is increasing as loads grow and as most new plants are fired by natural gas. Electric utilities can reduce their exposure to fuel price spikes by developing renewable resources and buying more of their fuel in longer-term contracts. While these measures can be more expensive in the near term, the tradeoffs are part of the utility least-cost planning process.

From 1999 to 2003, retail electricity prices rose 29 percent. The increase was 23 percent for residential customers and higher for larger customers. Both investor-owned (IOUs) and consumer-owned utilities (COUs) were affected. Oregon utilities face substantially higher costs for new electricity resources compared to the costs of existing resources. For these same years, residential use fell 3 percent and combined commercial and industrial use fell 10 percent. These values do not include the closure of large aluminum smelters in Troutdale and The Dalles since 1999.

Due to higher natural gas prices, wholesale electric prices in 2004 were up sharply from 2003. This had only a modest impact on retail prices, in part, because demand growth has slowed. Oregon IOUs generate most of their own power. Oregon COUs buy most of their power from federal dams and the Columbia Generating Station (the commercial nuclear power plant at Hanford, Wash.), through the Bonneville Power Administration.

Energy Supply — Fossil Fuels

Petroleum Supply

Oregon imports 100 percent of its petroleum, and unlike other Western states, does not have refineries or internal crude oil resources. Taken together, Alaska, Arizona, California, Hawaii, Nevada, Oregon and Washington form a nearly self-contained system of petroleum production and consumption. Although the system is relatively stable, a major disruption in any part of the supply and distribution chain could create a severe and prolonged petroleum shortage.

Figure 5 maps the major sources and distribution of Oregon's petroleum products. Four refineries in the Puget Sound area of Washington provide more than 90 percent of Oregon's refined petroleum products. The Washington refineries transport their products to Oregon and Washington markets via the Olympic Pipeline and barges. The bulk of Oregon's oil enters through the Port of Portland and is distributed statewide by tanker trucks, Columbia River barge service and the Kinder Morgan pipeline, which extends to Eugene. More than 80 percent of the crude oil these refineries export to Oregon originates in the Alaska North Slope oil fields. The Trans Alaska Pipeline transports crude oil 800 miles from the oil

fields on the state's northern coast to the Valdez terminal on its southern coast. From there, barges and tankers ship the crude oil to the Washington refineries and other destinations. The Western Canada Sedimentary Basin is another significant source of crude oil for the refineries. The remaining crude, less than 5 percent, comes from the continental U.S., Mexico, Indonesia or the Middle East.

In addition to Washington, refineries in Salt Lake City and British Columbia provide nearly 10 percent of Oregon's refined petroleum products. Under normal conditions, only minor amounts arrive from California and the Pacific Rim countries of Indonesia, South Korea and Japan via tanker ships. Tanker trucks distribute these petroleum products statewide.

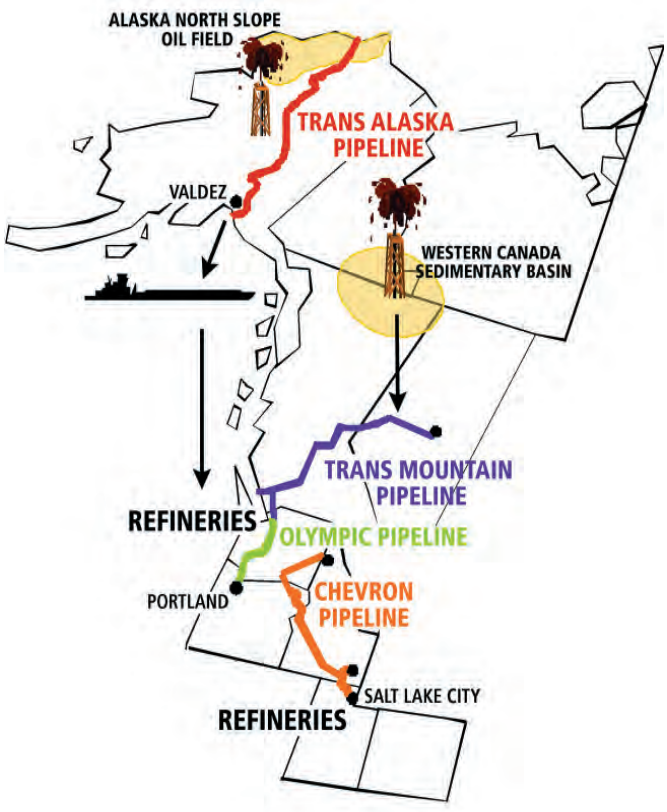


Figure 5: Sources of Oregon's petroleum.
Shows the interconnection of the source, refineries and transportation of Oregon's petroleum. The majority of the crude oil comes from Alaska.

Oregon has about 2,250 retail fueling stations, with more than 29,000 registered fuel pumps. Between 1997 and 2002, the state lost about 10 retail gasoline stations but gained approximately 6,000 retail fuel pumps. The difference between station and pump growth resulted from buyouts, remodels of retail gasoline stations, and installation of pumps at grocery and department stores.

Other Transport Fuels

Other fuels used for transportation in Oregon include ethanol, biodiesel, compressed natural gas, liquefied natural gas, liquefied petroleum gas (propane) and electricity. These alternative fuels are used in place of diesel and gasoline, although some of them are either used with, or partially derived from, petroleum products.

Federal policy directs utilities and states to adopt alternative fuels to reduce dependence on foreign petroleum or to improve air quality. Most alternative-fueled vehicles are eligible for Oregon residential and business energy tax credits and state energy loans.

Ethanol and biodiesel are the main alternatives to gasoline and diesel respectively. Ethanol is an alcohol fuel distilled primarily from corn. Biodiesel is oil, distilled primarily from soy. Both biofuels also can be produced from other types of biomass (plants and other organic matter).

Following ethanol, compressed natural gas and propane are Oregon's most common alternative fuels. However, they represent less than 0.04 percent of transport fuel use.

Hybrid (gas-electric) vehicles average 45 miles per gallon – twice that of the average passenger car. A hybrid recovers energy normally wasted when braking and uses it to power an electric motor that assists the gasoline engine. Hybrids also gain efficiency by having the gasoline engine operate at a constant optimum speed. As of October 2004,

Oregonians had registered about 4,000 hybrid vehicles, up from 800 at the end of 2002. More vehicle manufacturers are introducing hybrid models to the market.

Oregon's state fleet has about 77 hybrids, 150 com-pressed natural gas and 67 flex fuel (ethanol) vehicles, and more will be purchased. Tri-Met's MAX light rail transit system in the Portland area operates on electricity.

Petroleum Contingencies

To mitigate the effects of a petroleum emergency, the Oregon Department of Energy (ODOE) maintains the Oregon Petroleum Contingency Plan. The plan outlines alert and notification procedures as well as actions to supply gasoline and diesel fuel to the emergency services sector for vehicles, generators and onsite storage. Growing use of transportation petroleum in the West puts pressure on an already tight supply system.

The Valdez terminus of the Trans Alaska Pipeline can store up to 386 million gallons of crude oil. However, this represents, at most, one week of the pipeline's current output.

Distribution sites in the Portland area store less than one month's supply of refined petroleum products. Smaller stocks are stored at private distribution centers in Eugene, Medford, Bend, Pendleton, Coos Bay, Newport and Astoria. Local availability and retail prices are sensitive to supply, demand and delivery schedules. In the pas, distributors have occasionally limited allocations. In some cases, this forced service stations to curtail retail hours.

The Puget Sound refineries have operated above 90 percent capacity for the past decade. The refineries cannot accommodate dramatic demand increases and have no plans to increase production capacity. If refinery output decreased due to an emergency, Oregon would have to import petroleum products from distant refineries. The state could face shortages and steep cost increases.

Three of five British Columbia refineries have closed since 1996, significantly reducing additional refinery production. Five San Francisco Bay area refineries operate at capacity and have been converted to produce only products meeting California Air Resources Board standards. Increasing demand in the California market for these products makes it less likely these refineries will be able to supply the Oregon market.

The world's largest oil refinery, owned by SK Corporation in Ulsan, South Korea, could provide petroleum products using crude from Southeast Asia. Production has begun in the oil sands region of Alberta, Canada, but this will likely only replace declining crude oil supplies in North America.

Natural Gas Supply

Oregon imports 100 percent of its natural gas and receives it from British Columbia, Alberta, Wyoming, Colorado and New Mexico. Two connected interstate pipelines deliver the natural gas (Figure 6).

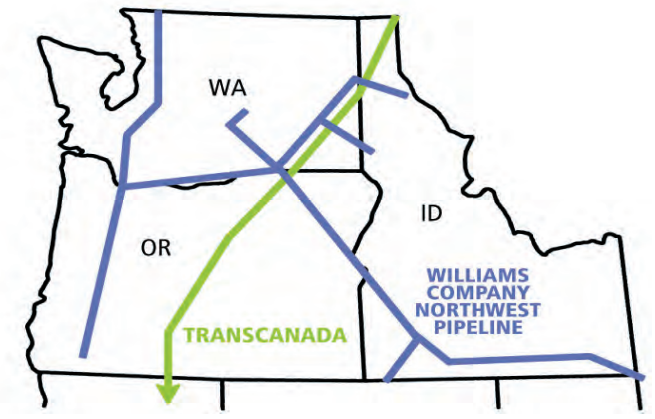


Figure 6: Pipelines serving Oregon
Two natural gas pipelines serve Oregon customers. The Williams Company pipeline and the Gas Transmission Northwest (GTN) pipeline owned by TransCanada bring product from the Rocky Mountains and Canada. Pacific Gas and Electric National Energy Group formerly owned the TransCanada line.

The Williams Company's Northwest Pipeline brings natural gas to Portland from British Columbia and the Rocky Mountain region of the U.S. British Columbia gas enters the U.S. near Sumas, Wash. and roughly follows Interstate 5. Gas from the Rockies comes into Oregon near Ontario. A lateral pipeline transports gas from Washougal, Wash. to the Portland area, the Willamette Valley and Grants Pass. Natural gas from Alberta arrives in a Gas Transmission Northwest (GTN) pipeline. It enters the U.S. near Kingsgate, Idaho, and moves through eastern Oregon, leaving the state near Malin, before traveling on to California and Nevada. A lateral line transports natural gas from Klamath Falls to Medford. The GTN pipeline is owned by TransCanada and connects with the Williams Northwest pipeline at Stanfield, Oregon.

Three natural gas utilities serve Oregon:

- Northwest Natural serves 80 percent of Oregon's retail customers, including the Willamette Valley and the coast.
- Avista Corporation serves parts of southern Oregon and La Grande.
- Cascade Natural Gas serves parts of central and eastern Oregon.

Northwest Natural receives natural gas from the Williams' pipeline. Northwest Natural owns underground gas storage facilities in Mist, Ore. and liquefied natural gas storage facilities in Newport and Portland. Northwest Natural also has contracts to use liquefied natural gas storage at Plymouth, Wash. and underground storage at Jackson Prairie, Wash.

Avista obtains natural gas from the Williams pipeline and the Williams-Grants Pass lateral as well as TransCanada's main pipeline and Medford lateral.

Cascade customers from Madras to Chemult receive natural gas from TransCanada's GTN pipeline. The Williams Northwest pipeline serves Cascade customers from Umatilla to Ontario. Cascade and Avista either own or have contracts to use natural gas storage facilities.

Several projects are underway to expand natural gas pipeline capacity in the U.S. and Canadian West. The largest of these is the Kern River Gas Transmission Company's $1.2 billion pipeline expansion designed to meet growing demand for natural gas in Utah, Nevada and California.

Although pipeline additions will likely keep pace with growing demand, U.S. domestic production may not. A drilling boom in 2001 did little to increase U.S. production. By early 2002, domestic production had returned to 2000 levels despite current high wholesale prices.

From 2001 to 2003, U.S. gas production declined almost 3 percent and Canadian imports declined by 8 percent, despite significantly higher prices. In order to make up for declining domestic production, the U.S. would have to import natural gas from abroad.

Natural gas produced overseas has to be liquefied for ocean transport. It is expensive to liquefy, transport, and regasify, and it will take time to build the tankers and production facilities. One liquefied natural gas (LNG) regasification plant is proposed for Coos Bay and three others are being discussed for Columbia and Clatsop counties. It is unlikely any of these will be ready before 2008; there will also be increasing worldwide competition for the gas.

Three possible new sources could fill the gap at wholesale prices of $4 per thousand cubic feet or less:

- Pipelines to reserves in Prudhoe Bay, Alaska and MacKenzie Delta, Canada
- Imported liquefied natural gas
- Deep offshore exploration of the Gulf of Mexico

These will require huge investments of time and money. Natural gas prices for Oregon and the

U.S. likely will remain volatile until these new sources are available.

Natural Gas Regulation

The Federal Energy Regulatory Commission regulates siting of interstate natural gas pipelines as well as prices for the use of pipelines. The Oregon Energy Facility Siting Council sites and regulates large intrastate pipelines.

The Oregon Public Utility Commission (PUC) regulates the rates Oregon's natural gas utilities charge their retail customers. Wholesale natural gas prices are not regulated. Many industrial customers buy directly from the wholesale market.

Retail natural gas rates generally pass along the wholesale cost of natural gas to retail customers. The PUC sets retail rates so utility companies have the opportunity to earn a fair rate of return on their investments.

State statute requires natural gas utilities to offer conservation programs. Utilities provide free energy audits and weatherization incentives for residential customers. They also provide energy audits for commercial customers, but charge for this service.

Natural gas utilities also have to prepare integrated resource plans for the PUC. These plans outline contracts to meet natural gas demand, proposed pipeline expansions, new storage facilities, and energy conservation budgets and programs. In 2002, Northwest Natural began new conservation and low-income bill assistance programs.

Natural Gas Contingencies

A sustained loss of pipelines connecting Oregon to any of its sources of natural gas would disrupt the state's economy, particularly manufacturing. However, barring a major earthquake or other catastrophic event, it is unlikely a sustained disruption would occur. In the event of a disruption, utilities could acquire alternative supplies. This would impact wholesale costs and retail rates, but only for sustained interruptions.

Because natural gas customers have electricity, a gas pipeline interruption could put stress on the electric system, which would face increased electrical loads. Reduced gas supplies for gas-fired power plants would also strain the electric system.

Electricity Supply

Figure 7 shows the mix of resources for Oregon's utilities. This also include biomass self-generation (such as wood waste) by industrial customers and renewable energy certificates (green tags) purchased by customers or on their behalf by their utility. Green tags are the environmental benefits that take place when renewable energy replaces fossil-fuel energy.

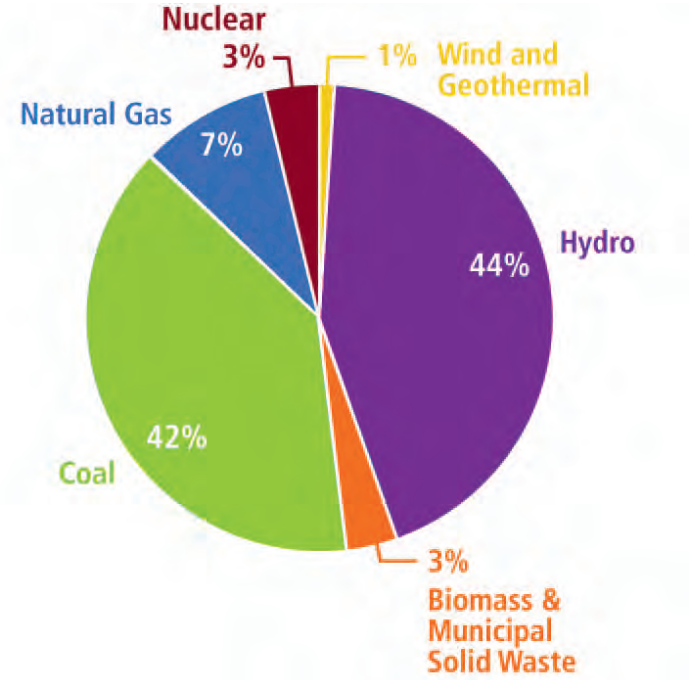


Figure 7: Where Oregon gets its electricity.
Oregon's 2003 fuel mix shows that electricity comes mainly from hydropower and that generated by coal.

Oregon's fuel mix varies based on water and snow (hydro) conditions. For example, natural gas generation in 2003 was 7 percent or about half the 2001 level. In 2001, hydro generation was down and gas generation filled much of the gap. Coal power comes from the Boardman plant in Oregon and from plants in Utah, Wyoming, and Montana. Nuclear power is from the Columbia Generating Station at Hanford, Wash. Biomass refers to generation from pulping liquors at paper factories, woodwaste and waste methane gas. Municipal solid waste (MSW) refers to the generation plant in Marion County. MSW accounts for only about 6 percent of combined biomass and MSW generation. New wind facilities have been added since 2001, but in 2003, wind was still less than 1 percent of total generation.

From 2001 to 2003, the Northwest added approximately 3,350 megawatts (MW) of new generation to the system; most of it fired by natural gas, including 1,675 MW in Oregon. One megawatt roughly equals enough electricity for the instantaneous demand of 750 to 1,000 homes at once.

The power supply should be adequate for several years, even in a drought. However, adequate resources do not guarantee stable wholesale prices. The West is dependent on natural gas-fired power plants. If natural gas prices spike, power prices likely will follow.

Electricity Conservation

Electric energy conservation is making a comeback, if tax credit and other incentive programs are a measure. In 2000, the combination of the Oregon Department of Energy's Residential Energy Tax Credit and Business Energy Tax Credit programs stimulated savings of 58.9 million kilowatt-hours (kWh). In 2001, the savings nearly doubled to 109.2 million kWh. By 2003, the savings reached 860.3 million kWh – more than 14 times the energy saved in 2000.

This dramatic increase in electric energy saving can be attributed to several factors including:

- A West Coast energy crisis in 2001 that saw energy prices soar as a result of the collapse of the California energy markets.
- Volatile and increased natural gas prices that have raised the cost of generating electricity.
- Expansion of energy efficiency efforts by the Oregon Department of Energy, utilities and other energy efficiency delivery organizations to help the public identify and implement energy projects.

The continued volatility and long term upward trend in electricity prices likely will help keep electric energy savings moving upward in Oregon.

Electricity Contingencies

Earthquakes and drought pose the greatest natural risks for Oregon's electricity supply. A drought would be especially problematic if accompanied by a natural gas shortage or the loss of major transmission lines or power plants. Extremely cold weather also strains supplies.

The Bonneville Power Administration (BPA), Pacific Power and PGE have contingency plans for dealing with short- and long-term electricity shortages. The PUC approves plans from Pacific Power and PGE. ODOE and Oregon Emergency Management notify local agencies in case of emergencies.

PGE and Pacific Power have programs to pay customers for reducing use if there is a long-term shortage. During severe long-term shortages, the PUC could require all Oregon electricity consumers to reduce monthly use, relative to the prior year.

During a short-term shortage, utilities ask their customers to make voluntary reductions. If these fall short, utilities can black out individual substations for one or two hours. These events are called rotating outages or rolling blackouts. Critical substations serving hospitals, communications or public safety are exempt. If a substation serves only a few large customers, and those customers reduce their use by the same proportion as the outage, the substation is exempt. For some industrial customers, rotating outages are more disruptive than reducing output or shutting down equipment to achieve equivalent savings.

The Oregon Department of Energy is responsible for planning, preparedness and response to various emergencies that affect the state. They include nuclear emergencies at fixed facilities, radioactive waste transport incidents on Oregon highways, petroleum disruptions or shortages, and electricity emergencies involving the State's 38 consumer- owned utilities.

Immediately following September 11, ODOE conducted vulnerability assessments on the electric, nuclear and petroleum industries. The assessments showed that while we cannot plan for every contingency, the region's nuclear, petroleum, and energy industries have implemented appropriate measures to reduce the likelihood of a terrorist event on a facility, shipment, a pipeline, or an electrical grid.

Energy Supply — Renewable Resources

Nature provides a constant supply of renewable energy resources. Their use usually produces fewer pollutants than fossil fuels. Renewable energy resources include:

- Hydroelectricity
- Wind
- Biomass fuels (from plants and other organic matter)
- Solar
- Geothermal (heat from the Earth)

All renewable energy sources can be used to generate electricity. Solar, geothermal and biomass can supply heat. In addition, biomass can be used to fuel vehicles.

Hydroelectricity

In 1999, electricity accounted for about 20 percent of Oregon's total energy use. This percentage has been constant since 1980.

Wind

Wind-generated electricity is increasingly competitive as wind turbine and other costs decline, the price of natural gas increases, and the federal wind production tax credit continues. Oregon now has five large wind projects with a total capacity of 259 MW. The largest is the Stateline project, straddling the Washington/Oregon border, just north of Pendleton. Turbines on the Oregon side of this project have a maximum output of 120 MW. Other wind farms include Vansycle Ridge (24.5 MW), Klondike (24 MW), Condon (about 50 MW) and Combine Hills (41 MW). Wind machines generate, on average, about a third of the maximum output or capacity.

Several new wind projects and expansions are under way or being planned for a total capacity of more than 400 MW. However, transmission capacity between eastern and western Oregon remains the main barrier for further large-scale development of wind.

Smaller locally owned or community-owned wind farms are also under development. The economics of smaller projects are more challenging due to the higher cost of installing small numbers of utility-scale wind turbines. Transmission issues are often barriers for these kinds of developments as well.

Photo by D.A. Black

Photo 1: Wind Development in Oregon
Renewable energy investments grow a "second crop" for farmers, ranchers and forest landowners.

Biomass

Biomass facilities produce electricity and heat or steam from wood, pulping liquor at papermills, and gas (methane) from landfills, sewage treatment plants and manure. In 2003, total biomass provided 79 trillion Btu of energy. About 37 percent of this energy was from wood wastes burned at 49 industrial sites. In addition to producing steam and process heat, ten of these sites generate power, totaling about 866,000 megawatt-hours (MWh) of electricity. About 46 percent of the total biomass energy came from combustion of pulping liquor at six pulp mills. Two pulp mills produced 310,000 MWh of electricity in 2003.

In 2003, three landfills tapped waste methane gas to generate 37,000 MWh of electricity and provided industrial fuel. In addition, 29 wastewater treatment plants used methane to generate 26,000 MWh of electricity and provide heat for sewage treatment. Two facilities produced about 500 MWh of electricity from cow manure.

New biomass energy markets may provide a way of disposing of forest biomass residues from timber harvest and decreasing wildfire risks by reducing available fuels. These markets are being explored in central and eastern Oregon.

Biofuels

Biomass also can be used to produce biofuels for transportation, including ethanol and biodiesel. Ethanol is a renewable fuel currently distilled primarily from corn. In the future, ethanol may be produced from lignocellulosic (plant materials) feedstock such as wood waste and agricultural residue, which are abundant in Oregon. The ethanol content in gasoline can be as high as 15 percent without to need to modify standard engines. Slight modifications to a vehicle's fuel system must be made to run on E-85 (85 percent ethanol). In Oregon, ethanol is the predominant oxygenate in the gasoline supply. In 2002, up to 60 million gallons of ethanol were used to oxygenate the 1.6 billion gallons of gasoline used by Oregonians. That ethanol, which accounts for up to 4 percent of Oregon's gasoline supply, was produced in the Midwest.

Canola, rapeseed, mustard, soy and other crops, along with waste grease from the food service and

food-processing industry can be refined into oil suitable to fuel diesel vehicles and to be used as lubricants. Many of these feedstocks can be grown in Oregon. Biodiesel can be blended in various ways, but generally comes in B-20 (20 percent biodiesel, 80 percent petroleum diesel) or B-100 (100 percent biodiesel) forms. Currently, suppliers are rapidly developing an Oregon customer base of public and commercial fleets. The Oregon Department of Administrative Services began buying B-20 exclusively, which amounts to about 200,000 gallons per year. The total amount of B-20 used in 2003 in Oregon was about 700,000 gallons, up from 100,000 gallons in 2001.

Solar

Solar energy is a large, untapped natural resource available throughout Oregon. Oregon's solar resources are significant, with two-thirds of Oregon receiving as much or more than Florida. Solar energy can provide space heating, hot water and electricity. Solar electricity will primarily be produced with photovoltaic cells for distributed systems. Large solar thermal-electric plants may become an option.

Designing buildings to make the most of sunlight for lighting also can reduce energy needs. South-facing windows with overhangs to prevent overheating in summer and heat storage materials add little to the cost of a new building.

Solar water heating can supply about half of the hot water for a typical Oregon home. Residents have installed more than 17,600 solar water heating systems in the last 25 years. There are more than 300 solar electric systems in the state.

Geothermal

Geothermal resources include high-temperature (100 degrees Celsius and above) for electricity generation, intermediate-temperature (100 – 50 degrees C) for industrial, agricultural and municipal applications and low-temperature heat pump applications. Most areas of high heat flow are in the Cascades, central Oregon, southeast Oregon and parts of northeast Oregon.

By the end of 2003, about 1,800 ground-source heat pumps provided space and water heating for Oregon homes. The City of Klamath Falls uses geothermal energy for a district heating system. Geothermal sources elsewhere in Oregon supply heat for buildings, swimming pools, resorts and industrial uses. All of these applications fall into the "direct use" category.

Geothermal electric generation could provide important renewable base load generation. Geothermal experts continue to consider the area outside the Newberry National Volcanic Monument to be one of the best prospects for high-temperature geothermal electricity production in the Pacific Northwest. To date, limited exploration drilling has measured temperatures up to 315 degrees C.

Ocean Wave

Generation of electricity through conversion of ocean current, swell, wave action, tidal gradients, and thermal gradients is being successfully demonstrated around the world. Most promising applications are offshore use of the consistent rise and fall of swells along deep-water shorelines where there is significant year-round wave action. Wave power densities in Oregon are estimated to be capable of producing between 5 and 15 megawatts per mile of coastline.

The Electric Power Research Institute (EPRI) has proposed building six demonstration projects in six states, including Oregon and Washington. One of EPRI's 500 kW demonstration projects may come to the Oregon coast by 2006.

Promoting Renewable Resources in Oregon

The Oregon Department of Energy (ODOE) provides tax credits and low-interest loans for all types of renewable resource projects. Large wind, geothermal and biomass facilities also qualify for federal production incentives.

Many utilities offer consumers the option to pay extra to support development of new renewable resources, including wind, geothermal, landfill gas and solar. These resources may be in Oregon or located elsewhere on the Western electric grid. Portland General Electric's (PGE) renewable sign-up program has more than 33,000 customers purchasing the renewable power options. Pacific Power has about 18,000 customers using their renewable program.

Some Oregon residents and businesses invest in on-site renewable resource generation. Oregon law requires electric utilities to buy excess power from customers with small solar, wind or hydro-electric systems. Utilities also must purchase excess power produced by small fuel cells, which can run on natural gas or methane.

Under Senate Bill 1149, the 3 percent public purpose charge on the bills of PGE and Pacific Power customers will provide an estimated $10 million per year to promote renewable resources.

In 2004, under the guidance of the Governor's office, ODOE coordinated the development of the Renewable Energy Action Plan, with extensive contributions from many state agencies and other stakeholders. This Plan's goal is to encourage and accelerate the sustainable production of energy from renewable sources, stimulate economic development (particularly in rural parts of the state), and improve the environmental future of Oregon. The Plan seeks to demonstrate a variety of technologies for tapping renewable resources and to help remove barriers to renewable resource development.

Environmental Impacts of Energy Use

Energy use and production affects the environment in a number of ways, including impacts to air and water.

Air Pollutants

Carbon dioxide (CO2), methane and nitrous oxide (N2O) are greenhouse gases. Carbon dioxide cannot be removed easily from tailpipes and smokestacks. Therefore, reducing carbon dioxide emissions requires increasing energy efficiency, switching to less carbon-intensive fuels (from coal to natural gas generation, for example) or using renewable resources.

The Oregon Department of Environmental Quality (DEQ) regulates emissions of nitrogen oxides, volatile hydrocarbons, sulfur oxides and particulate matter from vehicles, factories and power plants. Oregon's emissions must meet federal standards.

Vehicle emissions are the principal source of nitrogen oxides and volatile hydrocarbons in Western cities. Power generation from coal, and to a lesser extent natural gas, is another major source of nitrogen oxides.

Due to recent pollution control requirements, new gas-fired power plants produce only 3 percent of the nitrogen oxides of existing coal-fired plants of the same size, and virtually no volatile hydrocarbons, sulfur oxides or particulate matter.

Coal power plants are a major source of sulfur oxides. Diesel-powered vehicles also produce sulfur oxides, but new federal standards will greatly reduce these emissions.

Wood stoves, diesel-powered vehicles, field burning and forest fires are significant sources of small particulates.

Other Environmental Impacts

All forms of energy production result in environmental impacts. Fossil-fueled power generation produces, in general, more significant impacts than renewable resources. However, wind generation can have wildlife impacts and geothermal power production can result in the release of naturally occurring volatile chemicals such as mercury. Chemically hazardous wastes are produced in the manufacture of solar photovoltaic cells. Production and collection of biomass energy resources can result in soil and forest resource depletion if not managed correctly. All forms of energy production must be carefully reviewed, and possible impacts minimized.

The Oregon Water Resources Department rules allow new power plants to use water only if the use does not interfere with existing water uses, including fish and wildlife habitat. The DEQ regulates water pollution and increases in temperature from power plant discharges.

State standards also set limits on the impacts that new power plants can have on soils, protected areas, fish and wildlife habitat, threatened and endangered species, noise, and scenic, cultural and recreational values. The Energy Facility Siting Council requires new plants to meet state standards.

Federal and non-federal projects must comply with decisions by federal authorities related to salmon species that are threatened with extinction. Improvements in fish habitat often are part of Federal Energy Regulatory Commission (FERC) re-licensing of non-federal projects.

Nuclear Cleanup and Emergencies

Oregon has two small nuclear reactors used for research: one at Reed College in Portland, and another at Oregon State University's Radiation Center in Corvallis. The reactors are regulated by both the U.S. Nuclear Regulatory Commission and by Energy.

Hanford Nuclear SIte

The Hanford Nuclear Site, located on the Columbia River in southeast Washington, is the largest environmental cleanup in the world. The site covers 586 square miles and contains waste from more than 40 years of producing plutonium for America's nuclear weapons program. The U.S. Department of Energy (USDOE) owns and operates the site.

The Hanford Site includes more than 1,800 waste sites, ranging from small areas of surface contamination to 177 underground tanks holding more than 53 million gallons of highly radioactive waste. Hanford's tanks pose the greatest health and environmental threat. At least 67 of the tanks have leaked more than one million gallons of highly radioactive waste into the soil. The tank leaks, combined with intentional releases into the soil, have resulted in extensive contamination of the groundwater beneath the site.

Since Hanford cleanup began, much of the focus has been on resolving immediate threats: concerns about tanks that might catch fire or explode; concerns about spent nuclear fuel stored in leaking, earthquake-vulnerable basins; and concerns about tons of unstable plutonium. After 15 years of cleanup, some of the immediate risks have been successfully resolved, but many serious issues remain. Now the focus is on the quality of the remaining cleanup. There is considerable debate about that issue. In recent years, USDOE Headquarters has stressed a quicker, less expensive cleanup. This, in effect, means leaving more waste in place.

There are still plenty of long-term risks. Extensive groundwater contamination remains and huge amounts of sub-surface waste are still moving toward the groundwater, including high-level radioactive waste leaked from the tanks. Highly radioactive materials remain in unlined burial grounds. Huge facilities to immobilize Hanford's tank wastes are still years from being built and operating.

The remaining cleanup will take decades. In the meantime, a fire, explosion or accident involving Hanford's underground waste storage tanks, plutonium manufacturing facilities or laboratories could release radioactive materials. Such a release could affect Oregon.

Also located at Hanford is the Columbia Generating Station, the Northwest's only operating commercial nuclear power plant. An accident at this plant could cause an airborne radioactive release, with potential impacts to Oregonians.

The consequences in Oregon from a radioactive release could be economic and environmental. Agricultural operations near Umatilla and Hermiston are only about 40 miles from Hanford.

To mitigate the risk Hanford poses to Oregon, the Oregon Department of Energy (ODOE) is urging USDOE to clean up the site and clean it up properly, as soon as possible. The Oregon Department of Energy also works with USDOE, the Columbia Generating Station, Washington State and the affected counties to ensure that the region can provide a coordinated response to a Hanford emergency. This includes conducting and participating in routine exercises.

Every two years, the Federal Emergency Management Agency (FEMA) evaluates Oregon's ability to respond to a commercial nuclear power plant accident that results in the release of radioactive materials. Oregon is tested on its ability to alert and mobilize emergency responders; assess the severity of the radiological accident; identify and track the radioactive release; and conduct environmental monitoring, sampling, and analysis. The state must also show it can issue and implement appropriate protective actions for the public, and provide timely and accurate information to the public and news media. FEMA evaluations show that the Oregon Department of Energy has met all the test objectives.

Trojan Nuclear Power Plant

The Trojan Nuclear Power Plant is on the bank of the Columbia River in Columbia County. Portland General Electric (PGE), the plant's majority owner and operator, permanently closed Trojan in 1993 and is decommissioning the plant. Decommissioning involves removing radioactive and hazardous materials so the site can be used for another purpose. ODOE oversees the decommissioning work.

Trojan's nuclear reactor was dismantled in the late 1990s and all major components were shipped to the Hanford commercial low-level waste site for burial.

The plant's spent fuel is stored on site in dry storage containers, known as the Independent Spent Fuel Storage Installation. PGE finished the

decommissioning of the spent fuel pool and its associated building in 2003. The fuel will be stored securely at the plant site until a national spent-fuel repository opens.

In early 2002, the U.S. Secretary of Energy recommended that the federal government proceed with constructing such a repository at Yucca Mountain in Nevada. Congress voted to override Nevada's veto of the proposed disposal site. A national spent fuel repository is not expected to open until after 2010.

After PGE completes all clean-up activities, the utility must perform a detailed survey that shows all areas of the plant are free of contamination. The Energy Facility Siting Council must review and approve the survey before cleanup is considered finished. ODOE provides technical staff for the Council.

In October 2004, PGE petitioned the Council to adopt administrative rule amendments that would relieve PGE of regulatory requirements associated with plant decommissioning. If adopted, these amendments will represent the Council's approval of Trojan's decommissioning. The facility will require a site certificate from the Council as long as spent nuclear fuel remains on site. If the Council approves the Trojan rule amendments, all areas of the plant, except for the spent fuel storage area, will be free for non-nuclear use.

An accident involving Trojan's spent fuel would, at most, result in a small release of radioactive materials. On-site workers might need protection; people off-site likely would not. The State of Oregon, Columbia County and PGE are prepared to respond to an emergency. Energy's emergency preparedness plan includes the Trojan Nuclear Plant.

Lakeview Abandoned Uranium Mines

During the 1950s, two uranium mines were developed in Lake County. The White King and the Lucky Lass mines were abandoned in the 1960s. In the mid-1980s, the U.S. Department of Energy and State of Oregon completed a cooperative cleanup of the uranium mill site near Lakeview. The mines themselves, however, were never cleaned up.

Former Governor Kitzhaber petitioned the U.S. Environmental Protection Agency (EPA) to list the mines on the National Priorities List for federal Superfund cleanup. The EPA issued a record of decision adding the mines to the list in September 2001. Besides the EPA, others involved include ODOE, the U.S. Forest Service, and the Oregon Department of Environmental Quality.

The EPA, DEQ and ODOE negotiated a consent decree in which Kerr-McGee agreed to perform the cleanup work. Final site design will include consolidating and stabilizing about one million tons of mine overburden (rock waste) and neutralizing the acidic water in the White King mine pit. Cleanup is expected to run through the 2006 construction season. Management of surface water and groundwater may require long-term attention.

Research Reactors

Oregon has two small nuclear reactors used for research: one at Reed College in Portland, and another at Oregon State University's Radiation Center in Corvallis. The reactors are regulated by both the U.S. Nuclear Regulatory Commission and by ODOE.

Transportation of Radioactive Materials

Radioactive materials travel on Oregon's roads every day. Radioactive waste travels through the state, destined for disposal at Hanford. Radioactive medicines are distributed daily across Oregon, and radioactive materials often are transported to and used at construction and industrial sites.

Most of these shipments pose a low risk because of the nature of the cargo. More shipments, of much more dangerous waste, likely will be trucked in the future as waste is moved from Hanford to permanent disposal sites.

ODOE works with local, state and federal agencies to ensure the safe transportation of these wastes. ODOE also works to ensure swift and appropriate response to a radioactive material transportation accident, providing training for emergency responders along the transport corridors. Nearly 800 emergency responders and hospital emergency room personnel have attended radiological training since January 2003.

Energy Issues Facing Oregon

Energy and the Economy

Energy price and supply affect Oregonians. For example, energy price increases caused Oregonians to spend 50 percent more per unit of energy to heat their homes in 2002 than they did in 1998. Energy conservation and efficiency, along with renewable resources can help insulate Oregonians from volatile energy prices. This benefits the state's economy.

Energy efficiency and renewable energy result in direct local economic improvement. Project construction creates a one-time surge in economic activity, while operation and maintenance create long-term jobs. Every $100 million of investment in renewable energy creates about 1,250 full time equivalent jobs and nearly $200 million in economic benefits, which increase tax revenues by about $1 million. [1]

Efficiency and renewable energy can also meet a significant portion of Oregon's incremental energy needs, in some cases at a lower cost than that of conventional fuels. For example, when natural gas prices rose to about $7 per million Btu that translated to about 5.6 cents per kWh, which is significantly higher than the cost of wind energy.

Between 1990 and 2002, utilities in the Pacific Northwest invested $2.4 billion in conservation, resulting in savings of 2,600 average megawatts (aMW) annually. This precluded generating the output of five large coal plants and avoided significant environmental cost. That $2.4 billion investment is recovered in electricity bill savings every 18 months. [2]

In 2004 alone, Oregonians invested nearly $200 million in efficiency and renewable energy. These investments support Oregon's economy by increasing business activity, cutting energy costs, and making Oregon business more competitive.

Economic development and energy agencies from Oregon, Washington and British Columbia commissioned Poised for Profit: How Clean Energy Can Power the Next High-Tech Job Surge in the Northwest. This 2001 report showed that the clean energy sector could be twice the size of the aircraft industry within 20 years and generate as many as 30,000 new jobs. The study estimated this sector includes more than 225 companies with revenues, and research and development funding exceeding $2 billion.

Local efficiency and renewable energy investments boost revenues for Oregon designers, vendors, manufacturers, and service providers in a wide range of manufacturing and construction trades. Energy cost savings build each year from these investments and stay in Oregon's economy.

Businesses that make efficiency or renewable energy improvements are more competitive, because of lower operating costs and in many cases better control over production and product quality. In addition, Oregon business becomes less dependent upon foreign oil and natural gas supplies, which have experienced sharp price increases.

For example, developing biodiesel and ethanol production from Oregon renewable resources will provide local business with numerous opportunities. In-state production also offers long-term

[1] Based on Economic Impact Analysis of Energy Trust of Oregon Program Activities, Final Report, by ECONorthwest, Portland, April 2003.

[2] Per communications with Tom Eckman, Conservation Program Director, Northwest Power and Conservation Council, September 16, 2004. Assumes average avoided cost – or value of savings – of 5.5¢/kWh, or $55/MWh. In 2001, when West Coast market prices for electricity spiked to $250/MWh and higher, the savings realized in the Pacific Northwest would have been appreciably greater.

benefits to the environment and the economy.

A Minnesota study suggests that local economic benefits are about 10 times higher for locally owned and operated businesses when compared to those from projects owned by corporations outside the region.

Central Oregon may serve as an example of an efficiency and renewable energy development cluster. The nine-county central Oregon corridor (Wasco, Sherman, Gilliam, Wheeler, Deschutes, Jefferson, Crook, Klamath, and Lake counties) possesses diverse renewable resources including solar, wind, geothermal, and biomass. The corridor can build on several dozen renewable energy-related companies manufacturing fuel cell applications, photovoltaic system inverters and other technologies.

Oregon businesses are recognized for their experience developing renewable energy. Institutes in the higher education system are dedicated to the full range of energy efficiency and renewable resources. The scientists at Oregon's universities are a deep resource for technology and information in this sustainable industry. Oregon's economy can benefit from their unique expertise. For example, microelectronics, fuel cell applications, power controllers, and renewable resource technical services are supported by Oregon incentives. The combination of scientific expertise and state incentives positions Oregon businesses to export these technologies.

Actions to Maintain Hanford Cleanup

Oregon has a tremendous stake in ensuring the safe and timely cleanup of the Hanford Nuclear Site in southeastern Washington State. Hanford is only 35 miles from the Oregon border. The Columbia River flows through the Hanford Site, and then continues downstream past prime Oregon farmlands and fish habitat. The threat to the Columbia River from Hanford's radioactive and chemical wastes is Oregon's greatest concern at Hanford.

In addition, cleanup decisions at Hanford can influence the amount and type of waste that is brought to Hanford for treatment or disposal and influence the amount and type of waste that leaves Hanford for other disposal sites. These wastes travel on more than 200 miles of Oregon highways. Oregon works to ensure the safe transport of these radioactive wastes. In addition, Hermiston, Boardman and Umatilla are within the 50-mile nuclear emergency-planning zone of the Hanford Site. The people there could be at risk in the event of a major accident at Hanford.

Despite Oregon's strong interest in Hanford cleanup, Oregon has no regulatory authority over Hanford cleanup. A Tri-Party Agreement between the U.S. Department of Energy (USDOE), the U.S. Environmental Protection Agency and the Washington Department of Ecology is the legally binding action plan for cleaning up chemical and radiological wastes at Hanford.

Over the years, the Oregon Department of Energy (ODOE) has attempted to secure a more formal role in decision-making about the Hanford cleanup. In June 2002, the director of the Washington Department of Ecology acknowledged Oregon's "bona fide interest in Hanford matters" and offered to provide ODOE with real time briefings about Tri-Party Agreement negotiations.

While Oregon seeks new opportunities to gain a stronger role at Hanford, ODOE's Nuclear Safety Division continues to work closely with USDOE, with Hanford's regulators, with stakeholders and with tribal nations to implement sound technical and policy decisions regarding the cleanup. We

continue to review the cleanup plans that USDOE and its regulators propose and provide Oregon's input and perspective. In addition, work with our congressional delegation ensures sufficient funding for cleanup.

Emergency Preparedness

The national focus on security of critical infrastructure in the wake of 9-11 has significantly increased ODOE's responsibilities in emergency planning, preparedness and response activities. Before 9-11, the agency's only emergency response program with security concerns involved nuclear emergencies that affected Oregonians. This includes preparing and responding to nuclear accidents at the Trojan Nuclear Power Plant, the Columbia Generating Station, the Hanford facilities, and to accidents involving the transport of radioactive materials on Oregon highways.

Now, the nation's petroleum supply and distribution system, and electrical grid are also classified as critical infrastructure vulnerable to terrorist attacks. Protecting the health and safety of Oregonians from severe petroleum disruptions and electricity emergencies involving the State's 38 consumer-owned utilities is the responsibility of ODOE. To address security and terrorism concerns and needs related to energy infrastructure, the Oregon Department of Energy has been meeting with state and federal law enforcement agencies and energy suppliers.

To better protect, secure, and respond to a severe or long-term emergency involving Oregon's petroleum supply and distribution system, ODOE is expanding and restructuring its Petroleum Contingency Plan. For the first time, ODOE is working directly with the U.S. Department of Energy's Office of Energy Assurance, Oregon's petroleum suppliers, law enforcement, other state agencies, and the state's 36 counties to ensure a coordinated response to petroleum emergencies. The Oregon Department of Energy is developing a database with sensitive information on fuel consumption, designated emergency fueling stations, and maps of emergency routes in the state to simplify and accelerate the overall application process for emergency fuel during a crisis.

The Oregon Department of Energy is also working with the Oregon Public Utility Commission (PUC) and Oregon Emergency Response System to expand the existing notification plan for rotating outages to include all electricity emergencies. ODOE and the PUC are jointly responsible for planning and response to electricity emergencies affecting Oregon. ODOE is responsible for Oregon's consumer-owned utilities while the PUC regulates the State's investor-owned utilities.

Responding to petroleum and electricity emergencies requires extensive coordination. This includes facilitating the allocation of fuel and notifying or providing critical emergency information to the State's utility providers to avert an electricity crisis. ODOE will continue to work with its federal, state, local, and industry counterparts to ensure a comprehensive response to energy emergencies affecting Oregon.

Petroleum – Price Increases and Production Peaks

Oregon should expect continued high gasoline and other oil price prices that could negatively affect our economy, which remains heavily dependent on oil. About half the energy products Oregon uses are refined oil, most of it for transportation. In 2000, Oregonians spent 2.6 percent of their total personal income on gasoline and 4.3 percent on all oil products combined.

The price Oregonians pay for petroleum products depends on world oil prices. Middle East production strongly influences the world price. The Middle East produced 28 percent of the world's oil in 2001 and controls two-thirds of the world's oil reserves. There have been four world price spikes in the last 30 years, in 1973, 1979, 1990 and 2004. These were due to high world oil demand and the Yom Kippur War, the Iran-Iraq War, the Persian Gulf War, and the Iraq War, respectively. As recent events indicate, the Middle East remains unsettled.

Another potential problem is long-term price trends. World oil production may peak in the next decade and begin a long-term decline. Meanwhile, world demand for oil continues to grow. Increased demand will maintain or increase already high oil prices.

While U.S. oil production peaked in 1970, most experts think that worldwide production will peak within five to ten years. This is based on a projected maximum global resource base of 2.2 trillion barrels, which has held steady since the 1950s.

Production from most non-OPEC sources, such as Canada, Mexico, and the North Sea, likely already has peaked. Production from many OPEC nations has reached a plateau, and is unlikely to increase before it begins to decline.

The oil peak does not mean we are about to run out of oil. It means we have used about half the Earth's oil — the easiest and cheapest half to find and produce. After the peak, prices may rise sharply. This would have a major impact on the U.S. and world economies, because oil accounts for about 40 percent of the energy we use, including 95 percent of U.S. transportation energy. All the major recessions of the past 35 years were preceded by sharp increases in the price of oil.

The state has little ability to mitigate the economic impacts of a sustained fuel price increase after it occurs. Oregonians can reduce their vulnerability to oil prices by decreasing the miles they drive, buying vehicles that get more miles per gallon, and increasing the use of alternative fuels.

The most significant options to reduce vehicle miles traveled relate to work commutes, which includes increased transit use, van/carpooling, and telework. Improved commuter options are:

- Increasing incentives for employers to reduce single-occupant commuting. Employers can pay for transit passes and can develop telework sites or encourage working from home.
- Expanding incentives to encourage vanpooling and carpooling, such as carpool parking discounts and high-occupancy vehicle lanes.
- Starting commuter rail along existing rail lines.
- Expanding transit service.

High efficiency vehicles, including hybrids, offer the greatest potential for reducing gasoline use in the near term. However, the most significant option to improve vehicle efficiencies is to encourage improvement in the federal Corporate Average Fuel Economy (CAFE) standard. Congress has not increased fuel economy standards for new vehicles since 1985. The report of the Governor's Global Warming Advisory Group, *Oregon Strategy for Greenhouse Gas Reductions*, provides a number of recommended actions that also reduce use of petroleum.

For Oregon's overall petroleum supply, the Oregon Department of Energy is responsible for allocating gasoline and diesel during critical emergencies. ODOE's Petroleum Contingency Plan ensures a coordinated response with the state's petroleum suppliers, law enforcement,

other state agencies, and the counties. The revised plan will include a database with county-specific information on fuel use, designated emergency fueling stations, and maps of emergency routes.

Natural Gas – Price Increases and Production Peaks

As with petroleum, the recent spikes in natural gas prices may seem minor once world production peaks and begins to decline. Rather than spike and decline, natural gas prices would likely remain high.

Natural gas accounts for 20 to 25 percent of U.S. primary energy use. Natural gas is a clean, high-value resource that could substitute for oil in many uses. However, like oil, natural gas is non-renewable and production will peak and decline. For North American natural gas, that appears to be happening now.

From 2001 to 2003, U.S. gas production declined almost 3 percent and Canadian imports declined 8 percent, despite significantly higher prices. In addition, world natural gas production eventually will peak. Discoveries of new fields peaked in 1970, and for the past three years, the world has used more natural gas than it has found.

Because of these production declines, natural gas prices are more than double what they were five years ago. High natural gas prices hurt the economy.

To make up for declining domestic production, the U.S. would need to import natural gas from abroad. However, natural gas produced overseas must be liquefied for ocean transport. This is expensive, as is regasification, and it will take time to build the tankers and production facilities. One LNG regasification plant is proposed in Coos Bay and three in Columbia and Clatsop counties. It is unlikely any LNG facility will be ready before 2008 and even then, there will be increasing worldwide competition for the gas. Much of it likely will go to countries closer to the source of production where it can be moved easier and cheaper by pipeline. Oregon will get product with a higher delivered price.

Oregon wholesale natural gas prices rose 168 percent between January 1999 and July 2004. Over the same period, residential rates rose 94 percent. This is largely responsible for the drop in natural gas use for residential, commercial and industrial sectors of 3, 8 and 37 percent respectively. While the reduced use in the residential and commercial sectors was due primarily to price increases, the economic recession added to reductions in the industrial sector.

Natural gas prices influence electric prices. Because roughly 8 percent of Oregon's electricity is generated from natural gas, gas prices influence retail electric prices. The share of gas-fired generation is increasing as loads grow and since most new power plants are fired by natural gas. Electric utilities can reduce their exposure to fuel price spikes by developing renewable resources and buying more of their fuel in longer-term contracts. These measures can be more expensive in the near term. These tradeoffs are part of the utility least-cost planning process.

Natural gas prices continued to rise in late 2004. Oregonians can reduce their vulnerability to natural gas price spikes by weatherizing their homes and installing premium-efficiency equipment in homes, buildings and factories. Natural gas utilities and others offer conservation programs.

Public schools (K-12) in Pacific Power and Portland General service territories are eligible for $6

million per year for electric, natural gas and oil conservation. In addition, ODOE recently received funds from an overcharge settlement to cover energy efficiency measures in Oregon K-12 public schools served by municipal utilities, people's utility districts, and electric cooperatives.

The Oregon Department of Energy offers tax credits and loans for conservation in buildings and factories and programs to reduce natural gas use in state facilities.

Expanding state, utility and non-profit conservation programs would reduce Oregon's vulnerability to natural gas price spikes.

Alternative Fuels for Transportation

Alternatives to gasoline and diesel play a major role in reducing demand for foreign petroleum, diversifying our fuel mix, and reducing carbon dioxide emissions. Oregon recognizes the following alternative fuels: ethanol, methanol, electricity, compressed natural gas, liquefied natural gas, liquefied petroleum gas, biodiesel, hydrogen, and hybrid vehicles. Many of these transportation fuels burn cleaner, come from renewable sources and can originate in the Northwest.

A balanced approach is needed to meet Oregon's alternative fuel and transportation efficiency objectives. Alternative transportation fuels can provide lower emissions, cost savings and insulation from petroleum price variance. Renewable biofuels (ethanol and biodiesel) show the most promise and can be produced in Oregon. Locally developed biofuels can stimulate economic development and reduce overall fuel costs.

Biodiesel can displace conventional diesel with blends ranging from 2 to 100 percent. Blends up to 20 percent require no engine modifications. Biodiesel is a clean burning alternative fuel, produced from domestic, renewable resources. Biodiesel can be made from waste grease products or locally grown agricultural products, such as rapeseed or mustard seed. Pure biodiesel is biodegradable, nontoxic and essentially free of sulfur and aromatics.

Ethanol alcohol fuel is usually mixed with gasoline at 85 percent ethanol and 15 percent unleaded gasoline to form what is called E-85. In 2004, gasoline in Oregon had an overall average ethanol content of 2 to 3 percent. Ethanol can be blended with conventional gasoline up to 10 percent without any engine modifications. Blends using 85 percent ethanol (E-85) require slight engine modifications. Typically derived from distilling corn, ethanol is also a byproduct of starch manufacturing.

To help develop alternative fuels, the Oregon Renewable Energy Action Plan recommends that:

1. Diesel sold in Oregon contain 2 percent biodiesel (on average).
2. Fifteen million gallons of biodiesel be produced annually from Oregon crops or products and waste oils collected in Oregon.
3. Gasolines sold in Oregon contain 2 percent ethanol (on average).
4. Oregon produce one hundred million gallons of ethanol annually.

Electricity Supply

Adequate Electricity Resources

Conservation, new renewable generating resources, and the transmission infrastructure to deliver power from generating plants to load centers are the key elements in assuring adequate electricity.

In its 5th Power Plan, the Northwest Power and Conservation Council (NPCC) concluded that, on a regional basis, there should be a surplus of electricity at least until the end of the decade, even in a drought. These conclusions assume moderate growth in demand, availability of power plants developed by independent power producers, and the aggressive regional pursuit of conservation and demand response options even in a time of surplus.

Utility Resources

Between 2001 and 2003, Oregon added 1,675 MW of natural gas- fired capacity, and 307 MW of average wind generation. Many power plants have been completed in California, Arizona, Washington and Nevada, helping to ensure adequate resources throughout the West.

To avoid the shortages and price spikes of 2000 and 2001, Oregon's investor-owned utilities plan to rely less on wholesale power markets. Instead, they plan to ensure adequate resources by building more gas-fired and wind power plants or sign long-term, fixed-price purchase agreements.

The Bonneville Power Administration (BPA) resources can meet the current needs of Oregon's consumer-owned utilities. Long-term, BPA's role in meeting the load growth of its customers after 2011 may diminish or disappear.

In addition to wind plants, Oregon will likely need new stand-alone gas-fired plants in the next decade. State law, through Energy Facility Siting Council exemptions and incentives, encourages smaller turbines or internal combustion engines at customer sites. Producing both heat and power, the plants are more efficient than producing heat and power separately and cause fewer CO2 emissions. They also reduce transmission line losses and can reduce the need to upgrade transmission and distribution systems.

Transmission Infrastructure Improvements Needed

Transmission constraints – both physical and contractual – present a significant challenge to developing new generation. For example, interconnecting with BPA in some of Oregon's best wind generation areas, and shaping and transmitting wind and other generation from east of the Cascades to western load centers both present problems.

Aggressive Pursuit of Conservation

The NPCC has concluded that it makes economic sense to aggressively pursue cost-effective conservation, even in a time of surplus. ODOE agrees. It is a matter of "pay me now or pay me more later." Under virtually all scenarios in the NPCC's analysis, acquiring conservation at a quicker pace than in the past several years would result less costly and less risky system.

The NPCC's Plan calls for the region to acquire more than 500 average megawatts of conservation from 2005 through 2009. Oregon's share of this target is roughly 150 average megawatts. Accomplishing the NPCC's targets will require the commitment of every energy stakeholder. ODOE will work with all Oregon utilities to determine their share of the target and move quickly to acquire those shares.

Aggressive Pursuit of Renewable Generation

The NPCC projects the need for new generating resources sometime after 2010. Most new power plants in Oregon over the past decade run on natural gas. However, natural gas prices are volatile and were very high in 2004. Renewable resource generating plants have no fuel costs and raise fewer and less severe risks and environmental concerns.

Renewable resources, whether in the construction, operation or component manufacturing phase, are good for Oregon's economy. For that reason, Oregon should make maximum use of renewable energy.

Oregon's Renewable Energy Action Plan provides that by the end of 2006, 300 MW of wind energy will be developed, as will 2.5 MW of new solar electric, 5 MW of new biogas, 25 MW of new biomass, and 50 MW of new combined heat and power. Under the Plan, renewable generation will meet 10 percent of Oregon's load by 2015. This will increase to or exceed 25 percent of the load by 2025. ODOE will continue to encourage rapid development of economically viable renewable resources.

Renewable resources are preferable to the likely alternative of new coal. Coal generation would have significant human health and environmental impacts. New coal-fired plants produce more than twice the carbon dioxide (CO2) of new gas-fired plants and, even with maximum control technologies produce significant amounts of sulfur dioxide, nitrogen oxides and mercury. It is unlikely new coal-fired plants will be built in Oregon in the near future.

Any development of mine-mouth coal-fired generation would require an investment in transmission of an estimated $1 billion to bring the electricity to the population centers in western Oregon. Strategic upgrades to accommodate smaller renewable resource generation projects, along with continued investments in energy efficiency would eliminate the need for a coal plant and the transmission needed to serve it.

Electricity and Natural Gas Transmission

Developing sources of new energy is important, but just as important is upgrading the energy delivery infrastructure. This includes natural gas storage, pipelines and compressor stations, electricity transmission lines and substations. Oregon's natural gas infrastructure has been upgraded recently with the expansion of Northwest Natural's Mist storage facility and completion of Northwest Natural's new pipeline from Sherwood to Molalla. Both projects received a site certificate from the Energy Facility Siting Council.

The immediate need is to upgrade the electricity transmission system. Bottlenecks and lack of capacity at various locations constrain the development of new power plants, including wind. For example, wind development in eastern Oregon awaits construction of the proposed 500-kilovolt transmission line between the McNary and John Day dams on the lower Columbia River.

The problems with the transmission system, which result in inefficiency as well as reduced reliability and capacity, include managing real-time capacity constraints, lack of responsibility and incentives for expansion. There is also a poor match between contracted rights and the physics of the transmission system. These can be addressed by renegotiating transmission contracts and establishing regional markets for transmission capacity and related services.

The electricity system upgrades in particular need to target renewable resources. This includes providing transmission for new smaller generation that serves local needs. At the same time, to the extent that we can develop such local renewable resources and combined heat and power generation resources, the need for transmission is reduced.

The Bonneville Power Administration's (BPA) policy on open capacity should give preference to electricity generated from renewable resources. BPA has discretion on scheduling load and access to its transmission system, and it can take steps to ease access to its system.

Energy's Action Plan for 2005 and 2006

(ODOE) is to ensure Oregon has an adequate supply of reliable and affordable energy and is safe from nuclear contamination, by helping Oregonians save energy, develop clean energy resources, promote renewable energy and clean up nuclear waste. We set the following goals to achieve our mission:

- Meet a significant portion of Oregon's incremental energy needs with conservation and renewable resources.
- Help reduce carbon dioxide emissions through incentives and other programs.
- Prepare the state and counties within 50 miles of an operating commercial nuclear power plant for nuclear emergencies.
- Reach key cleanup milestones at the Hanford Nuclear Reservation.

This two-year action plan seeks to meet these goals. A number of these actions appeared in the 2003 Plan. We evaluated those actions, found them effective, and concluded they should be continued.

Conservation

Households

1. **Encourage homeowner investments in cost-effective efficiency measures and renewable resources.**
   Highly efficient appliances and renewable resources for heating, hot water and electricity can significantly reduce use of fossil fuels. But the higher initial cost of many technologies is a significant barrier. Providing tax credits helps overcome this obstacle.

   ODOE will continue to update standards and eligible technologies for the state's Residential Energy Tax Credit program and provide information and technical help to Oregonians who use it. In addition, ODOE will implement a Governor's directive to bring the tax credit application process on-line.

2. **Continue services and incentives for weatherizing homes.**
   Weatherizing homes is a significant source of energy savings. Since 1977, Oregon law has ensured that every household in the state has the opportunity to learn which measures its home needs to make it energy-efficient. For many measures there are financial incentives to help pay for them.

   For oil-heated homes, which typically are older and less efficient, weatherization and heating upgrades reduce the impact of volatile fuel-oil prices. ODOE provides rebates through the State Home Oil Weatherization Program.

   In addition, the Oregon Department of Energy will continue to train and certify contractors to properly design and seal heating ducts and work with others to develop new incentive programs. ODOE also will promote the Business Energy Tax Credit and State Energy Loan Program for weatherization and other efficiency upgrades for rental housing.

   For low-income households, ODOE will continue to participate in the Oregon Housing and Community Services Department's Advisory Committee on Energy. The committee crafts policies and procedures for weatherization and energy assistance. ODOE will work with Oregon's congressional delegation to advocate for an increase in federal funding for weatherizing low-income housing.

3. **Support energy-efficient building residential codes.**
Oregon's statewide residential building code includes significant energy- efficiency measures. The Oregon Department of Energy will continue to provide training and technical help for the building industry and local building departments. ODOE will assist the Building Codes Division with recommendations from the West Coast Governors' Global Warming Initiative to upgrade energy codes.

   On the national level, ODOE helps develop federal standards for appliances. This includes water heaters, air conditioners, dishwashers, clothes washers, refrigerators, and heat pumps. States are preempted from adopting such standards, because products are national in scope. ODOE will continue to serve on this national committee.

4. **Encourage energy-efficient building practices beyond code levels.**
ODOE also will promote energy-efficient building practices that exceed code. ODOE is supporting development of an integrated High Performance Home. The concept includes a super-efficient building shell, solar equipment, advanced heating and ventilation systems, and electronic controls to help homes approach zero net energy use. At certain times of the day or year the house will produce more energy than it needs, while at other times it may use some power from the local utility. Over the entire year, power purchased from the utility will be offset by power produced by the house and sold back to the utility. ODOE will demonstrate the concept, monitor performance in a few homes, and promote the concept to builders, designers, and homebuyers.

   For the more conventional market, ODOE administers the Environmental Protection Agency's (EPA) Energy Star Home program in Oregon. The program requires sealing of heating and cooling ducts, more efficient heat pumps or natural gas furnaces, and improvements to windows and floor insulation. To maximize market potential, ODOE will provide training and quality control for the program, and ensure coordination with the Residential Tax Credit program, High Performance Homes Initiative, and utility programs.

   The Oregon Department of Energy will also encourage more energy-efficient manufactured housing. Oregon produces 75 percent of the manufactured homes in the region. ODOE has worked with the industry to design and market energy-efficient manufactured homes under the Super Good Cents® (SGC) brand name. More than 60 percent of new manufactured homes are built to SGC standards. The Department will continue administering the regional program and work to increase market share. Manufacturers will be helped to improve energy efficiency by conducting research to reduce duct losses. Work in also underway to launch a "buyback" program to retire old, inefficient manufactured homes and replace them new, more efficient models.

Businesses

5. **Encourage businesses to invest in cost-effective energy efficiency and renewable resources.**
Tax credits are available to businesses for investments in energy efficiency and renewable resources to help them overcome the higher first-costs. ODOE

evaluates the performance of the Business Energy Tax Credit program, identifies priority target markets and implements improvements. ODOE also will use the State Energy Loan Program and work with others to leverage tax credit benefits for Oregon businesses. The loan program is targeting at least $5 million per year in efficiency investments in commercial buildings.

6. **Upgrade energy standards for commercial buildings.**
State code for commercial buildings sets minimum standards to ensure that new buildings include all practicable energy efficiency measures. ODOE will provide training and materials to code officials, designers, distributors, and contractors to help ensure compliance with the code. ODOE will monitor code implementation and evaluate actual energy savings. New technologies and practices make additional cost-effective energy savings possible. ODOE will assist the Building Codes Division with recommendations from the West Coast Governors' Global Warming Initiative to upgrade energy codes.

7. **Promote building commissioning as standard practice in nonresidential buildings.**
The building commissioning process ensures that the complex equipment providing lighting, heating, cooling, ventilating and other amenities in buildings works together effectively and efficiently. Studies on commissioning show that the practice provides savings of 15 to 30 percent. The Oregon Department of Energy continues to lead a project to make commissioning standard practice for public buildings in the Northwest. In addition to demonstrating and documenting commissioning in 36 buildings, ODOE provides information and commissioning guides.

Industry

8. **Apply best practices in Oregon industries and increase efficiency investments.**
To remain competitive, industry depends on stable supplies and prices for natural gas, electricity and petroleum. In 2004, natural gas prices doubled, petroleum prices were at a record high, and historically low electricity rates in the Northwest were at or above the national average. Companies that adopt the most efficient production methods reduce energy costs, waste and emissions while they improve productivity and often product quality.

   Competition for capital is acute and fixed costs are rising. The federal tax structure supports the write-off of energy cost expenditures, while capital investments in energy-efficient or renewable energy technology are recovered through depreciation of equipment. Continued business energy tax credits are critical to support investments in energy efficiency. The Oregon Department of Energy will continue to provide Oregon industries with up-to-date information on best practices and help them use the state tax credit. In addition, ODOE will assist industries in applying for national grants for research and innovative efficiency projects.

   ODOE has a grant to work with the states of California, Washington, Idaho, the national laboratories, the Northwest Food Processor's Association, the California League of Food Processors, utilities, and energy efficiency advocates. The purpose is to develop and disseminate information on best practices and emerging technologies to

help the food processing industry invest in energy and resource efficiency. In addition to helping the industry reduce costs, we hope to transfer the model to other industries.

9. **Assist Oregon's largest electricity consumers to invest in energy efficiency.** Oregon law allows large electricity consumers to directly invest much of the public purpose charge on their utility bills in energy efficiency and the above-market cost of renewable energy.

   ODOE will continue to certify that the proposed site, investments, and expenses are eligible as provided by law. ODOE will continue to provide technical help to Oregon's largest energy-using industries on efficiency opportunities. ODOE will promote all services and incentives available to the largest electricity consumers to encourage industry investments.

10. **Assist Oregon's energy efficiency and renewable fuels manufacturers to invent, produce, and sell state-of-the-art services and equipment.** Many Oregon businesses invent, design, manufacture, and deliver energy efficiency equipment, including wind energy generators, fuel cells and reformers, inverters for solar electric systems, controls, premium efficiency light fixtures, hybrid vehicle controls, renewable transportation fuels, and more. These businesses are creating jobs and helping Oregon's economy grow. ODOE will help find the latest information, develop networks of experts, and use the state's incentive programs to assist them.

Public Buildings

11. **Reduce energy bills for Oregon schools.** Oregon law sets aside funds for improving the energy efficiency of K-12 schools in the service areas of Portland General Electric and Pacific Power. Education service districts administer the funds. Funds must first go to energy audits, then to measures recommended by those audits. ODOE helps coordinate the program, provides technical help and quality control, manages a database to track the program, and reports on expenditures and results. Many of the audits already are completed. In the next two years, ODOE will work with the education service districts to implement $8 million to $10 million in energy efficiency projects.

    In addition, the Oregon Department of Energy (ODOE) recently received $1 million from an overcharge settlement to fund energy efficiency measures in Oregon K-12 public schools served by municipal utilities, people's utility districts, and electric cooperatives. Using separate funding ODOE will provide technical assistance for energy audits and project specifications.

    ODOE also will continue to provide funding to schools using the State Energy Loan Program, federal monies and other sources. ODOE identifies schools with high energy bills, conducts energy audits and makes recommendations for cost-effective efficiency measures.

12. **Develop high-performance school buildings.** ODOE will continue training for school staff, construction vendors, administrators and facility managers on the advantages of building high-efficiency, environmen-

tally sound buildings. ODOE provides technical assistance and funding via the State Energy Loan Program and the Business Energy Tax Credit Pass-through to help schools finance high performance energy-efficiency measures and meet the standards. Through 2004, one Oregon school has been built to meet the stringent Leadership in Energy and Environmental Design (LEED) Gold rating and five have been completed that meet the LEED Silver rating. Eight more schools have been constructed to meet federal High Performance Schools standards. At the end of 2004, four schools designed to meet the LEED Silver rating and five schools designed to meet federal High Performance Schools standards were under construction.

13. **Expand the use of the energy tax credit for governments and schools.**
The owner of a conservation project is allowed to transfer the state energy tax credit to an Oregon business in exchange for cash payment. The project owner may be a public institution. ODOE will continue to develop partnerships to promote this option for schools and local, state and federal buildings in Oregon. ODOE will coordinate these efforts with the State Energy Loan Program to invest in public building conservation measures.

14. **Increase the energy efficiency of new and remodeled state buildings by 20 percent or better.**
State law requires that new state buildings and major renovations be at least 20 percent more energy-efficient than required by Oregon's building code. ODOE recommends savings measures to consider in the design and reviews the plans to ensure targets are achieved. ODOE has provided assistance for 70 new or renovated state buildings and is working on more than 56 other projects. Estimated savings for completed buildings are about $2 million per year.

The law also requires existing state buildings to reduce electricity use 10 percent compared to energy use in 2000. The Oregon Department of Energy will continue to help state agencies develop and carry out conservation plans and use the State Energy Loan Program funds to help achieve the 10 percent reduction. ODOE will identify best practices for building design and energy-using systems and distribute its report to state agencies.

ODOE also has worked with a group of state agencies to evaluate whether they could get additional savings by aggregating loads and buying power on the open market. The group determined that the market wasn't mature enough yet, and that risks outweighed potential benefits. ODOE will continue to monitor the market.

15. **Establish energy savings performance contracting for public buildings.**
Energy savings performance contracting provides guaranteed energy savings to secure financing and pay for efficiency improvements without increasing operating budgets. Contractors also provide project management, reducing the need for in-house expertise. The Oregon Department of Energy has developed model contract documents for state and local governments and schools. ODOE demonstrated energy savings performance contracting with Oregon State University's Hatfield Marine Science Center and will continue to help other public agencies.

16. **Continue federally funded community energy projects.**
ODOE uses federal Rebuild America funds to provide technical help for resource-saving projects for schools, state agencies, local governments and others. Work includes design assistance, training, demonstration projects and technical analysis. ODOE will continue Rebuild America projects with Oregon State University, Willamette Education Service District, Portland Public Schools, Redmond School District, Canby School District, Salem-Keizer School District, Condon School District, The Dalles Middle School, Oregon Parks and Recreation Department, and the cities of Salem, Bend and Cannon Beach. Using grant funds, ODOE provides technical help with energy savings performance-contracting services for universities and K-12 schools.

Transportation

17. **Reduce drive-alone commuting.**
Reducing vehicle miles traveled for commuting is the most effective way to reduce Oregon's dependence on imported and polluting gasoline and diesel. ODOE provides employers with information and incentives for vanpooling, shuttles, employee bus passes, and for developing innovative transportation choices.

    ODOE coordinates the Columbia-Willamette Clean Cities Coalition. The group consists of fleet managers and alternative fuel industry representatives. The goal is to share information with fleet managers on the benefits of clean fuels, clean fuel vehicles and reducing vehicle miles traveled.

18. **Increase purchases of hybrid gas-electric vehicles.**
Hybrid gasoline-electric vehicles hold great potential for reducing fossil fuel use and vehicle emissions. The Oregon Department of Energy will continue to provide tax credits and low-interest loans to encourage hybrid vehicles for business and personal use. ODOE also will help the state motor pool buy more hybrid vehicles for the fleet.

19. **Foster alternative fuel production and fueling stations.**
Alternative fuels such as biodiesel, ethanol, natural gas, electricity and hydrogen are less polluting and diversify our transportation fuel supply. But they cost more than diesel and gasoline. ODOE will continue to provide information, technical help, tax credits and low-interest loans to encourage alternative fuel production and fueling stations in the state.

20. **Reduce truck idling.**
Interstate heavy-duty diesel trucks idle during rest stops to operate refrigeration units, maintain cab comfort, provide power to domestic appliances and accessories, and perform other functions. The Oregon Department of Energy will participate in state and regional efforts to reduce energy use and air pollution impacts associated with long duration idling. ODOE will also provide information, technical help, tax credits, and low-interest loans to encourage the reduction of truck idling. For example, ODOE has approved a tax credit and loan for the Lane Regional Air Pollution Authority program to install alternative power units on long-haul diesel trucks.

Clean Energy Resources

21. **Implement the Oregon's Renewable Energy Action Plan.**
At the direction of Governor Kulongoski, the Oregon Department of Energy led the formulation of the Oregon Renewable Energy Action Plan. The Plan's purpose is to encourage and accelerate the production of energy from renewable sources, stimulate economic development (particularly in rural areas), and improve the environment. The Plan sets long- and short-term goals for both electricity generation and transportation fuels. The Plan proposes a number of administrative actions to encourage renewable energy. One of the Plan's highlights is the 10-10 program, where renewable resources would meet 10 percent of Oregon's electricity load by 2015.

22. **Increase the share of renewable resources serving Oregon's energy needs.**
The Oregon Department of Energy will continue to provide loans and tax credit in coordination with incentives offered by the Energy Trust and Bonneville Power Administration. ODOE will provide technical support for the Energy Facility Siting Council's review of applications for renewable resource power plants, and provide information and technical assistance to local governments on model siting standards.

    ODOE has a federal grant and is leading a state Wind Working Group. The group includes farming and rural interests, developers, utilities, government agencies, and environmental groups. ODOE will continue to guide implementation of the group's Action Plan to overcome barriers to wind development, with a focus on locally owned small wind farms. ODOE also obtained funding for an Oregon Geothermal Working Group and will coordinate efforts to develop geothermal resources for electricity generation and direct use applications.

23. **Assess the feasibility of a state Renewable Portfolio Standard.**
The Renewable Energy Action Plan calls for an assessment of the feasibility of a state Renewable Portfolio Standard, which would require all electricity suppliers to gradually increase renewable resources used to supply power needs. Such a Renewable Portfolio Standard will be compared with production-based incentives as to its effectiveness to encourage renewable energy. A broadly based working group will explore the options.

24. **Support federal incentives for renewable resource generation.**
The federal energy production tax credit for investor-owned utilities and other companies has been extended to the end of 2005, along with a related production incentive for publicly owned utilities (the Renewable Energy Production Incentive or REPI). Congress expanded eligibility beyond wind and some crop-based resources to include solar, geothermal, small irrigation hydroelectric power, open-loop biomass, refined coal, agricultural livestock waste nutrients, municipal solid waste and landfill gas.

    ODOE will continue to work with Oregon's congressional delegation to extend the incentives for at least 10 years; to establish tradable credits for electric cooperatives, municipal power

providers and others; and to make REPI more consistently available. (REPI is now handled through annual appropriations separate from tax legislation.)

25. **Develop a registry for the Western electric grid to verify renewable energy claims.**
Power plants that use a renewable resource have two products for sale: electricity and environmental attributes such as cleaner emissions. Increasingly these products are sold separately, to different customers. Power from wind turbines, for example, is sold in the wholesale market at the same price as power from a coal or natural gas plant, and no claims are made that the generation process is any cleaner. The higher cost of the wind power is recouped through the sale of its environmental attributes to retail customers who pay a little more to increase the share of electricity that comes from renewable sources.

    To prevent fraud and ensure that customers get what they are paying for, ODOE is working with the Western Governors' Association and Western states to develop a Western Renewable Energy Generation Information System (WREGIS). The WREGIS will serve as an independent, regional electricity generation tracking system that will issue and track renewable energy certificates (known as WREGIS certificates). The system is being designed to meet the tracking and verification needs of regulators, utilities, generators, marketers, and other stakeholders in the West. The registry will validate sales claims for power sources, energy production and environmental characteristics. It will also facilitate sales and maintain consumer confidence in the green or renewable power market.

26. **Support customer choice of renewable resource generation.**
Oregon law requires Portland General Electric and Pacific Power to provide renewable resource rate options to their residential and small business customers. As of 2004, PGE ranked second in the U.S. in green power sales, and Pacific Power ranked fourth. The utilities regularly provide more than a million Oregon households and businesses with information on the environmental impacts and costs of electricity from renewable energy sources compared to fossil fuels. ODOE will continue to work with the Public Utility Commission, utilities, and third-party providers to enhance consumer choice and information programs.

27. **Remove transmission barriers to renewable energy development.**
Oregon has sizable wind resources. But a scarcity of transmission lines between the resource areas and load centers is a barrier to further development of wind power and other renewable resources, such as geothermal power.

    The Oregon Department of Energy will advocate that the Bonneville Power Administration, other transmission providers and project developers build the long-distance transmission system needed to support resource development and give renewable resources preferential access to the transmission currently available. Bonneville's policy on open capacity should give preference to electricity generated from renewable resources.

    ODOE will also urge that electricity system upgrades target renewable resources, including transmission for new, smaller generation that serves local needs.

We will also support development of local renewable resources and combined heat and power generation resources, which reduce the need for transmission.

To further address this issue, the Oregon Department of Energy will advocate early construction of the proposed 500-kilovolt-transmission line between the McNary and John Day dams on the lower Columbia River.

As part of Oregon's Renewable Energy Action Plan, a Renewable Energy Working Group will be formed to work on transmission and other issues. The Oregon Department of Energy would be staff to the working group.

28. **Encourage renewable energy research and demonstration projects.** The outstanding work of Oregon's universities and community colleges on renewables should be promoted to help Oregon businesses gain a national and international leadership role in the renewables market. ODOE will work with the universities, community colleges and other stakeholders to achieve that goal. The Oregon Department of Energy also will pursue collecting more data on wind characteristics to help community and locally owned wind farms and large-scale wind farm development. Such a publicly available database will help evaluate integration with the grid of large-scale wind energy.

    Information on the geochemistry of wells and springs is needed to assist the geothermal industry, state and federal agencies and research institutions in geothermal resource target evaluation. ODOE will work with the Oregon Geothermal Working Group on this and other efforts.

    The Oregon Department of Energy will also support continued funding for the University of Oregon's solar resource assessment work.

29. **Develop clean distributed resources to help meet Oregon's energy needs.** Generating electricity at or near the place it will be used can improve reliability of the electric grid, reduce the need for utility system upgrades, and cut demand for utility power during high-cost peak hours. New combined heat and power systems, including microturbines and fuel cells, are very efficient and provide the high-quality, reliable power that a growing number of businesses need. Many distributed generation systems, from solar panels to methane digesters, use clean renewable energy.

    These projects qualify for the State Energy Loans Program and the Business Energy Tax Credit. ODOE will continue to demonstrate and document the benefits of distributed generation, provide information, technical help and incentives for consumers, train equipment installers, and offer information to policy makers and the public. ODOE will help the dairy, wood, food, and paper products industries turn wastes or underutilized feedstock residues into renewable resource fuels for highly efficient combined heat and power.

    ODOE is working with the Public Utility Commission and others to identify and remove barriers to clean distributed resources. ODOE participates in PUC proceedings seeking to assure that these projects are economically viable.

Energy Supply

Siting Major Energy Facilities

30. **Continue reviewing applications for power plants and proposed Liquefied Natural Gas (LNG) terminals.**
Oregon law requires a site certificate before a large energy facility, such as a power plant, transmission line, gas pipeline or natural gas storage facility, can be built or operated in the state. The Oregon Energy Facility Siting Council makes decisions about siting most large energy facilities and issuing site certificates. The Oregon Department of Energy serves as staff and coordinates all permits required by state and local government agencies.

    ODOE has reviewed an unprecedented number of siting applications in the last four years. The high level of activity continues. ODOE is reviewing additional applications representing more than 3,000 megawatts of power plant capacity. The Oregon Department of Energy has or expects Notices of Intent for more power plants, half of which will be wind power.

    Production of natural gas has declined in North America for the past two years. Because of this decline, developers are proposing to license and build LNG terminals to import liquefied gas from overseas. These new proposals are energy facilities under Oregon Law, and in 2004, ODOE received the first Notice of Intent to file an application for this type of energy facility. ODOE will work closely with state and local government agencies as well as the Federal Energy Regulatory Commission to review LNG proposals.

31. **Work with the Energy Facility Siting Council to identify and resolve policy issues raised by some power plant applications.**
Among the issues are water supply conflicts, local air quality concerns and cumulative air impacts. Natural gas-fired power plants use tremendous quantities of water, and water use has been raised in several siting reviews. In addition, many members of the public have concerns about siting power plants in areas where they may affect important visual resources or farmland. We will review our standards and those of other agencies to address this.

32. **Implement Oregon's strategy for reducing greenhouse gases.**
Two efforts are underway related to global warming. The first is the three Governors' West Coast Climate Change Initiative, with the states of Oregon, Washington and California. The states are working on joint actions to reduce greenhouse gas emissions. One action for truckers is to use alternatives to serve their cab instead of idling the rigs all night. The three states are also considering the adoption of other measures, such as pooled purchasing for energy-efficient state vehicles and equipment. Common efficiency standards for appliances, which the federal government has failed to set, are also being considered

    Each state is also taking its own measures to reduce carbon dioxide emissions. In Oregon, the focus is the Governor's Advisory Committee on Global Warming. It comprises 28 public members representing a range of interests. The recommendations include support for implementation of the Renewable Energy Strategy, support for the energy efficiency

goals of the Northwest Power and Conservation Council, and other actions to help the region acquire as much cost-effective conservation as possible.

Adequate Supplies and Fair Prices

33. **Encourage needed investments in electricity supplies and delivery systems.**
Oregon's investor-owned electric utilities rely in part on short-term purchases of electricity and natural gas, particularly during drought years. In light of recent price hikes, least-cost plans for Oregon utilities should include more long-term acquisitions and renewable energy. ODOE will encourage strategies that diversify the resource mix and reduce the utilities' reliance on the short-term market.

    Further, electric transmission lines, natural gas storage facilities and interstate pipelines should expand rapidly enough to support appropriate resource choices for the growing economies in the West. ODOE is a member of the Western Interconnection Planning Work Group that is studying the need for transmission lines in the West.

34. **Intervene in wholesale power and transmission investigations and ratemaking proceedings.**
The Oregon Department of Energy (ODOE) will continue to participate in investigations by the State Attorney General to pursue refunds when abuses have occurred. Under the Williams Settlement, ODOE received $1 million of the $15 million total. The funds are being used to improve the energy efficiency of schools in Grant, Malheur, Union, Harney, Baker, Klamath, Gilliam, Lane, Tillamook, Columbia and Washington counties.

    The spikes in wholesale electric prices have raised concerns that competition may not be functioning effectively. To help prevent wholesale price manipulation, the Oregon Department of Energy will intervene in state and federal proceedings to ensure open access to distribution and transmission systems and limit the influence of the largest market players.

35. **Advocate for retail electric rate designs that encourage appropriate conservation, fuel switching and load shifting.**
Average prices of energy from the Bonneville Power Administration and Oregon's electric and natural gas utilities are set to recover past investments. Customers, however, will make the appropriate conservation and fuel-switching choices only if their bills reflect the resulting cost savings in the long run. Appropriate rate design can do that while still charging average prices that recover utility costs.

    The costs of serving electricity load are highest at times of peak system use. Reducing consumption during these periods reduces energy, transmission and distribution costs, lowering prices for all customers.

    ODOE will encourage rate designs and programs that provide appropriate conservation, fuel switching and load shifting.

36. **Ensure Oregon can provide energy for essential services during supply emergencies.**
Oregon imports all of its petroleum, natural gas and much of its electricity. Supply problems or accidents that affect distribution could create severe or prolonged shortages for Oregonians.

The Oregon Department of Energy is responsible for Oregon's Petroleum Contingency Plan. ODOE will ensure a coordinated response with the state's petroleum suppliers, law enforcement, other state agencies, and the counties. The revised plan will include a database with county-specific information on fuel use, designated emergency fueling stations, and maps of emergency routes.

In 2004, ODOE signed a Memorandum of Understanding with the Oregon Public Utility Commission to define roles and responsibilities in response to energy emergencies. In the event of rotating outages and other severe electricity emergencies the two agencies will be able to respond in coordination.

Energy will continue to work with the Federal Bureau of Investigation, the U.S. Department of Energy's Office of Energy Assurance, Bonneville Power Administration, and organizations identified as critical infrastructure within the private sector to ensure that Oregon and the Pacific Northwest are prepared to respond effectively to energy emergencies.

Nuclear Safety

37. **Advocate cleanup actions at the Hanford site that protect the health and safety of Oregonians and the environment.**
The U.S. Department of Energy's (USDOE) Hanford Nuclear Reservation in southeastern Washington is the largest environmental cleanup site in North America. The ODOE will push for thorough cleanup as it works with the Oregon Hanford Cleanup Board, USDOE, Hanford's regulators, stakeholders and tribal governments.

38. **Continue to improve and implement the state's transportation safety plan for radiological materials.**
ODOE administers the state's transportation safety program for radiological materials. ODOE will continue to provide training, maintain equipment and disseminate shipment information to local emergency response teams to ensure they can respond effectively to an accident involving radioactive materials. ODOE also will continue to work with the federal government and other Western states — primarily through the Western Governors' Association and the Western Interstate Energy Board — to develop and implement procedures governing the transport of radioactive materials to reduce the likelihood of an accident.

39. **Ensure Oregon is prepared to respond to nuclear emergencies.**
Although the risk of a nuclear emergency in Oregon is low, the consequences of such an event could be severe, particularly for the agricultural industry. ODOE administers the state's Nuclear Emergency Response Program. The program includes planning response to incidents at the Hanford nuclear site, Energy Northwest's Columbia Generating Station (a commercial nuclear plant on the Hanford site), the decommissioned Trojan nuclear plant near Rainier, and research reactors at Oregon State University in Corvallis and Reed College in Portland. ODOE will continue regular training and drills with state and county agencies to ensure they are ready to respond if a nuclear emergency occurs. The Oregon Department of Energy will also continue to refine and test execution

of the state's comprehensive, coordinated response to an emergency.

40. **Complete cleanup of mines in Lake County.** Uranium was mined at the White King and Lucky Lass mines in the Fremont National Forest, northwest of Lakeview. Both mines are listed as hazardous waste sites on the National Priorities List. ODOE is working with the U.S. Environmental Protection Agency (EPA), the Oregon Department of Environmental Quality (DEQ) and Kerr-McGee Corp. to clean up the two mine sites.

    In 2001, the EPA issued a decision that spells out how the site will be cleaned up. The EPA, DEQ and ODOE negotiated a consent decree through which Kerr-McGee agreed to perform the cleanup work. The design work began in 2003, and cleanup should be completed during the limited summer construction seasons of 2005 and 2006. In the future, ODOE may need to oversee management of surface water and groundwater.

State Program Achievements

Conservation and Renewable Resource Savings

Conservation is a cornerstone of Oregon's energy policy because it is the most environmentally clean resource and, over the long run, it is the cheapest. The Oregon Department of Energy provides information, demonstrates new technologies, and offers a variety of programs to encourage Oregonians to use energy more efficiently and to use renewable energy sources.

The 1975 Oregon Legislature set as state goals the promotion of "the efficient use of energy resources" and the development of "permanently sustainable energy resources."

This report describes ODOE's conservation and renewable resource programs, including energy loans, and gives estimated savings and electricity generation in 2003. These are the total energy savings and generation from activities since ODOE began its programs in 1979.

Electricity	6.1	billion kilowatt-hours
Natural gas	196.8	million therms
Oil	9.1	million gallons
Wood & other fuels	2.1	trillion Btu

Altogether, the yearly energy savings and electricity generated are 45 trillion Btu — enough to meet the energy needs of 542,000 Oregon homes. Those savings cut energy bills for Oregonians by $554 million a year.

Business Energy Tax Credit

Total number of tax credits: (since the program began)	7,461
Recipients	
Commercial firms	5,933
Manufacturers	924
Farms and ranches	604
Types of investment	
Conservation	5,906
(including 1,827 rental weatherization projects for 48,100 apartments and homes)	
Recycling	1,005
Renewable resources	550
Energy savings in 2003	
Electricity	1.8 billion kWh
Natural gas	100.5 million therms
Oil	6 million gallons
Wood and other	2.1 trillion Btu
Electricity generated in 2003	
1,035 million kWh	
Dollar value of savings and generation in 2003	
$227.3 million	

ODOE offers tax credits to businesses to encourage them to invest in energy conservation, renewable resources, recycling, alternative fuels, transportation efficiency and sustainable buildings. The owner of a project may transfer the tax credit to an Oregon business in exchange for cash payment. The project owner may be a public or non-profit institution.

The tax credit is 35 percent of the eligible cost of the project. The tax credit may be taken in one year for projects under $20,000. For larger projects, businesses take 10 percent of the credit in the first and second years and 5 percent each year thereafter. For conservation projects, the energy savings must pay back the investment in one to 15 years.

Among the most recent projects that received a Business Energy Tax Credit are:

- A large wood-products employer in Baker County replaced metal halide lamps with new energy-efficient lighting. They will receive a tax credit of $10,500 on their $30,000 investment.
- A farmers' cooperative in McMinnville installed variable frequency drive motors at a cost of $31,500. Their tax credit is more than $11,000.
- A farmer in Wasco County invested $72,645 in a new pivot sprinkler system saving not only water but reducing energy costs by $4,800 annually. The tax credit was $25,000.
- The Port of Tillamook Bay invested $800,000 in an anaerobic digester using the output from 4,000 cows. The project will generate more than 3.8 million kWh annually. Using the pass-through program, the Port received $200,000 to fund the project.
- A 68-unit apartment complex in Portland insulated and installed energy-efficient windows saving more than $7,000 annually in energy costs. The building owner received a tax credit for $35,000 and used the energy loan program.
- A university in Forest Grove is constructing a 40,000 square foot library. The building is being constructed to a LEED Silver rating by incorporating sustainable design and construction practices. Using the pass-through program, the university will invest $250,000 and receive a cash payment of $62,500.

Residential Energy Tax Credit

Total numer of tax credits (since the program began)	157,151
Renewable resource systems	
Solar water heating	17,645
Heat pump water heaters	300
Geothermal	2,090
Solar space heating	1,653
Solar electric	336
Wind	36
Hydro	20
	22,080
Appliances	
Clothes washers	68,704
Refrigerators	17,389
Dishwashers	39,123
Water heaters	1,055
Energy-efficient ducts	856
Heat pumps and aitr conditioners	417
Ventilation systems	6
Drain-water heat exchangers	24
	134,029
Alternative-fuel and hybrid vehicles	1,042
Energy savings in 2003	
Electricity	84.0 million kWh
Natural gas	1.8 million therms
Oil	11,000 gallons
Dollar value of savings and generation in 2003	$4.9 million

As new energy-saving technologies have come on the market, the Legislature has expanded the tax credit to encourage their adoption. Highly efficient appliances, including heating ducts and certain water heating systems, were added in 1997. The program expanded in 2000 to include fuel cells and in late 2001 to include highly efficient furnaces, boilers, heat pumps, ventilation systems and air conditioning systems.

Today, the tax credit is offered to households for the following:

- Up to $1,500 for solar and wind systems; up to $900 for geothermal systems
- A tax credit based on energy savings and cost for highly energy-efficient refrigerators, clothes washers, dishwashers, and certain water heating, space heating, cooling and ventilation systems and for sealing duct work
- Up to $750 for alternative-fuel vehicles and $750 for charging/fueling systems (a total of $1,500 for hybrid gasoline-electric vehicles)
- Up to $1,500 for fuel cells

State Home Oil Weatherization Program

Energy audits (since the program began):	43,545
Loans:	4,426
Loan amount:	$11.6 million
Rebates:	11,574
Rebate amount:	$6.5 million
Energy savings in 2003	
Oil:	1.9 million gallons

Dollar value of savings in 2003: $2.5 million

For households that heat primarily with oil, propane or wood, the Oregon Department of Energy's State Home Oil Weatherization Program offers a Home Energy Checklist and rebates for weatherization and heating measures. Oil companies doing business in Oregon fund the program. The program has also been streamlined to allow homeowners to conduct their own audits.

About 100,000 Oregon homes are heated with oil or propane. Most of them were built before energy standards were part of the building code and are often in need of weatherization and heating measures.

Energy-Efficient Manufactured Homes

Number of energy-efficient homes manufactured and sited in Oregon since mid-1995: 24,024

Energy savings in 2003	
Electricity:	125 million kWh
Natural gas:	536,000 therms

Dollar value of savings in 2003: $9.4 million

Unlike homes and apartments built on site, manufactured homes are not subject to Oregon's building code. Instead, federal law governs energy efficiency and other aspects of manufactured homes. Federal energy standards are minimal. ODOE has worked with the manufactured home industry in the Northwest since 1988 to build energy-efficient homes.

Under a voluntary agreement with 20 regional manufacturers, ODOE certifies homes that are very efficient. Homes that meet the standards are labeled Super Good Cents® or Energy Star. Compared to homes built to federal standards, these homes have more insulation, more efficient windows and doors, better sealed heating ducts, improved air sealing and a specially designed ventilation system. On average, the homes reduce the energy needed for heat by half.

Under the agreement, ODOE:

- Approves design plans
- Inspects homes at the plant
- Troubleshoots for homebuyers and manufacturers on any energy-related problems
- Researches and tests new energy-efficient building practices and materials
- Provides marketing assistance

More than 60% of Oregonians buying a manufactured home have chosen to buy an energy-efficient model.

Transportation Program

Project Type	# of Projects	Vehicle Miles Reduced
Commuter Pool Vehicles	14	7,855,632
Transportation Management Association	11	45,403,068
Transit Passes	111	116,636,666
Transit-Shuttles	7	576,729
Financial Incentives	19	12,611,758
Bicycles	11	335,199
Telework	32	364,545
Total:	**205**	**183,783,597**

ODOE works with business and governments to increase use of public transit, carpools, vanpools and bicycles. Energy encourages adoption of telework, employer financial incentives, transit passes, and other transportation alternatives. A key tool to encourage creative transportation options is the Business Energy Tax Credit.

Residential Building Codes

Number of homes built to energy standards	
Single-family	276,000
Multi-family	150,000
	426,000
2003 energy savings	
Electricity:	952 million kWh
Natural gas:	58 million therms

Dollar value of savings in 2001: $123.1 million

The cheapest and most effective way to ensure a home is energy-efficient is to build it that way. In 1974, Oregon became the first state to include energy standards in a statewide building code. The standards required minimum insulation levels in ceilings, walls and floors. Before that time, most Oregon homes were built with little, if any, insulation. Almost one-third of Oregon's 1.4 million existing houses and apartments are built to energy standards.

The energy standards have been raised several times since then. Changes to standards for space heating, cooling, ventilation, water heating, lighting and building envelope took effect in 2003. The changes will reduce energy use 5 to 10 percent in new houses. A home built today requires about half the energy to heat as a home built before the energy standards.

ODOE's role is to submit recommendations to the Building Codes Division for cost-effective changes to the standards and provide training and technical help for the building industry and local building departments.

Commercial Building Codes

2003 energy savings*	
Electricity:	1.4 billion kWh
Natural gas:	13.8 million therms

(*Since 1983)

Dollar value of savings in 2003: $97.7 million

Building envelope and heating, ventilation and air conditioning (HVAC) standards became part of the state building code for commercial buildings in 1978. The standards address lighting, the heat loss and gain of the building shell, and the efficiency of heating, ventilation and cooling systems. The standards were raised in 1988, 1995, and 2003. Changes that took effect late in 2003 are estimated to save about 10 percent more energy than the previous code.

The Oregon Department of Energy submits recommendations for cost-effective changes to the standards and provides training and technical help for designers, contractors and local building departments. Oregon's commercial code is about 5 percent more energy-efficient than the national standard.

Large Electric Consumer Public Purpose Program

Number of completed projects: 76

2003 energy savings

Electricity:	148.2 million kWh

Dollar value of savings in 2003: $1.5 million

Under Senate Bill 1149, Portland General Electric and Pacific Power must collect a public purpose charge from both residential and business consumers within their service areas. The public purpose charge is 3 percent of the total electric costs charged to a customer. It went into effect on March 1, 2002.

Large electric consumers (over one average megawatt or 8,650,000 kilowatt hours a year) may be eligible to self-direct portions of their public purpose charges. The Oregon Department of Energy reviews and certifies applications by large electric consumers for conservation projects and renewable energy resources. ODOE administers the program through an interactive Web site. As of December 2004, about 30 sites were actively participating in this self-direction program.

Energy-Efficient New State Buildings

Number of of energy-efficient new or renovated state buildings: 70

2003 energy savings

Electricity:	24.9 million kWh
Natural gas:	510,000 therms
Other:	3.9 billion Btu

Dollar value of savings in 2003: $2.0 million

An Oregon law enacted in 1990 requires that new state buildings and major renovations be as energy-efficient as possible — within cost-effectiveness guidelines. In response to the electricity crisis of 2001, legislation established a standard that is 20 percent better than building code.

ODOE recommends savings measures to consider in the design and reviews the plans to ensure targets are achieved. Typical measures adopted include energy efficiency improvements for windows, lighting, controls, and heating, ventilation and air conditioning equipment. By the end of 2003, 70 state buildings had been built or renovated with energy efficiency measures that go beyond code requirements. Average energy savings exceed 20 percent.

Alternative Fuels

Business tax credits

Vans/trucks (propane or natural gas)	315
Buses (propane or natural gas)	228
Forklifts (natural gas)	57
Cars (natural gas or electric)	138
Fueling stations (natural gas)	25

Residential tax credits

New gasoline-electric cars	1,017
New electric vehicles	3
New natural gas vehicles	2
Electric conversions	13
Propane conversions	2
Biodiesel conversions	2
Charging system	3

Vehicles that run on alternative fuels such as natural gas, biodiesel, liquefied natural gas, electricity, propane, methanol, ethanol and hydrogen are less polluting than vehicles that burn gasoline

or diesel. In 1991, the Legislature made alternative-fuel vehicles and fueling stations eligible for the Business Energy Tax Credit. In 1997, the Legislature expanded the Residential Energy Tax Credit to include alternative-fuel vehicles and fueling systems. Hybrid vehicles have rapidly increased in market share since being introduced in the late 1990s.

Oregon's first biofuel production facility is currently under development. The State of Oregon Department of Administrative Services Motor Pool Division plans to bring to Oregon its first ethanol (E-85) fueling station. In addition, five fuel vendors are providing biodiesel, oil distilled primarily from soybeans, to fleets throughout the state.

Schools

Number of school buildings completed since 1997:	117
Total incentives:	$742,000
2003 energy savings	
Electricity:	12.2 million kWh
Natural gas:	4.8 million therms
Other:	1.1 billion Btu

Dollar value of savings in 2003: $4.5 million

Oregon's electric industry restructuring law sets aside funds for improving the energy efficiency of schools in the service areas of Portland General Electric and Pacific Power. Education service districts administer the funds. More than 800 schools will benefit. Funds must first go to energy audits, then to measures recommended by those audits. The Oregon Department of Energy (ODOE) helps coordinate the program and provides technical help.

For schools statewide, ODOE provides training for school staff and construction vendors on building highly efficient, productive and environmentally sound buildings. Several school districts also are using construction bid specifications that ODOE wrote to ensure that energy-using systems operate correctly from the start.

In addition, ODOE developed specifications for energy-efficient portable classrooms, which many schools are using to accommodate increasing numbers of students. The energy-efficient classrooms reduced energy bills 30 to 50 percent compared to similar classrooms that meet only minimum standards.

ODOE has used federal Rebuild America funds to provide technical assistance for resource-saving projects for schools across the state. Work includes design assistance, training, demonstration projects and technical analysis.

Other Programs

Information from ODOE is available for building commissioning, energy savings performance contracting, demand-controlled ventilation, resource-efficient irrigation, and combined heat and power systems. Energy-saving ideas for businesses and homeowners have been promoted through the annual Energy Awareness campaign.

ODOE also works with federal programs that set appliance standards, help industry adopt efficiency practices, promote energy-efficient technologies and support installation of solar energy systems.

Energy Loan Program

Approved by the voters in 1980, the State Energy Loan Program (SELP) has made 606 loans since it began, totaling more than $315 million. SELP's

purpose is to promote energy conservation and renewable energy development. The program offers low-interest, long-term loans for projects that:

- Save energy
- Produce energy from renewable resources such as water, wind, geothermal, solar, biomass, waste materials or waste heat
- Use recycled materials to create products
- Use alternative fuels

The Loan Program can loan to individuals, businesses, schools, cities, counties, special districts, state and federal agencies, public corporations, cooperatives, tribes, and non-profits. The loans are funded by the sale of state general obligation bonds. Borrowers pay the costs of administering the program.

Conservation Loans

Of the 403 conservation loans made by the program through 2003, 152 have been to businesses, 80 to school districts, 61 to local governments and 35 to state government. Others receiving loans include Oregon colleges and universities, and tribal governments.

Renewable Resource Loans

Through 2003, SELP made more than 200 loans for renewable resource projects, with 77 for geothermal, 59 for solar, 29 for hydro, 18 for biomass, 16 for waste heat and one for wind.

Energy Savings and Generation in 2003

Electricity:	444.8 million kWh
Natural gas:	17.25 million therms
Oil/Diesel:	1.16 million gallons
Wood/other:	12 billion Btu
Electric Generation:	545.1 million kWh

Dollar Value of savings and production in 2003: $76.3 million

Besides loans for proven technologies, the program showcases innovation. Among the projects funded by the Energy Loan Program in 2003 and 2004 are:

- Associated General Contractors of America reconfigured their HVAC system with a $124,000 energy loan. They installed state-of-the-art variable frequency drives for the air handlers and variable air volume units controlled by direct digital controls. AGC expects the building to save about 24 percent.
- A Portland athletic club borrowed $140,000 to create a "green" addition to their facility, nearly doubling their square footage but keeping their energy costs to less than 60 percent of similar buildings.
- The Tamarack Wellness Center in Eugene received a loan of $273,000 for a 24 kW photovoltaic system and a solar domestic hot water system for the showers and therapy pool complex.
- A homebuilder borrowed $230,000 for a demonstration home in Bend. It included integrated energy features such as net-metered solar photovoltaics, structural insulated panels and insulated concrete forms.
- Oregon growers borrowed $665,000 for orchard fans. These wind machines use the temperature inversion to warm crops by convection rather than diesel smudge pots resulting in cleaner air and reduced energy use.
- The Round at Beaverton received a $1.6 million loan for construction of a centralized heating, cooling and domestic hot water delivery system in the mixed-use building complex on the light rail line.
- Oregon schools and universities received loans for more than $2.15 million including $1,000,000 for the University of Oregon's Lillis Business Complex, which incorporated many sustainable and renewable energy features.

- Loans in excess of $766,000 were used for weatherization and HVAC upgrades for Oregon apartment buildings, resulting in lower utility bills for tenants, and lower vacancy rates for property owners.

Acquiring Energy Resources

The Energy Facility Siting Process

The Energy Facility Siting Council, a seven-member citizen commission appointed by the Governor and confirmed by the Senate, makes siting decisions for large energy facilities. ODOE serves as its technical and administrative staff. ODOE reviews an application for site certificate, coordinates the review of other state agencies and local governments, and issues a proposed decision for public comment and Council consideration.

The Council has the authority to exempt proposed developments from its siting authority if certain criteria are met. High-efficiency cogeneration power plants, grain-based ethanol plants and temporary power plants are among those the Council has exempted from siting standards. These plants have little environmental or community impacts as long as the criteria are met.

The Energy Facility Siting Council uses all relevant state and local criteria in making its siting decision. In addition to their own standards, they apply applicable Oregon Department of Environmental Quality (DEQ), Department of State Lands, Oregon Department of Fish &Wildlife, Oregon Water Resources and local land use requirements. Only DEQ's federally-delegated water and air quality permits are excluded from Council review.

The Council affords the public a single review and set of hearings in which to participate. Developers have one process for all state and local government requirements. A siting decision can only be appealed to the Oregon Supreme Court. Oregon's consolidated siting process is a powerful tool for state consideration of these complex proposals.

New Generating Capacity in Oregon

Since 1990, ODOE and the Council have approved nine applications for large power plants. Six power plants have been built: Coyote Springs Power Plant, Hermiston Generating Plant, Hermiston Power Plant, Stateline Wind Plant, Klamath Expansion Project and Klamath Cogeneration Plant. Of the three most recent Council approvals, only the Port Westward Power Plant was under construction in late 2004. Construction has not begun on COB near Klamath Falls or Summit Westward near Clatskanie.

Proposals Under Review

The Klamath Expansion Project (a temporary 100 MW power plant), owned by Pacific Power (a PacifiCorp Company) Power Marketing, is being reviewed for permanent operation under a law adopted by the legislature in 2001 addressing the electricity shortages of that winter season. This single-cycle peaking plant will operate when demand and prices are high enough to justify its use.

ODOE and the Council have been reviewing an unprecedented number of energy facility proposals. Turner Energy Center in Marion County, the Klamath Generating Project, and the West Cascades Energy Facility in Lane County have submitted applications for a site certificate.

One approved site, the Stateline Wind facility, received an amendment to its site certificate to nearly double the number of turbines and power output at a site in Umatilla County.

Other developers are investigating possible proposals in Oregon. Those include:

- Wind facilities in Tillamook, Sherman and Gilliam counties
- Liquefied natural gas import terminals in the Coos Bay and Columbia and Clatsop counties
- Industrial cogeneration proposals are possibly in line for Council review beginning in 2005.

The number of proposed power plants reflects developers' hopes to build for the future competitive wholesale electricity market. Capacity for gas and electricity transmission, availability of capital and market prices will affect decisions to build power plants. Not all of the facilities reviewed will be built.

Site Certificates Approved

In 2003, the Council approved an application for a large natural gas pipeline. The Northwest Natural pipeline through Washington, Clackamas and Marion counties was put into service in September 2004.

In November 2004, the Council approved issuance of a site certificate to COB Energy Facility LLC for the proposed COB Energy Facility, subject to conditions. The proposed facility is a 1,150-megawatt, combined-cycle combustion turbine system, three miles south of Bonanza in Klamath County. A new 7.2-mile, 500 kV transmission line would connect the proposed facility to the Captain Jack substation to the south. Natural gas would be supplied to the proposed facility through a new 4.1-mile lateral from an existing interstate pipeline. Water would be supplied from a well about 2.8 miles from the proposed site.

Amendments

Amendments to site certificates for existing energy facilities have been reviewed and approved as well. Northwest Natural's Mist underground gas storage facility in Columbia County was approved for expansion in December 2003. In June 2003, the Council approved a major expansion of the Stateline Wind facility in Umatilla County. Several amendments of the Port Westward, Summit Westward and South Mist Extension pipeline were approved to allow administrative and site design changes.

Exemptions

Several high efficiency cogeneration facilities, temporary power plants or biomass fuel plants have been granted exemption from Council jurisdiction. These plants have not yet gone forward because wholesale prices have been too low for them to operate profitably. These include the Columbia River Energy project (43 MW), West Linn Paper project, (between 42 and 94 MW) and the Cascade Grain Ethanol plant in Columbia County.

Administrative Rule Changes

The Council adopted rules to define how staff will review proposals for carbon dioxide offset projects in August 2003. In addition, the Council adopted amendments to its rules interpreting the Council's authority under ORS 469.501(3) to balance the overall public benefits of a proposed energy facility against the damage to resources protected by any Council standard the facility does not meet. The Council concluded that the balancing rule would continue to be applied only in special circumstances that will rarely occur. Other changes to Council rules were made to clarify requirements and improve the process.

Model Siting Ordinance

The Oregon Department of Energy published a model land use ordinance to assist local governments in the siting of energy facilities not under Council jurisdiction. Oregon can expect to see more small energy facilities as technology improves for micro-turbines, fuel cells and other combined heat and power applications. The ordinance covers gas and electric transmission and distribution lines, cogeneration, wind and solar installations and hydroelectric facilities.

Biomass

Biomass includes plant and other organic matter, and it can provide electricity, heat and transportation fuel. ODOE's tax credits and loans have funded a number of biomass energy projects.

ODOE publishes annually a directory of Oregon biomass energy facilities and places on its Web site information about biomass energy technology, uses and resources in the state. ODOE also conducts studies, educational events, and provides technical assistance and secures federal funding for Oregon biomass projects.

In December 2003, the Oregon Department of Energy assessed forest and agricultural resources for electricity generation and ethanol production in Wallowa, Union and Baker counties. The report showed that the use of biomass for electric power or ethanol production would have net economic benefits, including an estimated six jobs created for each megawatt (MW) of biomass power capacity that is installed. ODOE also funded a research project on cellulose-ethanol technology.

In 2001, ODOE published a report on Western Forest Health and the use of Oregon forest resources for energy production. It concluded that a biomass energy market may be the key to initiating many forest restoration projects and that the potential for breaking through the forest health-biomass energy gridlock is promising in eastern Oregon.

Nuclear Safety Priorities

Hanford Cleanup

The Oregon Department of Energy continues to work towards a formal role for Oregon in the cleanup of chemical and radioactive waste at the Hanford Nuclear Site. ODOE also serves on the Hanford Advisory Board and as members of the Hanford Natural Resources Trustee Council. National participation includes the National Governor's Association and the State and Tribal Government Working Group.

ODOE does not view some cleanup decisions by the U.S. Department of Energy (USDOE) as fully protective of the environment. In July 2004, ODOE exercised its rights as a Trustee of Hanford's natural resources by joining with the State of Washington to file a notice of intent to sue USDOE over its failure to adequately assess natural resource injury. The notice to sue has resulted in improved discussions with USDOE. As of December 2004, Oregon planned to hold off on proceeding with litigation.

ODOE continues to be involved with litigation that challenges an internal USDOE order allowing it to redefine some high-level radioactive waste as incidental waste. Among Hanford's more than 1,800 waste sites are 177 aging underground storage tanks that hold about 53 million gallons of highly radioactive and chemically hazardous waste. During the cleanup process, some residual waste will likely remain in the tanks. Oregon is concerned that USDOE might leave waste in the tanks that should be retrieved, immobilized, and disposed of in a deep geologic repository.

ODOE is also closely following litigation filed by the State of Washington that attempts to stop waste from coming to Hanford until the full environmental impacts of these actions are assessed.

Through meetings and presentations, ODOE keeps Oregonians informed about Hanford cleanup decisions. Since January 2003, an advisory board to ODOE – the Oregon Hanford Cleanup Board – has conducted six meetings in northeast Oregon and along the Columbia River. Through ODOE's Community Outreach program, more than 4,500 Oregonians have been informed about the importance of Hanford cleanup.

Emergency Preparedness

ODOE is responsible for preparing and responding to nuclear emergencies, petroleum disruptions or shortages, and electricity emergencies involving the State's 38 consumer-owned utilities.

To ensure a timely and effective response to nuclear, petroleum, and electricity emergencies impacting Oregon, ODOE developed the capability to coordinate its emergency operations from within the agency. ODOE's Emergency Operations Center (EOC) opened on July 1, 2004 and was activated for the first time on July 30, 2004 in response to an actual emergency declared at the Columbia Generating Station in south-central Washington. The EOC allowed ODOE to promptly assess the severity of the event and determine there would not be any adverse impacts to Oregon as a result of the nuclear power plant emergency. The Federal Emergency Management Agency certified ODOE's EOC as a fully functional emergency center after a five-hour evaluation of its setup and operation.

ODOE participates regularly in planning meetings and drills to ensure that the State of Oregon is prepared to respond to an incident at a nuclear facility. ODOE participated in eight nuclear emergency preparedness drills and exercises in 2004. The Federal Emergency Management Agency had a positive review of ODOE's performance.

The Oregon Department of Energy's Petroleum Contingency Plan will ensure a coordinated response with Oregon's petroleum suppliers, law enforcement, other state agencies, and the 36 counties. To improve the overall fuel allocation process during a crisis, ODOE is developing a database with sensitive information on fuel use, designated emergency fueling stations, and maps of emergency routes.

ODOE signed a Memorandum of Understanding with the Oregon Public Utility Commission (PUC) to define roles and responsibilities in energy emergencies. While ODOE is responsible for petroleum contingency planning and the PUC for natural gas, the two agencies have joint responsibilities in planning and responding to electricity emergencies. The memorandum improves the coordination and response between the two agencies in a severe electricity emergency.

Transportation Safety

The Oregon Department of Energy regulates the transportation of radioactive materials in Oregon and maintains an effective capability of responding to a transportation incident. Since January 2003, there have been more than 555 radioactive shipments in Oregon and no accidents.

ODOE contracts with Oregon State Health Services to provide radiological response training for emergency responders. Since January 2003, 781 firefighters, police officers, paramedics and hospital emergency room staff received this training. ODOE also provided advanced radiological response training in 2003 and 2004 to members of Oregon's regional Hazardous Material Response Teams through its contract with Oregon

State University's Radiation Center. In addition, ODOE routinely calibrates and maintains the radiation detection equipment it provided to local emergency response agencies.

The Oregon Department of Energy continues to support shipments of transuranic waste from the Hanford Site to the Waste Isolation Pilot Plant in New Mexico. Since these shipments began in July 2000, USDOE has successfully made 121 such shipments. The Oregon Department of Transportation stops and inspects a sampling of these shipments.

In 2003, ODOE resumed discussions with other Western states and USDOE regarding procedures for the future shipment of spent nuclear fuel to a national repository. Shipments would originate at the shutdown Trojan nuclear plant, from the Columbia Generating Station near Richland, Wash., and from the Hanford Site. Those shipments could begin by 2010.

OREGON DEPARTMENT OF ENERGY

The mission of the Oregon Department of Energy is to ensure Oregon has an adequate supply of reliable and affordable energy and is safe from nuclear contamination, by helping Oregonians save energy, develop clean energy resources, promote renewable energy, and clean up nuclear waste

Appendix A *Electric Utilities Serving Oregon's Counties*

Baker	Oregon Trail Electric Cooperative, Idaho Power Company
Benton	Consumer Power Inc., Pacific Power
Clackamas	Canby Utility Board, Portland General Electric
Clatsop	West Oregon Electric Cooperative, Claskanie People's Utility District, Pacific Power
Columbia	West Oregon Electric Cooperative, Columbia River Public Utility District, Claskanie People's Utility District, Portland General Electric
Coos	Coos-Curry Electric Cooperative, Central Lincoln People's Utility District, City of Bandon Electric Department, Pacific Power
Crook	Central Electric Cooperative, Pacific Power
Curry	Coos-Curry Electric Cooperative, Central Lincoln People's Utility District
Deschutes	Midstate Electric Cooperative, Central Electric Cooperative, Pacific Power
Douglas	Coos-Curry Electric Cooperative, Douglas Electric Cooperative, Central Lincoln People's Utility District, City of Drain, Pacific Power
Gillam	Wasco Electric Cooperative, Columbia Basin Electric Cooperative
Grant	Oregon Trail Electric Cooperative, Central Electric Cooperative, Columbia Power Cooperative
Harney	Oregon Trail Electric Cooperative, Harney Electric Cooperative, Idaho Power Co.
Hood River	Hood River Electric Cooperative, City of Cascade Locks, Pacific Power
Jackson	City of Ashland Electric Department, Pacific Power
Jefferson	Central Electric Cooperative, Wasco Electric Cooperative, Pacific Power
Josephine	Pacific Power
Klamath	Midstate Electric Cooperative, Pacific Power
Lake	Midstate Electric Cooperative, Central Electric Cooperative, Surprise Valley Electric Cooperative, Harney Electric Cooperative, Pacific Power
Lane	Blachly-Lane Electric Cooperative, Consumer Power Inc., Lane Electric Cooperative, Midstate Electric Cooperative, Central Lincoln People's Utility District, Emerald People's Utility District, Eugene Water & Electric Board, Springfield Utility Board, Pacific Power
Lincoln	Central Electric Cooperative, Consumer Power Inc., Central Lincoln People's Utility District, Pacific Power
Linn	Consumer Power Inc., Pacific Power
Malheur	Harney Electric Cooperative, Idaho Power Company
Marion	Consumer Power Inc., Salem Electric Cooperative, Pacific Power, Portland General Electric
Morrow	Umatilla Electric Cooperative, Columbia Basin Electric Cooperative
Multnomah	City of Cascade Locks, Pacific Power, Portland General Electric
Polk	Consumer Power Inc., Salem Electric Cooperative, City of Monmouth Power & Light, Pacific Power, Portland General Electric
Sherman	Wasco Electric Cooperative, Columbia Basin Electric Cooperative
Tillamook	Tillamook People's Utility District
Umatilla	Umatilla Electric Cooperative, Columbia Basin Electric Cooperative, Columbia Power Cooperative, Milton-Freewater City Light & Power, Pacific Power, Hermiston Energy Services
Union	Oregon Trail Electric Cooperative, Umatilla Electric Cooperative
Wallowa	Pacific Power
Wasco	Central Electric Cooperative, Wasco Electric Cooperative, Northern Wasco County PUD
Washington	West Oregon Electric Cooperative, City of Forest Grove Power & Light Dept. Portland General Electric
Wheeler	Wasco Electric Cooperative, Columbia Basin Electric Cooperative, Harney Electric Cooperative, Columbia Power Cooperative
Yamhill	West Oregon Electric Cooperative, McMinnville Water & Light, Portland General Electric

Appendix B *Energy Glossary*

Average Megawatt — An aMW is 8,760 megawatt hours. This is the continuous output of a resource with one megawatt of capacity over a full year. The Northwest Power and Conservation Council says one average megawatt is enough electricity to supply about 600 electrically heated homes for one year.

Base Load — The minimum amount of electric power or natural gas delivered or required over a given period of time at a steady rate. The minimum continuous load or demand in a power system over a given period of time usually not temperature sensitive.

Biofuels — Alcohols, ethers, esters, and other chemicals made from raw biological material such as herbaceous and woody plants, agricultural and forestry residues, and a large portion of municipal solid and industrial waste.

Biomass — Organic waste from agricultural, livestock, and lumber industry products, dead trees, foliage, etc., and is considered a renewable energy source. Biomass can be used as fuel and is most often burned to create steam that powers steam turbine generators. It is also used to make transportation fuels like ethanol and biodiesel.

Btu — British thermal unit; the amount of heat required to raise the temperature of one pound of water one degree Fahrenheit under stated conditions of pressure and temperature (equal to 252 calories, 778 foot-pounds, 1,005 joules and 0.293 watthours). It is the U.S. customary unit of measuring the quality of heat, such as the heat content of fuel.

Building Envelope — Outer walls, windows, doors, etc. of a building or the building shell.

Carbon Offset — A mechanism by which the impact of emitting a ton of CO2 can be negated or diminished by avoiding the release of a ton elsewhere, or absorbing a ton of CO2 from the air that otherwise would have remained in the atmosphere.

Carbon Sequestration — The fixation of atmospheric carbon dioxide in a carbon sink through biological or physical processes, such as photosynthesis.

Carbon Sink — A reservoir that absorbs or takes up released carbon from another part of the carbon cycle. Vegetation and soils are common carbon sinks.

CO — Carbon Monoxide

CO2 — Carbon Dioxide

Cogeneration — (also Combined Heat and Power) Production of electricity from steam, heat, or other forms of energy produced as a by-product of another process.

cf—cubic foot; the U.S. customary unit of measurement of gas volume. It is the amount of gas required to fill a volume of one cubic foot under stated conditions of temperature, pressure and water vapor. One cubic foot of natural gas equals 1,000 British thermal units under standard conditions of atmosphere (one) and temperature (60 degrees Fahrenheit).

Cooperative Electric Association or Utility — utility owned and operated by its members.

Demand — The rate at which electric energy is delivered to or by a system or part of a system, generally expressed in kilowatts (kW), megawatts (MW), or gigawatts (GW), at a given instant or averaged over any designated interval of time. Demand should not be confused with Load or Energy.

Deregulation — The elimination or restructuring of regulation from a previously regulated industry or sector of an industry.

Distillate Fuel Oil — Light fuel oils distilled during the refining process and used primarily for space heating, on-and-off highway diesel engine fuel (including railroad engine fuel and fuel for agricultural machinery), and electric power generation.

Distribution — The delivery of electricity to the retail customer's home or business through low voltage distribution lines.

DOE — U.S. Department of Energy, also called USDOE.

Electric Energy — The generation or use of electric power by a device over a period of time, expressed in kilowatt-hours (kWh), megawatt-hours (MWh), or gigawatt-hours (GWh).

Electric System Losses — Total electric energy losses in the electric system. Losses are primarily due to electric resistance within transmission system lines and transformers.

End-Use Energy — Energy consumed by end-users in the end-use sectors.

End-Use Sector — The residential, commercial, industrial, and transportation sectors of the economy.

Energy Conservation — Using less energy, either by greater energy efficiency or by decreasing the types of applications requiring electricity or natural gas to operate.

Energy Efficiency — Using less energy (electricity and/or natural gas) to perform the same function at the same level of quality. Programs designed to use energy more efficiently — doing the same with less.

EPA — U.S. Environmental Protection Agency.

Federal Energy Regulatory Commission (FERC) — The Federal Energy Regulatory Commission regulates the price, terms and conditions of power sold in interstate commerce and regulates the price, terms and conditions of all transmission services. FERC is the federal counterpart to state utility regulatory commissions.

Flex Fuel Vehicle — Also called a dual fuel vehicle, is one with an engine capable of operating on two different types of fuels.

Fossil Fuels — Sources of energy from the earth, primarily crude oil, natural gas, and coal.

Fuel Switching — The substitution of one type of fuel for another, either temporary or permanent. Permanent might include someone who replaces gasoline-powered fleet vehicles with electric cars.

Geothermal Energy — The energy from the internal heat of the Earth, which may be residual heat, friction heat, or a result of radioactive decay. The heat is found in rocks and fluids at various depths and can be extracted by drilling or pumping.

GWh — gigawatt-hour; the unit of energy equal to that expended in one hour at a rate of one billion watts. One GWh equals 1,000 megawatt-hours.

Green Tags — are created when a renewable energy facility generates electricity. Each certificate or tag represents all of the environmental attributes or benefits of a specific quantity of renewable generation. Those include the benefits that everyone receives when conventional fuels, such as coal, oil, or gas, are displaced.

Greenhouse Gases — Greenhouse gases are water vapor, carbon dioxide, tropospheric ozone, nitrous oxide, methane, and chlorofluorocarbons (CFCs).

Grid — A system of interconnected power lines and generators that is managed so that power from generators is dispatched as needed to meet the requirements of the customers connected to the grid at various points.

Hogged Fuel — The bark, sander dust and other wood-related scrap not usable in product production that is burned in biomass boilers.

Investor Owned Utility (IOU) — Common term for a privately owned (shareholder owned) gas or electric utility regulated by the Oregon Public Utilities Commission.

Interconnected System — A system consisting of two or more individual electric systems that have

connecting tie lines and whose operations are synchronized.

KV — A kilovolt equals 1,000 volts.

Kilowatt (kW) — This is a measure of demand for power. The rate at which electricity is used during a defined period (usually metered over 15-minute intervals). Utility customers generally are billed on a monthly basis; therefore, the kW demand for a given month would be the 15- minute period in which the most power is consumed.

Kilowatt-hour (kWh) — This is a measure of consumption. It is the amount of electricity that is used over some period of time, typically a one-month period for billing purposes. Customers are charged a rate per kWh of electricity used.

Load — An end use device or customer that receives power from an energy delivery system. Load should not be confused with Demand, which is the measure of power that a load receives or requires.

Load Shifting — A type of load management that shifts use from peak to off-peak periods.

Liquefied Natural Gas (LNG) — Natural gas (primarily methane) that has been liquefied by reducing its temperature to -260 degrees Fahrenheit at atmospheric pressure.

Microturbines — Small, combustion turbines used for small-scale power generation.

MW — A megawatt equals 1,000 kilowatts or 1 million watts.

MWh — A megawatt-hour; the unit of energy equal to that expended in one hour at a rate of one million watts. One MWh equals 3,414,000 Btu.

NOx — Nitrogen Oxides

PV — Photovoltaic or solar electricity

Peak Load or Peak Demand — The electric load that corresponds to a maximum level of electric demand within a specified time, usually a year.

Pulping Liquor — A substance primarily made up of lignin (the chief non-carbohydrate constituent of wood), other wood constituents and chemicals that are by-products of the manufacture of chemical pulp. It can be burned in a boiler to produce steam or electricity through thermal generation.

Radioactive Waste — Radioactive or nuclear wastes are the wastes that result from nuclear weapons production, nuclear power generation and other uses of nuclear materials. The level of radioactivity (high-level waste, transuranic wastes, and low-level waste) usually categorizes these wastes.

Regasification — The process by which LNG is heated, converting it into its gaseous state.

Reliability — Electric system reliability has two components—adequacy and security. Adequacy is the ability of the electric system to supply the aggregate electric demand and energy requirements of the customers at all times, taking into account scheduled and unscheduled outages of system facilities. Security is the ability of the electric system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system facilities. Reliability also refers to the security and availability of natural gas and petroleum supply, transportation and delivery.

Renewable Resources — Renewable energy resources are naturally replenished, but flow-limited. They are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Some (such as geothermal and biomass) may be stock-limited in that stocks are depleted by use, but on a time scale of decades, or perhaps centuries, they can probably be replenished. Renewable energy resources include biomass, hydro, geothermal, solar and wind. In the future they could also include the use of ocean thermal, wave, and tidal action technologies.

Ship Bunker C — A very heavy, residual fuel oil left over after other fuels have been distilled from crude oil. Also called No. 6 Fuel, it is used in power plants, ships and large heating installations.

Substation — A facility for switching electric elements, transforming voltage, regulating power, or metering.

Telework — A program allowing an employee, with training, permission and the technology, to work part-or full-time in a location other than their employer's main office. The alternate location is often the teleworker's home. It conserves fuel, relieves traffic congestion and improves air quality

Therm — One hundred thousand (100,000) British thermal units (1 therm = 100,000 British thermal units). This is approximately the energy in 100 cubic feet of natural gas.

Transmission — Transporting bulk power over long distances.

Transuranic Wastes — This includes laboratory clothing, tools, plastics, rubber gloves, wood, metals, glassware and solidified waste contaminated with man-made radioactive materials.

Utility — A regulated entity that exhibits the characteristics of a natural monopoly. For the purposes of the electric industry, "utility" generally refers to a regulated, vertically integrated monopoly electric company. "Transmission utility" refers to the regulated owner/operator of the transmission system

Watt — The unit of measure for electric power or rate of doing work. The rate of energy transfer equivalent to one ampere flowing under pressure of one volt.

Wholesale Power Market — The purchase and sale of electricity from generators to resellers (who sell to retail customers and/or other resellers) along with the ancillary services needed to maintain

Appendix C *Energy Document Summaries*

Renewable Energy Plan

Governor Kulongoski also called for an Oregon Renewable Energy Action Plan. The Governor believes renewable energy offers a stable, affordable supply of energy critical to Oregon's economic recovery. ODOE has submitted two drafts of the Renewable Energy Plan for public comment. Information about the plan is available at: The draft can be viewed at: **http://www.oregon.gov/energy.**

The Plan's purpose is to encourage and accelerate the production of energy from renewable sources, stimulate economic development (particularly in rural areas), and improve the environment. The draft sets specific long- and short-term goals for both electricity generation and transportation fuels. The draft calls for a number of actions that state agencies can take administratively to encourage renewable energy. It will also suggest some legislative actions.

Oregon Strategy for Greenhouse Gas Reductions

Governor Kulongoski has committed to carry out the West Coast Governors' Global Warming Initiative. The initiative, undertaken by the governors of California, Oregon and Washington, addresses greenhouse gas emissions at a state and regional level. As part of that commitment, the Governor appointed the Governor's Advisory Group on Global Warming early in 2004 to develop an Oregon strategy. The Advisory Group's citizen members include businesses that both deliver and use energy, farmers, environmentalists, scientists and others.

Public input was received on a draft strategy. The final report, the Oregon Strategy for Greenhouse Gas Reductions, will be issued in early 2005. The strategy outlines goals and actions that Oregon can take to reduce greenhouse gas emissions. Recommended actions cover energy efficiency, renewable energy, electric generation, transportation and other areas. For more information about the report, go to **www.oregon.gov/ENERGY**. Reports are also available by calling ODOE at 1-800-221-8035.

ODOE's Economic Action Plan

Oregon's natural resource agencies prepared action plans for stimulating Oregon's economic recovery. ODOE's plan asserts that reliable, affordable energy is necessary to drive an expanding economy and that a significant portion of Oregon's incremental energy needs can be met with conservation and renewable resources. The goal of the plan is to help stimulate Oregon's economy by promoting a high level of investment in energy efficiency and conservation and to responsibly siting energy facilities and cleaning up the Hanford nuclear site. The plan lists the programs and services ODOE manages that meet the goal.

Petroleum Contingency Plan

To better respond to a severe or long-term emergency in Oregon's petroleum supply and distribution system, ODOE is restructuring the Oregon Petroleum Contingency Plan to ensure a coordinated response with the state's petroleum suppliers, law enforcement, other state agencies, and the state's 36 counties. ODOE is developing a database with sensitive information on fuel consumption, designated emergency fueling stations, and maps of emergency routes in the state.

Electricity Emergency Plan

ODOE has signed a memorandum of understanding with the Oregon Public Utility Commission that defines roles and responsibilities in electricity emergencies. The goal is to improve

the coordination and response between the two agencies when addressing potential rotating outages and other severe electricity emergencies.

ODOE's Sustainability Plan

Early in 2004 ODOE and other state agencies responded to the Governor's Executive Order by preparing plans for first steps toward operating as a sustainable organization. The plans were reviewed by the Oregon Sustainability Board and can be found at: **http://www.sustainableoregon.net/agency/index.cfm#plans.**

ODOE's programs all are related to sustainability. However, we have identified four sustainability actions to highlight and report results to the Sustainability Board. The highlighted action areas are High Performance Schools, Renewable Energy Development, West Coast Governors' Global Warming Initiative, and State Agency Assistance. These actions will influence Oregon's environment, economy, and community.

Biomass Plan for Northeast Oregon

The goal of this biomass resource assessment was to promote the cost-effective, sustainable use of biomass energy in Baker, Union and Wallowa Counties. The assessment focused on the use of biomass for electric power generation or conversion to ethanol fuel. The objectives were to identify how much biomass is generated in the region, determine how much biomass is available, and evaluate the economic and environmental impacts of biomass use.

The assessment concluded that the use of biomass for electric power or ethanol production would have net economic benefits. These economic benefits would include increased employment in a rural, natural resource-based economy. An estimated six jobs are created for each megawatt (MW) of biomass power capacity that is installed.

Northwest Power and Conservation Council's Fifth Plan

The Northwest Power and Conservation Council's Fifth Plan, approved in December 2004, concludes it makes economic sense for the Northwest to aggressively pursue cost-effective conservation, even in a time of an electricity surplus. The plan projects a surplus through 2009, during which the region should acquire more than 500 average megawatts of conservation. The plan contains extensive analysis of alternative forecasts of supply costs and demand trends and models hundreds of scenarios for how to cost-effectively meet demand. The plan can be viewed at: **http://www.nwppc.org/energy/powerplan/draftplan/Default.htm**

West Coast Governors' Global Warming Initiative

The Governors of Washington, Oregon and California approved a series of recommendations for action to combat global warming. This effort is widely considered one of leading state initiatives on climate change.

Among the recommendations are directives to:

1. Set new targets to improve performance in average annual state fleet greenhouse gas emissions.
2. Collaborate on the purchase of hybrid vehicles.
3. Establish a plan for electrification technologies at truck stops on the I-5 corridor.
4. Set goals and implement strategies and incentives to increase retail energy sales from renewable resources by 1 percent or more annually in each state through 2015.
5. Adopt energy efficiency standards for eight to 14 products not regulated by the federal government.
6. Incorporate aggressive energy efficiency measures into updates of state building energy codes.


We are Watt Watchers...
EVERYONE SAVE ENERGY
TOYS
We are Watt Watchers...
Fill washer and dryer to save water and electricity.
Turn off all lights and TV's when not using
ON
OFF
keep thermostat on 68° to save heat energy.
68°
55°
75°
Turn hot water heater down to save energy.
H
M
L
hot water heater
We are Watt Watchers...
ZZZ
ZZZZ
ZZZ
ZZZZ
ZZZ
ZZZ
ZZZ
We are Watt Watchers...
Gas for the week...$100.00
Electricity Bill... $65.00
Solar
Hybrid
Wind
Saving energy and the enviornment... Priceless