Northwest Power and Conservation Council

Testimony of the Northwest Power and Conservation Council
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Committee on Natural Resources
United State House of Representatives
Oversight Hearing on Hydropower
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My name is Melinda Eden, and I am one of two Oregon members of the Northwest Power and Conservation Council. I serve as Chair of the Council's Power Committee, which includes one member from each of the four Northwest states represented on the Council. On behalf of the Council, thank you for the invitation to present information at this hearing on hydropower.

The Northwest Power and Conservation Council is a regional planning agency. It is an interstate compact of the states of Idaho, Oregon, Montana, and Washington and was created by the state legislatures in 1981 under the authority of the Northwest Power Act of 1980. In the Power Act, Congress directed the Council to assure the Pacific Northwest region an adequate, efficient, economical, and reliable power supply while also protecting, mitigating, and enhancing fish and wildlife affected by the construction and operation of hydropower dams in the Columbia River Basin. As required by the Power Act, the Council produces a regional, 20-year Power Plan that guides the future resource acquisitions of the Bonneville Power Administration. The Power Plan also provides guidance to electric utilities in the region as they conduct their own resource planning. By law, the Council revises the Power Plan at least every five years. The Council's fish and wildlife mitigation is accomplished through the Columbia River Basin Fish and Wildlife Program, which by law is part of the Power Plan.

Through its planning, the Council works to ensure that the regional electricity supply remains low-cost and low-risk. It is important to protect and enhance the role of hydropower in the power supply by improving the efficiency of the region's electricity use, increasing the hydropower generation output of existing dams where feasible, continuing to mitigate effectively the environmental impacts of hydropower, and providing flexibility to support the development of renewable resources in the region.

In my testimony I will briefly discuss the Northwest power system; the record-setting gains in energy conservation in the Northwest in 2007; the future of hydropower in the Northwest; the Council's role in mitigating the impacts of hydropower on fish and wildlife of the Columbia River Basin; the rapid growth of wind power in our region and its impact on hydropower; and the important role hydropower plays -- and will continue to play -- in moderating greenhouse gas emissions from power plants that burn fossil fuels.

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Pacific Northwest Electricity

Twenty-eight years of investment in conservation, along with a rapidly growing supply of wind power and our continuing reliance on hydropower, make the Pacific Northwest electricity supply among the cleanest and most efficient in the nation. The cornerstone of the Pacific Northwest electricity system is energy created by falling water -- hydropower. Hydropower provides 61 percent of the region's electricity generating capacity. Most of the remainder is provided by power plants that burn natural gas or coal. Natural gas provides about 16 percent, and coal about 13 percent of the total capacity. There is one nuclear power plant in the region; it provides about 2 percent of the region's electricity. With normal precipitation, hydroelectric dams in the Pacific Northwest provide about 15,500 average megawatts of electricity, or about 75 percent of all the electricity used in the Northwest.

The amount of power provided by non-hydropower forms of renewable energy, particularly wind power, is small but growing. Biomass power plants provide less than 2 percent, geothermal and solar together provide less than 1 percent, but wind power provides 4.7 percent. As the result of renewable resource requirements in three of the Northwest states, development of wind and other renewable power will increase. In fact, it is increasing rapidly already. Since 2000, wind power development has increased by 3,463 megawatts in the region. In contrast, non-renewable natural gas-fired capacity has increased even more, however: by 5,403 megawatts during the same time period.

In the Northwest, hydropower is generated at both federal and non-federal dams. Most of the region's hydropower is generated at dams on the Columbia River and its tributaries. While there are both federal and non-federal dams in the Columbia River Basin, by far the largest portion of the hydropower supply is generated at federal dams. The Federal Columbia River Power System comprises 31 dams and one non-federal nuclear power plant. With normal precipitation, the energy produced by dams of the Federal Columbia River Power System is 9,098 average megawatts. Columbia River dams in the United States are operated in coordination with dams on the Columbia River and its tributaries in British Columbia under the Columbia River Treaty of 1964. This coordinated, international power supply is a model of binational cooperation that other countries with transboundary rivers have sought to emulate.

In short, the Pacific Northwest is hydropower country. The region has a long history of hydropower development. The first dams generated electricity on Columbia River tributaries in the late 1880s, just a decade after Thomas Edison invented the light bulb. The first dam across the mainstem of the Columbia River was completed in 1933. This dam, Rock Island, was built by a privately owned utility. Federal construction projects began that year at Bonneville and Grand Coulee dams. Bonneville was completed in 1938 and Grand Coulee in 1941. The last of the federal dams were completed in the 1970s.

Electricity generated at the federal dams in the Columbia River Basin is sold by the Bonneville Power Administration, a federal power-marketing agency. The electricity is sold for the cost of its generation. Over time, that cost has increased as additional components have been added -- for example, costs associated with Bonneville's share of the region's debt for financing nuclear power and the cost of mitigating the impacts of hydropower on fish and wildlife.

Importantly, the Federal Columbia River Power System is almost entirely self-financing. Costs associated with the dams are paid by those who use them. For example, customers of hydropower pay for the hydropower facilities through the rates charged for the electricity.

Energy Conservation: The Highest-Priority Resource in the Northwest
While hydropower is the most important generating resource in the Northwest, the Northwest Power Act of 1980 treats cost-effective energy conservation as a resource equivalent to power generation and the highest-priority resource to meet future regional demand for power. Energy conservation means reducing demand for electricity by improving the efficiency of electricity use. Conservation is not only the most important future electricity resource for the Northwest, it is the most cost-effective as well.

In focusing on energy conservation 28 years ago, Congress was quite far-sighted. Today, with gasoline prices hovering around $4 per gallon and with increasing public concern about greenhouse-gas emissions, global climate change, and the monetary and environmental cost of energy, the importance of energy-use efficiency is greater than ever before. Energy conservation is unlike any other electricity resource. There is no fuel, and therefore no ongoing fuel costs or associated risk of volatile prices. Conservation requires no backup resource to shape its output to meet demand. Conservation is not a fuel we import from a foreign country so there is no risk of supply shortages or curtailments. There are no emissions, and therefore no risks to the climate. There is no ongoing cost after the resource is installed -- except, for example, when a compact fluorescent light bulb burns out and needs to be replaced. Importantly in the Northwest, by reducing demand for power, conservation reduces pressure on the hydropower supply and therefore increases its potential to serve as a backup for renewable energy, particularly wind power.

Western states are national leaders in energy conservation as the result of impressive efficiency improvements in California and the Northwest states. In the Northwest since 1980, demand for electricity has been reduced by 3,700 megawatts. Fifty-one percent of that amount -- 1,913 megawatts -- has been achieved since 2000.

These efficiencies resulted from multiple sources including new building codes, the effects of national energy efficiency standards, and programs and incentives offered by states, the Bonneville Power Administration and the region's public and investor-owned utilities. The average cost of this conservation was less than 3 cents per kilowatt-hour. The current cost of wind power, by comparison, is more than 8 cents per kilowatt-hour.

Expressed as electricity generation, 3,700 megawatts is enough power to supply the entire state of Idaho and all of western Montana, with 400 megawatts left over. Put another way, 3,700 megawatts is the equivalent of seven, 500-megawatt coal-fired power plants that did not have to be built; 13.5 million tons of carbon dioxide that were not emitted into the atmosphere; and a savings to consumers, compared to the cost of electricity from the wholesale market, of nearly $2 billion per year in 2007.

The Council is pleased to report that in 2007 the Northwest set a one-year record for energy conservation, an achievement of 200 megawatts. The largest share of this savings was in the residential sector, and the largest contribution to that savings -- 60 percent of the residential savings -- was compact fluorescent light bulbs. Between 18.5 million and 19 million bulbs were

sold in the Northwest last year -- more than any other region of the United States in terms of bulbs per person. Looking to the future, the Council has identified more than 3,000 additional megawatts of conservation that is available, also at a cost of less than 3 cents per kilowatt-hour.

Future Hydropower Development in the Pacific Northwest
With more than 360 hydroelectric dams in the Pacific Northwest, hydropower is by far the most important generating resource in the region. However, hydropower is not the most important source of meeting future demand for power. That is because most of the economically and environmentally feasible sites for hydropower generation have been developed. The remaining opportunities, though numerous, are for the most part small-scale and relatively expensive.

Hydropower and Fish and Wildlife in the Columbia River Basin
Upgrades at existing dams could improve survival of migrating fish. Examples are installation of fish-friendly turbines and screens to guide fish away from the turbine entrances. This is not to suggest that such upgrades would render hydropower dams completely benign in terms of environmental impacts. Spill reduces power generation at dams on the Columbia and Snake rivers by about 1,200 megawatts to help juvenile salmon and steelhead migrate to the Pacific Ocean. Water is directed over spillways instead of through turbines. In the Power Act, Congress recognized that hydropower dams have impacts on fish and wildlife. One of the Council's three principal responsibilities, in addition to power planning and public information, is to protect, mitigate, and enhance fish and wildlife, and related spawning grounds and habitat, that have been affected by the construction and operation of hydropower dams in the Columbia River Basin. We fulfill this mandate through the development and implementation of the Columbia River Basin Fish and Wildlife Program.

The program provides protection for fish and wildlife from the effects of future hydropower development as well as from existing projects. Beginning in 1989, the Council included in the fish and wildlife program a set of standards for the Federal Energy Regulatory Commission (FERC) and others to apply to the development and licensing of hydroelectric facilities in the Columbia River Basin. FERC is one of the federal agencies that is required to take the Council's fish and wildlife program into account in its decision-making. The standards include designating certain river reaches in the basin as "protected areas," where the Council believes that hydroelectric development would create unacceptable risks of loss to fish and wildlife species of concern, their productive capacity, or their habitat.

New Renewable Resources in the Northwest
Wind power is proliferating rapidly in the Northwest. This has important implications for hydropower. One challenge we face is to integrate wind power, which is intermittent depending on the strength of the wind, into the power supply where stability is critical. To address this issue and others related to wind power, the Council and the Bonneville Power Administration convened a task force to study wind integration. An important conclusion of this wind-integration analysis has implications for the region's hydropower supply. According to the analysis, there are no technical barriers to integrating up to 6,000 megawatts of new wind-power capacity into the regional power supply (new transmission lines would be required after the first 3,000 megawatts). Six thousand megawatts is the amount of new wind power development envisioned for the 2004-2024 period in the Council's Fifth Power Plan. However, the cost of this wind power will depend on the flexibility of the hydropower system to provide backup generation at times when wind-power output declines.

When wind energy is added to a utility system, its natural variability and uncertainty is combined with the natural variability and uncertainty of loads. During times of very hot or very cold temperatures, the wind often does not blow. As a result, there is an increase in the need for hydropower flexibility required to maintain utility-system balance and reliability. According to the analysis, the cost of wind integration starts low, particularly when integrating with a hydropower system that has substantial flexibility, and then rises as increasing amounts of wind are added. Siting wind turbines in geographically diverse areas can help reduce costs. Ultimately, costs plateau at the cost of integrating wind with natural gas-fired power plants.

With increasing amounts of wind power in the regional power supply, there likely will be times when large, unexpected increases in wind output coincide with periods of limited hydropower flexibility. If other sources of flexibility are not available at the same time, system operators may need to limit wind output for brief periods in order to maintain reliability.

Moderating the Carbon Dioxide "Footprint" of the Northwest Power Supply
As the title of this hearing asserts, hydropower is clean and renewable. Hydropower in the mix of electricity-generating resources reduces the amount of electricity produced by power plants that burn fossil fuels, and therefore the amount of carbon dioxide and other greenhouse gasses released into the atmosphere from those plants. In November 2007, the Council reported the results of a year-long study of carbon dioxide emissions from the Northwest power plants.

The results demonstrated the moderating effect of the region's large hydropower base on carbon dioxide emissions from the power supply, compared to other areas of the West with less hydropower and more thermal generation. For example, under normal water conditions, in 2005 the Pacific Northwest would have produced about 520 pounds of carbon dioxide for each megawatt-hour of electricity generated, compared to 900 pounds for the entire western interconnected power system.

However, like other areas of the country, the Northwest faces the likelihood of increasing greenhouse gas emissions -- albeit at a slower rate than elsewhere. Moderating, slowing, and eventually reversing this growth is a challenge for our nation as well as for our region. Carbon dioxide emissions in the Northwest, thanks to hydropower, are already comparatively low. Forcing them to go lower will be a challenge for the Northwest. We face this challenge because the Northwest has essentially the same set of future electricity-generating options as the rest of the country. Unlike other regions of the country, however, the Northwest has the Council's Northwest Power Plan to guide future resource development. The plan follows the resource priorities in the Power Act. The priorities are: first, cost-effective energy efficiency (conservation); second, cost-effective renewable energy; third, high-efficiency thermal generation; and fourth, traditional thermal generation.

The base case of our analysis of carbon dioxide emissions from the Northwest power supply assumed implementation of the resource recommendations in the Fifth Power Plan, which includes aggressive development of energy conservation and renewable resources, particularly wind power (the Fifth Power Plan was completed in 2004; the Council is working on the Sixth Power Plan now and plans to finish it in mid-2009). According to the study, carbon dioxide emissions in the Western Electricity Coordinating Council (WECC) area increase about 3 percent to about 920 pounds per megawatt-hour by 2024, whereas the Northwest rate, with

aggressive development of energy efficiency and renewable energy, also increases 3 percent to about 530 pounds. The future growth rate of annual regional carbon dioxide production would be even higher if the conservation, wind power, and other renewable resource development called for in the Council's Fifth Power Plan were not accomplished. With implementation of the Council's plan in the base case, the annual carbon-dioxide production of the regional power system in 2024 under normal conditions would be about 67 million tons, an 18-percent increase over normal 2005 levels.

Carbon-Reduction Policy Focus

An important finding of the carbon dioxide analysis is that it will be difficult to achieve goals for carbon-dioxide emissions with policies that focus only on new power plants. If the energy efficiency targets of the Council's Fifth Power Plan were achieved and renewable energy portfolio standards were successfully implemented by all Northwest states, projected power-system carbon-dioxide emissions in 2024 would exceed normalized 2005 levels by more than 10 percent, and actual 1990 levels by more than 40 percent. Put another way, meeting the aggressive energy efficiency and renewable portfolio standards would slow, but not eliminate, growth of carbon-dioxide emissions. Even worse, if the region fails to meet the conservation targets in the Council's Fifth Power Plan, or if hydropower generation is reduced from current levels and the power replaced with new thermal generation, the effect would be a net gain in carbon-dioxide emissions over time.

Overall, the effects of the various scenarios addressed in the analysis, all of which are consistent with current policies that address future, and not existing, thermal power plants, yield a reduction of carbon-dioxide emissions equal to the output of one or two coal-fired power plants. In the Fifth Power Plan, the Council's forecast for regional carbon-dioxide production by the power system in 2024 exceeds 1990 levels by an amount equivalent to eight coal-fired plants. These results illustrate the difficulty of reducing carbon dioxide production with policies that affect only new sources of electricity generation. Existing coal-fired power plants dominate carbon-dioxide production from electricity generation. These plants provide about 23 percent of the region's electricity but 85 percent of the carbon-dioxide emissions from the regional power system. To stabilize carbon-dioxide emissions at 2005 levels or to reduce emissions to 1990 levels would require replacing the output of some of these existing coal-fired plants with additional energy conservation and other resources that produce little or no carbon dioxide. In addition, the analysis shows that policy choices made for purposes other than carbon-dioxide reduction, such reducing hydropower generation to improve environmental conditions for migratory fish, also can have significant adverse effects on carbon-dioxide production. In fact, the effect could be great enough to negate the carbon-reduction goals of state renewable portfolio standards.

Thank you again for the opportunity to testify at this hearing. Through the Council's planning processes for future power supplies and fish and wildlife protection, we are working to ensure that our region's hydropower-dominated electricity supply remains clean, reliable, and affordable.