Northwest Power and Conservation Council

Tom Karier
Washington Council Member
Northwest Power and Conservation Council

Testimony on *Protecting Federal Hydropower Investments in the West: A Stakeholder's Perspective*

May 4, 2011

Chairman McClintock and members of the Subcommittee, thank you for the opportunity to testify today at this important hearing on protecting federal hydropower investments in the West. My name is Tom Karier, and I am one of two Washington members of the Northwest Power and Conservation Council and chair of the Council's Power Committee.

The Council is authorized by federal law, the Northwest Power Act of 1980 (Public Law 96-501; 94 Stat. 2717), to prepare and periodically update a Northwest Power Plan that is implemented by the Bonneville Power Administration, a federal power marketing administration. Bonneville markets the output of the Federal Columbia River Power System, which comprises 31 hydropower dams and one non-federal nuclear power plant in the Northwest. Through its customer utilities, Bonneville supplies about 30 percent of the electricity consumed in the Northwest so the Council's power plan directly affects a significant portion of the region's electricity ratepayers. But the plan also is used by utilities throughout the region as they develop their own integrated resource plans, and Washington's renewable portfolio standard law requires that energy efficiency savings be calculated using the Council's methodology. So the reach of the Council's planning goes far beyond Bonneville.

The Federal Columbia River Power System includes many of the largest hydroelectric dams in the United States and provides 56 percent of the hydropower generated in the Northwest. Regionwide, hydropower is our largest source of electricity, averaging more than half of the power generated under normal precipitation.

The first dams of the Federal Columbia River Power System were constructed during the Depression, and so for more than 70 years our region has been enjoying clean, renewable, low-cost electricity thanks to the water power of the Columbia River and its tributaries.

It is in this context, as an energy policymaker in a region rich in hydropower, that I am testifying today. The Northwest Power and Conservation Council is working to ensure the long-term viability of the Columbia River Basin hydropower system for present and future generations while also protecting and enhancing fish and wildlife that have been affected by hydropower dams.

The Council was formed by the states of Idaho, Montana, Oregon, and Washington in 1981 in accordance with the Power Act. Each state's governor appoints two members to the Council. Through the Council, Northwest citizens can participate in determining how growing

851 S.W. Sixth Avenue, Suite 1100
Portland, Oregon 97204-1348
www.nwcouncil.org

Steve Crow
Executive Director

503-222-5161
800-452-5161
Fax: 503-820-2370

electricity needs will be met in the region, and also how fish and wildlife will be protected from the impacts of hydropower dams. The Council's power plan looks 20 years into the future, and by law we review the plan for revisions every five years. We issued our current plan, the sixth revision since the Council was created, in 2010.

According to the Power Act, the purpose of the power plan is to assure an adequate, efficient, economical, and reliable power supply for the Northwest region. The Act also recognized that development of the region's hydropower dams in the Columbia River Basin had detrimental effects on migratory and resident fish, and also wildlife, and required the Council to develop a program to mitigate those effects. The Council's Columbia River Basin Fish and Wildlife Program is an integral part of the Council's power plan. The Council's power plan and the fish and wildlife program are developed through open, public processes to involve the region's citizens and businesses in decisions about the future of these two interdependent aspects of the Pacific Northwest environment and economy.

Removing hydropower dams would increase carbon emissions and raise electricity costs

The region's hydroelectric system continues to be the Northwest's most important generating resource. Preserving the capability of the existing system will keep power costs and carbon emissions low compared to the rest of the country.

Concerns about climate change have altered the power planning landscape dramatically, both nationally and in the West. These concerns have resulted in new polices that affect electricity resource choices, such as restrictions on new coal-fired power plants because of concern about their emissions. In developing the Sixth Power Plan, the Council included estimates of the future cost of complying with carbon policies as a risk. Energy efficiency mitigates the risks of volatile fuel prices and unknown carbon costs.

The Northwest power system emits about half the carbon dioxide per kilowatt-hour of the nation or the rest of the western states. This is due to the large role played by the hydroelectric system of the region. A power system that maximizes cost-effective energy efficiency and renewable resources is a system that also minimizes the risk of exposure to the uncertain future cost of complying with carbon-reduction policies. To quantify the value of such a system, the Council's Sixth Power Plan includes an analysis of the effects of reduced hydropower capability. The analysis, which technically was one of our future-scenario models, examines the effects of removing the four federal dams on the lower Snake River - Lower Granite, Little Goose, Lower Monumental, and Ice Harbor -- from the regional power supply. While the scenario is specific to the removal of those four dams, the results could apply to other changes that reduce the capability of the hydroelectric system for any reason.

The lower Snake River dams provide 1,110 average megawatts of energy under average water conditions, about 5 percent of regional annual electric energy needs. In addition, the dams provide 3,500 megawatts of short-term capacity, a little more than 10 percent of the total hydroelectric system capacity, and as part of the Automated Generation Control (AGC) System, they provide system reserves to maintain the reliability of the power supply. They also provide reactive support for the stability of the transmission system.

The effects of removing the capability of the lower Snake River dams are mainly determined by the replacement resources that would be required for the power system to duplicate the energy, capacity, real-time load following, stability reserves and reactive support currently provided by the dams. The analysis assumed that the power produced by the dams was removed in 2020 -- half way through the 20-year timeframe of the Sixth Power Plan -- and the energy and capacity were replaced by other least-cost resources selected by the Council's regional portfolio model. That is, given the reduced energy and capacity of the hydroelectric

system, a low-cost and low-risk portfolio of new and replacement resources would take the place of the four dams.

The analysis showed that dam removal would increase the carbon emissions, cost, and risk of the regional power system. Existing natural gas-fired and coal-fired generating plants would be used more intensively. In addition, the region would export less energy and import more. Carbon emissions would increase 3 million tons per year because of the increased use of generating plants that burn fossil fuels, and the annual cost of the power system would increase by more than $530 million by 2020. Further, because the lower Snake River dams serve Bonneville public-utility customers, those utilities and their consumers would bear the cost increases. Using a rate-making rule of thumb that a $65 million to $80 million cost increase translates into a $1 per megawatt-hour increase in Bonneville rates, a $530 million increase in Bonneville costs would raise rates by between $6.60 and $8.15 per megawatt-hour. Based on Bonneville's priority firm rate (this is the rate Bonneville charges its public utility customers) of $28 per megawatt-hour in 2009, dam removal would raise that rate 24 percent to 29 percent.

Hydropower helps back up intermittent wind power

While the primary resource in the Council's Sixth Power plan is energy efficiency, cost-effective renewable resources also play a large role, accounting for 17 percent of new resources. This amount is only what is required to meet existing renewable energy portfolio standards in Oregon, Washington, and Montana (Idaho does not have a renewable portfolio standard). Aside from hydropower, wind currently is the dominant form of renewable energy in the Northwest, as it is competitive in price with new natural gas-fired generation given the various incentives and subsidies for wind power.

Beginning in 1998 with the 25-megawatt Vansycle Ridge project in southeastern Washington, commercial wind power has grown to exceed 4,000 megawatts of nameplate capacity in the Northwest. Wind power now is the fourth-largest component of the Northwest power system in terms of installed capacity (4,571 megawatts). Current plans call for wind power capacity to reach 6,200 megawatts in just a few years.

Although wind power is four times as expensive as energy efficiency, wind power shares some of the important advantages of efficiency. It is free of fuel-price risk and carbon-policy risk and can be developed in small increments with relatively short lead times. However, wind has very little capacity value for the power system. That is, it cannot be counted on to meet peak loads because wind turbines do not produce power in consistent amounts throughout the day. In addition, rather than providing flexibility to adjust to changing electricity demand, wind power imposes additional flexibility requirements on the power system because of its variability.

Hydropower is an excellent companion for wind because hydropower can be generated continuously and the output of dams can be increased or decreased to match the variability of wind. The availability of this backup energy from hydropower is one important reason why wind power is proliferating in the Northwest. So it is important to continue to maintain and improve the efficiency of the hydroelectric system where possible.

This backup role (sometimes called "balancing") for hydropower also is providing a new source of income for Bonneville and utilities that own dams. For Bonneville, this is yielding $30 million to $50 million in annual revenue that offsets customer rates. Some utilities that own hydropower dams are realizing as much value from providing backup services as they are from selling surplus power.

Energy efficiency is the highest-priority new resource in the Northwest

So important is energy efficiency in the Northwest's mix of electricity resources that in the Power Act Congress not only made it the highest-priority resource but also directed Bonneville to have a program to acquire efficiency resources consistent with the Council's plan. Importantly, Congress directed the Council to include in its power plans all of the energy efficiency that the Council determines is cost-effective -- not all of the energy efficiency that is available at any cost. Nonetheless, in developing its Sixth Power Plan in 2010 the Council identified a vast amount of cost-effective energy efficiency, nearly 6,000 average megawatts through the year 2029. The Council noted the size and value of this resource in the text of the Sixth Plan:

> *Across multiple scenarios considered in the development of the plan, one conclusion was constant: the most cost-effective and least risky resource for the region is improved efficiency of electricity use.*
>
> and
>
> *The plan finds enough conservation to be available and cost-effective to meet 85 percent of the region's load growth for the next 20 years. If developed aggressively, this conservation, combined with the region's past successful development of energy efficiency could constitute a resource comparable in size to the Northwest federal hydroelectric system. This efficiency resource will complement and protect the Northwest's heritage of clean and affordable power.*

Over the years since the Council was formed, improved energy efficiency has met nearly half of the region's growth in energy-service demand. If the region's energy savings were added back to the regional energy loads, load would have increased by 8,150 average megawatts between 1980 and 2008. During that time the region acquired 3,900 average megawatts of energy efficiency, so that actual loads to be met by electricity generation only increased by 4,250 average megawatts. Today, in 2011, acquired energy efficiency totals nearly 4,300 average megawatts. The Council's power plan is rich with energy efficiency because the Power Act requires the Council to meet future demand with cost-effective resources, energy efficiency gets highest priority among resources in the Act, and the Council has identified literally hundreds of potential efficiency improvements that cost less than one-third as much as the lowest electricity-cost generation technologies. The average cost of the energy efficiency in the Sixth Power Plan in 2009 was 3.6 cents per kilowatt-hour; the cost of the least-expensive new natural gas-fired power plant was 9.2 cents, and wind power in the Columbia Basin cost 10.4 cents per kilowatt-hour.

The availability of so much cost-effective energy efficiency is good news for those of us who care about protecting federal hydropower investments in the West, as it means that energy efficiency is helping to ensure that hydropower will remain the dominant electricity resource in our region by reducing the need to build thermal generating plants to augment the hydropower supply. Not only is energy efficiency by far the least-expensive resource available to the region, it also avoids risks of volatile fuel prices and the financial risks associated with large-scale resources, and also mitigates the risk of potential carbon-pricing policies to address climate-change concerns. Improved efficiency contributes not only to meeting future energy requirements but also provides capacity during peak load periods. The savings from efficiency generally follow the hourly shape of energy use, saving more energy when more is being used.

As a result, efficiency contributes more to load reduction during times of peak usage. Or in other words, efficiency improvements have capacity value, as well as energy value.

Hydropower affects fish and wildlife, but the effects can be mitigated

Preserving the capability of the existing hydroelectric system has significant value for the region. Mitigating damage to anadromous fish from development of the Federal Columbia River Power System has changed the operation of the hydroelectric system, reducing its energy capability and its flexibility. It is important to mitigate this damage, but also to do it in a way that best preserves the value of the low-cost, low-carbon hydropower resource. The Council attempts to ensure that its fish and wildlife program uses cost-effective strategies to improve survival of juvenile and adult anadromous fish that migrate past Columbia and Snake river dams to and from the Pacific Ocean, including salmon, steelhead, sturgeon, and Pacific lamprey. The program also addresses the effects of hydropower on resident fish -- those that do not go to the ocean.

Importantly, the fish and wildlife program is part of the power plan. The Power Act requires the Council to include measures in the program to protect, mitigate, and enhance fish and wildlife affected by the development, operation, and management of hydropower dams in the Columbia River Basin while also assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply through the power plan. The Act also directs federal agencies that operate the dams and sell their power to undertake those responsibilities in a manner that provides equitable treatment for such fish and wildlife with the other purposes for which the dams and related facilities are managed and operated.

The program identifies a comprehensive set of interrelated fish and wildlife problems and responsive strategies. State and federal fish and wildlife agencies, Indian tribes, and others propose projects to the Council to address the problems and implement the strategies. All project proposals are reviewed by the Council's Independent Scientific Review Panel, which submits its reviews to the Council. The Council then makes project-funding recommendations to Bonneville.

Mainstem hydropower dam operations and fish-passage improvements are addressed in the program with strategies that aim to optimize the survival of focal species. These efforts include re-establishing natural river processes to the extent feasible and consistent with the Council's responsibilities in the Power Act. The program also aims to rebuild healthy, naturally producing fish and wildlife populations by protecting, mitigating, and restoring habitats and the biological systems within them.

This has resulted in operational changes at the dams since the Council was created. Because of the Power Act, and more specifically because of the Endangered Species Act listings of more than a dozen species of salmon and steelhead in the Columbia River Basin since the early 1990s, hydropower generation has been reduced by about 1,100 average-megawatts. This primarily is due to legal requirements to spill water over dams to aid downstream juvenile fish migration during the spring and summer months.

The fish and wildlife program includes strategies to improve passage survival for migratory fish at the dams. I believe these measures, in combination with improvements in fish habitat and the careful use of artificial production, are helping to boost the number of adult fish returning from the ocean to spawn. In the last ten years or so we have seen big increases in some runs, particularly some species of Chinook and sockeye salmon. Especially since 1999, adult salmon and steelhead counts at Bonneville Dam have been averaging much higher than any comparable period since the dam was completed and fish counting began in 1938.

Snake River sockeye, the first Columbia River Basin salmon species listed for protection under the Endangered Species Act (in 1991), have demonstrated a strong response to a captive

broodstock program and favorable ocean conditions over the last decade. The number of these fish returning to spawn and counted at Lower Granite Dam has been higher in recent years than any time since the 1950s. As well, juvenile salmon and steelhead passage survival at the dams also has been improving in recent years due to factors such as spill, system bypass improvements, and in-river improvements such as predator control.

Finally, fish spawning and rearing habitat is being improved under the Council's fish and wildlife program. From 2005 to 2010, for example, 1,435 miles of instream and streamside habitat were improved and 1,527 miles of habitat were opened to spawning by the removal of passage barriers.

Conclusion: Hydropower and energy efficiency: Critical to a low-cost, low-risk power supply

The Pacific Northwest power system is faced with significant uncertainties about the direction and form of climate-change policy, future fuel prices, salmon recovery actions, economic growth, and integrating rapidly growing amounts of variable wind generation. The Council's resource strategy for the Sixth Power Plan provides guidance for Bonneville and the region's electric utilities on choices that will help meet the region's growing electricity needs while also reducing the risk associated with uncertain future conditions.

Hydropower is the most important source of electricity in the Northwest, not only providing low-cost, carbon-free energy on a consistent basis but recently providing critical backup for the increasing amount of carbon-free wind power in the region. By continuing to add energy efficiency to the power supply, the region will preserve and enhance the flexibility of hydropower to meet demand while also providing low-cost backup services for increasing amounts of renewable energy.