A wind turbine blade is ready to be lifted into place at the Windy Point Wind Farm in the Columbia River Gorge.
Photo: C. Bruce Forster

Northwest Power and Conservation Council

Briefing Book

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Northwest Power and Conservation Council

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Northwest Authors Comment on the Council

Charged with bringing new order to Columbia River management, the Council has generally drawn praise for its efforts at promoting energy conservation but has had a more difficult time gaining consensus on saving salmon.

— William Dietrich, *Northwest Passage: The Great Columbia River,* 1995, page 290.

The 1980 Northwest Power Act seemed positively prescient in reducing the utility industry's role in the region's energy planning and in placing policy-making into the hands of the Power Planning Council. The Council would be appointed by the governors of the states of Oregon, Washington, Idaho and Montana. The law seemed as responsive to the needs of the public for its time as the construction of the hydropower system itself had seemed during the New Deal two generations before.

— Joseph Cone, *A Common Fate: Endangered Salmon and the People of the Pacific Northwest,* 1995, Page 30.

[The Council, under the Northwest Power Act] gave priority to the runs above the Bonneville Dam. And for the first time, they tried to change the operation of the river rather than just mitigate the effects of management. Their plans regulated flows to help push the salmon downstream, and some dams were retrofitted with juvenile bypass systems to keep the smolts out of the turbines. But given the gravity of the [salmon] situation, the changes were modest; they failed to achieve their goals.

— Richard White, *The Organic Machine: The Remaking of the Columbia River*, 1995, Page 103.

The Northwest Power Act, in theory, spelled out a revolution in western water management. It put longtime inmates of the engineered river — Indian tribes and fish agencies — in a position of power. To administer the revolution, the Power Act created a novel bureaucratic creature. Not quite a federal agency, not a state agency, the Northwest Power Planning Council was made up of two gubernatorial appointees from each of the four states in the Northwest. The Council had powers (rather vaguely defined powers, as it turned out) to change the behavior of the federal agencies that managed the hydrosystem.

— Blaine Harden, *A River Lost: The Life and Death of the Columbia,* 1996, Page 216.

… the Northwest Power Act forged a link between regional energy development and fish and wildlife recovery. At a conceptual level, the Act aimed for a power system that would meet energy demands through measures that impose the least economic and environmental cost on the region, while taking pressure off Columbia River fish and wildlife. For the power system, moving ahead would require modified operation of the Columbia River dams and financing for measures to offset the dams' effects on fish and wildlife. For fish and wildlife interests, mitigation would require a healthy hydropower system capable of generating sufficient revenues to finance energy and fish and wildlife conservation measures. Perhaps neither fish nor power interests perceived the connection clearly, but it is apparent in hindsight: Under the terms of the Northwest Power Act, neither fish and wildlife conservation nor power development could proceed without the other.

— John Volkman, *A River in Common: The Columbia River, The Salmon Ecosystem and Water Policy, A Report to the Western Water Policy Commission,* 1997, Page IV-20 (68).

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Background

1. The Federal Columbia River Power System

The development of the Federal Columbia River Power System in the Pacific Northwest began in the 1930s under a program of regional cooperation to meet the needs of electric power production, land reclamation, flood control, navigation, recreation, and other river uses. From the beginning, the federal government has played a major role in the development of one of the largest multiple-use river systems in the world. The U.S. Army Corps of Engineers and the Bureau of Reclamation built 31 hydropower dams (many have other purposes in addition to power generation) in the Pacific Northwest, 29 of them on the Columbia River and its tributaries. Investor-owned and publicly owned utilities also built a major system of dams and generating facilities, beginning in the late 1800s.

Congress directed the Bonneville Power Administration, in the Bonneville Project Act of 1937, to build and operate transmission lines to deliver the power from dams, and to market electricity from federal generating projects on the river at rates set only high enough to repay the federal investment over a reasonable period of time.

Today, the Federal Columbia River Power system includes these dams:

Name	River, State	In-service year	Capacity
Albeni Falls	Pend Oreille, ID	1955	43 MW
Anderson Ranch	Boise, ID	1950	40 MW
Big Cliff	Santiam, OR	1953	18 MW
Black Canyon	Payette, ID	1925	10 MW
Boise River Diversion	Boise, ID	1912	3 MW
Bonneville	Columbia, OR/WA	1938	1,077 MW
Chandler	Yakima, WA	1956	12 MW
Chief Joseph	Columbia, WA	1958	2,458 MW
Cougar	McKenzie, OR	1963	25 MW
Detroit	Santiam, OR	1953	100 MW
Dexter	Willamette, OR	1954	15 MW
Dworshak	Clearwater, ID	1973	400 MW
Foster	Santiam, OR	1967	20 MW
Grand Coulee	Columbia, WA	1942	6,795 MW
Green Peter	Santiam, OR	1967	80 MW
Green Springs	Rogue, OR	1960	16 MW
Hills Creek	Willamette, OR	1962	30 MW
Hungry Horse	Flathead, MT	1953	428 MW
Ice Harbor	Snake, WA	1962	603 MW
John Day	Columbia, OR/WA	1971	2,160 MW
Libby	Kootenai, MT	1975	525 MW
Little Goose	Snake, WA	1970	810 MW
Lookout Point	Willamette, OR	1953	120 MW
Lost Creek	Rogue, OR	1977	49 MW
Lower Granite	Snake, WA	1975	810 MW
Lower Monumental	Snake, WA	1969	810 MW

Name	River, State	In-service year	Capacity
McNary	Columbia, OR/WA	1952	980 MW
Minidoka	Snake, ID	1909	28 MW
Palisades	Snake, ID	1958	176 MW
Roza	Yakima, WA	1958	11 MW
The Dalles	Columbia, OR/WA	1957	1,808 MW

Total: 31 dams, 20,460 megawatts of capacity. The U.S. Army Corps of Engineers operates 21 of the dams, and the Bureau of Reclamation operates 10.

The Columbia River Treaty with Canada[1]

As demand for power grew, the United States and Canadian governments recognized a need for development of water storage sites in the upper reaches of the Columbia River Basin. The governments of both nations negotiated a treaty in the early 1960s for the cooperative use of dams that would be built by both countries. Four dams were built under the treaty. Three are on the Columbia River or a tributary in Canada — Keenleyside, Duncan and Mica — and the fourth, Libby, is on a major Columbia tributary, the Kootenai River, in Montana. The Canadian dams were completed by 1973, and Libby was completed in 1975. The administrator of the Bonneville Power Administration and the Division Engineer of the Northwestern Division of the U.S. Army Corps of Engineers together comprise the U.S. Entity under the treaty. The Canadian entity is BC Hydro.

The Canadian dams provide flood control and water storage for the purpose of additional power generation at dams downstream in the United States. The power-generating capability of downstream dams increased by the following percentages as a result of the treaty storage: Grand Coulee, 13 percent; Chief Joseph, 14 percent; the five mid-Columbia public utility district dams, 18 percent; and dams farther downstream on the Columbia, 11 percent collectively. In return, Canada received two payments: one from the U.S. Treasury for flood control benefits and the other a cash lease payment for the first 30 years of the additional power generation. Known as the downstream benefit, the additional power is divided equally between Canada and the United States. Following the 30-year lease/sale by Canada to U.S. parties, in the late 1990s Canada's share of the downstream benefit was returned to Canada.

The arrangement obligates the United States to deliver the power to B.C. Hydro at the U.S.-Canada border, most of it at Blaine in western British Columbia and a small portion at Selkirk in the Columbia River Basin, where transmission connections already exist. But delivery at Blaine and Selkirk may be at times a formal fiction. Instead, B.C. Hydro finds a buyer for the power or service and notifies Bonneville where to deliver. Even if delivered at Blaine, B.C. Hydro still largely markets the power rather than use it for its local firm-power customers.

Since 1964, when the treaty was ratified, the United States and Canada have enjoyed significant benefits through coordinated river management by the two countries. When the treaty was negotiated, its goals were to provide significant flood-control and power-generation benefits to both countries. The treaty contains two provisions, however, each of which may significantly change these benefits as early as the year 2024.

[1] Parts of this section are taken verbatim from the 2014/2024 Columbia River Treaty Review website, www.crt2014-2024review.gov.

First, in 2024 the 60 years of purchased flood control space in Canadian treaty dams expires. Instead of a coordinated and managed plan to regulate both Canadian and U.S. projects for flood control, the treaty calls for a shift to a Canadian operation under which the United States can call upon Canada for flood control assistance. The United States can request this "called upon" assistance as needed but only to the extent necessary to meet forecast flood control needs in the United States that cannot adequately be met by U.S. projects. When called-upon is requested, the United States will then have to pay Canada for its operational costs and any economic losses resulting from the called upon flood control operation.

Second, while the treaty has no specified end date, it does allow either Canada or the United States the option to terminate most of the provisions of the treaty on or after September 16th, 2024, with a minimum of 10 years advance written notice. Thus, the year 2024 is the first year a notice of termination would take effect assuming written notice of termination is given by the Canadian or U.S. governments by 2014. Unless the treaty is terminated or the federal governments elect to modify the treaty, its provisions continue indefinitely, except for the changes in flood control discussed above.

Given the significance of both of these provisions, it is important that the parties to the treaty understand the implications for post-2024 treaty planning and Columbia River operations. The U.S. Army Corps of Engineers and the Bonneville Power Administration, the agencies that implement the treaty in the United States, began a multi-year effort in 2009 to understand these implications. This effort is called the 2014/2024 Columbia River Treaty Review.

Operations under the treaty are complex and affect millions of people and a wide variety of issues on both sides of the border. Implementing the required specified treaty changes in flood control provisions in 2024 and considering the consequences of possible treaty termination will be a major challenge for both countries. Due to the scope and complexity of these issues, the U.S. Entity is taking a phased approach to studying the treaty and the issues related to its future. Each phase will provide valuable information, building toward a comprehensive and informed picture for evaluating the future of the treaty.

Phase 1 of the 2014/2024 Columbia River Treaty Review, the initial modeling and analysis phase, is a joint effort between the U.S. and Canadian Entities. Its purpose is to provide fundamental information about post-2024 conditions both with and without the current treaty and only from the limited perspective of power and flood control. These initial studies are not designed to establish future operating strategies, alternatives to the treaty, or government policies, but simply to begin the learning process. The initial Phase 1 studies were completed in August 2010, followed by additional modeling to show how requirements in the Biological Opinion affect treaty operations.

Once Phase 1 is complete, the U.S. Entity and the U.S. Department of State will work together to coordinate next steps and additional phases, including developing the appropriate level of consultation and involvement with other U.S. parties, such as affected states, tribes, and other stakeholders.

More on Columbia River Treaty history is on the Council's Columbia River history website at www.nwcouncil.org/history/ColumbiaRiverTreaty.asp. The website for the 2014-2024 Treaty Review is www.crt2014-2024review.gov.

Interties between the Northwest and Southwest

Also in the 1960s, Congress authorized construction of three major power lines linking the Columbia River hydropower dams with power markets in California and the rest of the Pacific Southwest. The interties benefit the Pacific Northwest in several ways. They allow the sale of hydropower from the Columbia when it is not needed here and would otherwise be lost in the form of water spilled over dams without generating electricity, and they permit this region to buy power from California when power is needed here during shortages and periods of heavy use. In the first instance, sales of surplus Northwest hydropower to California has saved the equivalent of some 200 million barrels of oil. In the second case, California utilities sold power to Pacific Northwest utilities in the drought years of 1973, 1977, 1979, 1992, 1993, 1994 and 2001.

To protect Northwest access to the federal hydropower, Congress authorized regional preference provisions in 1964. Bonneville must offer any surplus power to utilities in the Northwest before selling it to California. Sales to California can be called back if the power is needed in the Northwest. Sales of firm energy can be recalled with 60 days notice; sales of peaking capacity can be recalled in five years.

The Hydro-Thermal Power Program

With the dams developed in Canada as well as in the United States, the river system provided virtually all the electricity needed by the region until the early 1970s. But by that time, all dam sites on the mainstem of the Columbia that were economically feasible and environmentally acceptable either were developed or were under development, and the region was looking for other ways to meet electric load growth. Bonneville and the region's utilities were predicting shortages of electricity unless thermal generating plants were built in response to increasing demand.

The region’s publicly owned utilities and investor-owned utilities turned mainly to coal-fired and nuclear plants to meet growth throughout the Pacific Northwest. Utilities believed the development of such plants was the most economical and environmentally acceptable option available at the time. Bonneville helped the utilities respond to these needs by participating in the Hydro-Thermal Power Plan for the continued development of electricity resources in the Pacific Northwest.

Under the plan, Bonneville agreed to acquire electricity by entering into “net billing” agreements with its utility customers. These agreements made it possible for the publicly owned utilities, which owned shares of power plants, to sell to Bonneville all or part of the generating capacity of new thermal projects. Bonneville credited, and continues to credit, the wholesale power bills of these utilities in amounts sufficient to cover the costs of their shares in these plants. Bonneville then sells the output of the plants, melding the higher costs of the thermal power with the lower costs of hydropower for the benefit of all customers. The plants were cooperative efforts of both publicly owned and investor-owned utilities, but Bonneville purchased only the shares of generating capacity owned by publicly owned utilities.

Under the Hydro-Thermal Power Program (Phase I), Pacific Power & Light Company (today known as Pacific Power) and other investor-owned utilities built the twin Centralia, Washington, coal-fired plants with the co-ownership of several publicly owned utilities. Portland General Electric Company built the Trojan nuclear power plant, with 30-percent co-ownership by Eugene Water and Electric Board (EWEB) covered by a net-billing agreement. And the Washington Public Power Supply System (WPPSS),

under net-billing agreements, completed one nuclear plant (WNP 2) and partially constructed two other nuclear plants (WNP 1 and 3) in Washington state. The Hanford N-reactor turbine generator, built by WPPSS, also came on line just prior to the formal initiation of the Hydro-Thermal Power Program, and before its closure in 1987 was considered a part of the overall effort. Bonneville became the agent for integrating these resources so the consumers of the region could benefit from the greatest efficiency and lowest costs from operation of the regional electric system. Under the plan, the thermal power plants would run continuously to meet the baseload, or constant, power needs. The hydroelectric dams would be operated to follow the fluctuation of energy needs throughout the day.

In spite of the efforts of utilities and Bonneville to continue developing the region's generating resources in a systematic way, the region continued to lose ground to rapidly growing demands for electricity. The Hydro-Thermal Power Program failed to meet the region's expectations for two basic reasons. A revision of regulations by the Internal Revenue Service denied tax-exempt status to bonds sold by publicly owned utilities to finance their plants if power from the facilities was sold to Bonneville, a federal agency. And, Bonneville's financial ability to participate in net-billing agreements reached its limit far sooner than expected because of the climbing costs of new thermal plants.

In 1973, Bonneville and the region's utilities initiated Phase II of the Hydro-Thermal Power Program, in which the utilities would finance their own plants without net-billing participation by Bonneville. Thus, WPPSS nuclear plants 4 and 5, now terminated, were not covered by net-billing contracts. Nonetheless, Bonneville expected to provide electric load management and power integration services and to supply peaking power and reserves from federal facilities in order to bring about the most efficient mix of resources possible. Bonneville's participation in this program was enjoined by a federal court in 1975. The court required that Bonneville complete an environmental impact statement on the impact of the Hydro-Thermal Power Program.

The environmental impact statement, which was not completed until 1980, found that fluctuation in the use of hydroelectric dams would have to be limited to protect shore structures along the river. Bonneville put the Hydro-Thermal Power Program on hold while the impact statement was being prepared, and during those five years a number of events occurred that led to the demise of plants 4 and 5. These included construction delays at all five of the WPPSS nuclear plants, cost increases for those plants as the result of overruns and mismanagement, decreasing regional demand for power, growing public interest in energy efficiency as a low-cost alternative to the extraordinarily expensive nuclear plants, and court decisions that relieved the participating utilities of their obligation to pay for the plants.

Bonneville continues to pay for the net-billed plants, even though construction was suspended on plants 1 and 3 in 1983 and never restarted. (More on the Hydro-Thermal Power Program is on the Council's Columbia River history website at www.nwcouncil.org/history/HydroThermal.asp).

Public power preference

The Bonneville Project Act of 1937 directed that the electric cooperatives and other publicly owned utilities of the region be given highest priority for the available federal power. They consequently came to be called "preference customers." In 1964,

Congress authorized the Pacific Northwest Consumer Power Preference Act, which directed that only surplus energy from the Columbia River system could be sold outside the Northwest. Firm power from the system was reserved for the Northwest, except under conditions specified in the Act. Until the 1970s, the legal preference of public customers was unchallenged, largely because there had been enough electricity for everyone. In 1973, when Bonneville's firm-power contracts with investor-owned utilities expired, Bonneville could not offer new ones if preference customers were to continue to have first call on federal resources. So the firm power contracts with the investor-owned utilities were not renewed.

However, Bonneville continues to sell some peaking power to the investor-owned utilities — power the utilities need during periods of heavy use in the winter heating season. Bonneville also sells power to the investor-owned utilities and utilities outside the region when electricity surplus to the needs of the preference customers is available.

In 1976, Bonneville's power demand and supply projections showed that federal power supplies were running short for preference customers, and that Bonneville would no longer be able to guarantee preference customers that their load growth could be met beyond 1983. Bonneville issued a notice of insufficiency to the utilities in June of 1976. The following month, 88 public utilities signed contracts with WPPSS to build nuclear plants 4and 5. The WPPSS nuclear construction program proved to be a debacle, but it also prompted changes in regional energy policy. Mismanagement and cost overruns at the five WPPSS plants were at the root of the financial problems, but the WPPSS debacle also was a failure of electricity demand forecasting. The impetus for the nuclear construction effort lay in demand forecasts produced by the region's utilities, through the Pacific Northwest Utilities Conference Committee, and Bonneville. The forecasts proved to be too high.

Rate disparities

With PNUCC and Bonneville warning of future power shortages, with the investor-owned utilities relying on their own hydro and thermal power resources to meet the demand of their customers, and with the prices of federal hydropower remaining much lower than that of new thermal generation, a divisive struggle developed for access to the limited federal hydropower. Sixty percent of the residential and farm customers of the region were served by investor-owned utilities. These customers were paying, on average, twice as much for electricity as customers of publicly owned utilities receiving wholesale power from Bonneville. The city of Portland sued Bonneville, claiming a right to a share of hydropower resources for its residents. The Oregon Legislature passed a law authorizing formation of a statewide public utility — the Domestic and Rural Power Authority — to seek service as a preference customer from Bonneville so that all residential customers of private utilities could receive the rate benefits of federal resources. Elected officials of other states talked of forming their own statewide public utilities.

Stimulated by rate disparities, the public power movement also experienced a renaissance. A strong public power move to buy out investor-owned utility service areas by means of elections in accordance with state law was revived in Oregon. All votes to form new PUDs failed in the November 1980 elections, but one long inactive PUD, the Columbia Peoples Utility District west of Portland, won voter approval for issuing bonds to buy out utility properties in Columbia County.

Meanwhile, planning for more resources to meet demand was hamstrung by uncertainty over the allocation of low-cost federal power among competing claimants, existing and new. For example, Bonneville's contracts with its direct-service customers, which are large industrial firms that purchase power directly from Bonneville, were to expire in the 1980s. The power sold to these industries would have to be sold to public utilities under the preference clause. If they were to survive in the Northwest, these industries needed an assured source of electricity.

2. Declining salmon runs

Finally, by the late 1970s it became clear that our regional prosperity, which resulted in large measure from inexpensive hydropower from the federal dams, had extracted a price on fish and wildlife in the Columbia River Basin. Just a century earlier, for example, between 10 million and 16 million salmon and steelhead returned to the Columbia each year. But by the late 1970s the annual returns had dwindled to about 2.5 million fish, and most of those returned to hatcheries. Environmental groups and other advocates for fish and wildlife considered filing petitions to protect dwindling fish populations under the federal Endangered Species Act.

These pressures on our regional electric power supply, which once seemed inexhaustible, caused Pacific Northwest residents to question the institutions governing the development, sale, and distribution of generating resources. Should new preference agencies be formed to replace private companies in given areas? How would the needs of new preference customers be met? Should private utilities undertake new generating projects in a hostile atmosphere of rapidly rising rates and the threatened shift to public power? How would large industrial customers in the region be served? How should the public, and their elected representatives, participate in decisions that were critical to the region's economy and environment? Who ultimately would be responsible for planning and acquiring new resources to avoid impending electricity shortages? How would our region protect the fish and wildlife that had been damaged over the years by the construction and operation of hydropower dams?

The region continued to work for a cooperative solution that preserved local options while obtaining regional efficiencies of an integrated electric system. Several alternatives were explored, but no agreement was reached. To avoid a court battle over allocation issues, the region turned to Congress for a solution.

3. Toward a Congressional solution

Revisions to the Bonneville Project Act were considered as early as 1975. The legislation was prompted by Bonneville's Notice of Insufficiency in June 1976, coupled with the threat posed by Oregon's Domestic and Rural Power Authority. However, it was not until 1977 that Bonneville and its customers, through the Pacific Northwest Utilities Conference Committee (PNUCC), drafted legislation to solve the region's energy problems. U.S. Senator Henry M. Jackson of Washington introduced the PNUCC bill in September 1977, but neither that bill, nor a less complex successor drafted a year later, managed to progress very far by the time the 95th Congress adjourned in late 1978.

When the 96th Congress convened in 1979, a coalition of Bonneville customers was solidly behind a legislative solution to the Northwest's power crisis. Neither Bonneville nor its customers wanted an administrative allocation of limited power supplies, although Bonneville did propose an allocation scheme in October of 1979.

Bonneville and its customers, however, maintained that such an allocation would be subjected to protracted litigation. They alleged that Congress could avoid the uncertainties accompanying administrative allocation by devising a legislative allocation scheme and equipping Bonneville with the authority to purchase power from non-federal sources on a long-term basis. Supplying Bonneville with purchase authority was, they claimed, the key to implementing any legislative allocation scheme. Congress apparently agreed. The Senate passed the regional legislation on August 3, 1979; the House passed an amended bill on November 17, 1980, which the Senate agreed to two days later. On December 5, 1980, President Carter signed the Pacific Northwest Electric Power Planning and Conservation Act into law as Public Law 96-501.

4. Northwest Power Act

After four years of deliberation, Congress devised methods for protecting the preference that existing federal law gives publicly owned utilities, while at the same time providing the benefits of federal hydropower to residential and small farm customers of private utilities. It should be noted that the Act passed largely because it seemed to benefit all the interest groups that lobbied for it.

The Act directs that Bonneville should continue its traditional role of transmitting and marketing power, but also carry out additional responsibilities. Under the Act, Bonneville must acquire all necessary energy resources to serve public utilities that choose to apply to Bonneville for wholesale power supplies. The Act contains checks and balances to insure that all customers of Bonneville are treated equitably.

Bonneville remains accountable to the people of the Pacific Northwest for the actions it takes to meet the needs of residents and industry. By creating a regional planning council consisting of two members from each of the four Northwest states to develop a regional plan, Congress provided a regional decision-making system. It emphasizes local control of resource development and power planning.

Here are some of the major provisions of the Act:

- The states of Idaho, Montana, Oregon, and Washington were authorized to form the Council (in the Act, Section 4.(a)(2)(A), it is called the Pacific Northwest Electric Power and Conservation Planning Council) with two representatives from each state, appointed by the governors. The Act directed the Council to draw up a plan for meeting the electrical needs of the region at the lowest possible cost. The plan must give highest priority to cost-effective conservation to meet future demand for electricity. Renewable sources of energy must be given next-highest priority in the region's power planning, to the extent that they are cost-effective, ranking ahead of conventional thermal generating resources. Among thermal options, fuel-efficient methods of producing energy, such as cogeneration, must be given priority.

- Bonneville became responsible for meeting loads of customers and managing the regional electrical system to achieve the purposes of the Act relating to fish and wildlife, system efficiency, and experimental projects. The plan adopted by the Council, which is amended periodically, is the basis for Bonneville's actions in meeting loads of its customers. Congress exercises budget review of all proposed Bonneville expenditures. If Bonneville decides

to acquire resources not consistent with the Council's plan, specific Congressional approval is required prior to any commitment by Bonneville. Bonneville must give priority to cost-effective conservation and renewable resources in meeting the region's needs. Bonneville may also purchase the generating capabilities of new thermal projects, but only after determining that they are required in addition to all cost-effective conservation and renewables that can be achieved or developed in time. Such projects must also be found reliable and compatible with the regional electric system. Bonneville must spread the benefits and the costs of resources among all of its customers through its rates.

- The supply preference and resulting price advantage to co-ops and publicly owned utilities by federal law was protected and enhanced. Bonneville was given the responsibility of meeting the full future requirements of preference customers — something Bonneville was not previously authorized to do.

- Residential and farm customers of investor-owned utilities received rate relief. The utilities sell to Bonneville an amount of electricity equal to their residential and farm loads at their cost. In return, Bonneville sells to them enough energy at Bonneville's standard rates to cover these residential and farm loads. The rate advantages cannot enhance company profits, but must be passed on directly to the customers.

- Direct service industries received new 20-year contracts for power from Bonneville, but at a higher price than they paid under previous contracts. In effect, they paid the cost of rate relief to residential and small farm customers of investor-owned utilities during the first four years, and a substantial portion thereafter, which they agreed to do in exchange for assurances of long-term supplies.

- Bonneville sells electricity at a rate that reflects the melded cost of federal hydropower and more expensive thermal resources, conservation, and renewable sources of energy. The Act contains incentives, as well, to encourage conservation and renewables. Bonneville may credit utilities for their individual actions to implement conservation and renewables.

- The Council is to prepare, and periodically amend, a program to protect, mitigate, and enhance fish and wildlife, and related spawning grounds and habitat, that have been affected by the construction and operation of any hydroelectric project on the Columbia River or its tributaries. This applies to anadromous (ocean-going) fish as well as to resident (non-ocean-going) fish, and terrestrial and aquatic wildlife. The Act directs the Bonneville administrator to use the Bonneville fund to protect, mitigate, and enhance fish and wildlife affected by hydropower dams in a manner consistent with the program developed by the Council. A 1996 amendment of the Power Act authorized the Council to create the Independent Scientific Review Panel to review projects proposed for funding by Bonneville through the Council's

program. The ISRP is discussed in the section of this briefing book that addresses fish and wildlife planning.

- All planning for electric resources and fish protection must involve the public. State and local control of land use and water rights is protected under the Act and the decision to allow construction of new resources is left with utilities and state siting authorities.

- The Council must provide a method for balancing environmental protection and the energy needs of the region. For each new energy resource, the provisions of the National Environmental Policy Act must be followed.

- The Council is required to seek the recommendations of the region's tribal, state and federal fish and wildlife agencies. In addition, the Council's measures must be consistent with the legal rights of the region's tribes.

5. Challenges for the future

Since 1996, the electricity industry in the United States has been in the midst of a significant restructuring. This restructuring is the product of many factors, including national policy to promote a competitive electricity generation market and state initiatives in California, New York, New England, Wisconsin, and elsewhere to open retail electricity markets to competition. This transformation is moving the industry away from the regulated monopoly structure of the past 75 years. Today we are served by individual utilities, many of which control everything from the power plant to the delivery of power to our homes or businesses. In the future, we may have a choice among power suppliers that deliver their product over transmission and distribution systems that are operated independently as common carriers.

There is much to be gained in this transition, as electricity consumers can benefit from competition, but also much to lose from volatile wholesale power markets and illegal marketing activities, as the region learned during the energy crisis of 2000/2001. On the optimistic side, not too many years ago competition in the natural gas industry helped lower the cost of electricity produced by gas-fired generating plants. On the negative side, completion of a new pipeline linking the gas fields of northern Alberta with the American Midwest increased competition between that region and the Northwest and contributed to higher gas prices here in the early 2000s. During the energy crisis of 2000/2001, natural gas prices tripled in a year, and then subsided as the electricity supply rebounded. Competition among manufacturers and developers of combustion turbines contributed to the availability of less expensive, more efficient power plants that can be built relatively quickly, and many new plants were added to the Northwest and West Coast power supply during the energy crisis, when stratospheric prices — well over $200 per megawatt-hour — meant that construction debt for the plants could be paid down quickly. Generally speaking, surplus generating capacity on the West Coast, combined with increasing competition among wholesale suppliers, reduces the price utilities must pay for power on the open market, as long as supplies are adequate. Broad competition in the electricity industry can result in lower prices and more choices about the sources, variety and quality of their electrical service, but competition also can lead to price escalations, as the region learned during the energy crisis.

Electricity markets can be benign as long as supply and demand remain somewhat aligned. But as the experience of 2000/2001 made abundantly clear, competitive markets can be volatile. In a competitive energy marketplace, prices can explode to unheard-of levels in a matter of months when demand increases and the supply decreases. Coupled with rapidly increasing costs for natural gas, the advantages of competition can turn quickly to disadvantages.

If nothing else, the absurdly high West Coast prices for wholesale electricity in late 2000 and the first five months of 2001 showed there are risks inherent in the transition to more competitive electricity services. Merely declaring that a market should become competitive will not necessarily achieve the full benefits of competition or ensure that they will be broadly shared — particularly when the weather, power plant outages, regulatory rules, and natural gas prices don't cooperate.

It is entirely possible to have deregulation without true competition. Similarly, the reliability of our power supply could be compromised if care is not taken to ensure that competitive pressures do not override the incentives for reliable operation. How competition is structured is important.

It is also important to recognize the limitations of competition. Competitive markets respond to consumer demands, but they do not necessarily accomplish other important public policy objectives. The Northwest has a long tradition of energy policies that support environmental protection, energy-efficiency, renewable resources, affordable services to rural and low-income consumers, and fish and wildlife restoration. These public policy objectives remain important and relevant. Given the enormous economic and environmental implications of energy, these public policy objectives need to be incorporated in the rules and structures of a competitive energy market, and not abandoned in the face of escalating demand and tight supplies of power.

In some respects, the transition to a competitive electricity industry is more complicated in the Northwest than elsewhere in the country because of the presence of the Bonneville Power Administration. Bonneville is a major factor in the region's power industry, supplying, on average, 40 percent of the power sold in the region and controlling more than 70 percent of the region's high-voltage transmission. Bonneville benefits from the fact that it markets most of the region's low-cost hydropower. It is hampered by the fact that it has comparatively high fixed costs, including the cost of past investments in nuclear power and the majority of the cost of fish and wildlife recovery in the Columbia River Basin.

As a wholesale power supplier, Bonneville already is fully exposed to competition, and Bonneville struggles when market prices are above its own cost-based rates. The transition to a competitive electricity industry raises many issues for Bonneville and the region. For example, can Bonneville continue to meet its financial and environmental obligations in the face of intense competitive pressure? When market prices rise and some of Bonneville's debt obligations have been retired, how can the Northwest retain the economic benefits of its low-cost hydroelectric power when the rest of the country is paying market prices? And finally, what is the appropriate role of a federal agency in a competitive market? The question is not only whether Bonneville can compete in the near term, but also, should it be a competitor?

In the mid 1990s, Bonneville struggled in a low-cost market. During the energy crisis of 2000 and 2001, when wholesale market prices shot up to 10 times the usual price, and higher at times, federal power was the envy of every utility facing marketplace sticker shock. The drought of 2001, which reduced Columbia River runoff to the second-

lowest level in 73 years of record-keeping, reduced the region's hydropower capacity by 4,000 megawatts, and Bonneville, which at that time normally purchased about 3,000 megawatts in the market in order to meet its customers' demand, spent nearly $3 billion on power in a single year, 2001.

Largely because of Bonneville's experiences in 2001, a group of Bonneville customers proposed a fundamental change in Bonneville's power marketing role in the future, a proposal to limit Bonneville to selling only the output of the federal Columbia River Power System — this is called Tier 1 — essentially ending its role in the marketplace and making its customers responsible for meeting their own load growth beyond their guaranteed share of the federal system (Tier 2), which Bonneville would supply. That proposal, known as the Joint Customer Proposal (JCP), initiated a multiple-year-long process, known as the Regional Dialogue, by Bonneville to define its future role in power supply. This process culminated in 2007 and its principles were embodied in power-sales contracts in 2008.

The Council strongly supported and participated in these processes and offered a number of recommendations. Bonneville adopted a Regional Dialogue Policy, which defined its potential resource-acquisition obligations for power sales after 2011, whether at Tier 1 or Tier 2 rates. The administrator's potential future obligations also include additional firm energy, capacity, and flexibility for integrating wind power into Bonneville's balancing area. Its obligations to provide flexibility for wind-power balancing also are driven by its obligations under NERC standards as the host balancing authority for wind-power resources that are meeting load elsewhere, primarily in California.

The size of these obligations is not well understood because the obligations will be driven by choices of Bonneville's customers and the amount of wind power located in Bonneville's balancing area. Moreover, the supply of resources available to meet these obligations, particularly for additional flexibility to deal with wind integration, is uncertain. There are, for instance, a number of regional and West-wide discussions underway about institutional and business-practice changes to help balancing authorities deal with these issues.

Because of these uncertainties, the Council adopted several general principles in the Sixth Plan to guide Bonneville should it need to acquire resources to meet any of these several kinds of obligations. They are, briefly:

- Aggressively pursue the Council's conservation goals first
- Aggressively pursue the various institutional and business-practice changes to reduce the demand for flexibility and to use the existing system more fully
- Look broadly at the cost-effectiveness and reliability of possible sources of new capacity and flexibility, such as gas or other generation types, and take into account synergies in meeting several types of needs with single resources

The federal power system in the Pacific Northwest has conferred significant benefits on the region for more than 60 years. The availability of inexpensive, cost-based electricity has supported strong economic growth and helped provide for other uses of the Columbia River, such as irrigation, flood control, and navigation. The renewable and non-polluting hydropower system has helped maintain a high quality environment in the region.

But while the power system has produced significant benefits, these benefits came at a substantial cost to the fish and wildlife resources of the Columbia River Basin. Salmon and steelhead populations were reduced to historic lows (some of these have rebounded in the 10 years between 2001 and 2010), and 12 populations of salmon and steelhead, plus bull trout and Kootenai River white sturgeon, are listed for protection under the federal Endangered Species Act. Resident fish and wildlife populations also have been affected. Native Americans and fishery-dependent communities, businesses and recreationists have suffered substantial losses due in significant part to construction and operation of the power system.

It is important that the region sustain its core industries, support energy efficiency and renewable resources, and restore salmon runs. As John Volkman comments in his book on Columbia River water policy, excerpted at the beginning of this briefing book, fish and wildlife mitigation requires a healthy hydropower system capable of generating sufficient revenues to finance energy and fish and wildlife measures — neither fish and wildlife conservation nor power development can proceed without the other.

6. Energy-efficiency accomplishments

Since the 1980s, improvements in the efficiency of electricity use met 40 percent of the new demand for power in the Northwest, and the same — or more — is possible over the next 20 years. Importantly, the future cost of energy efficiency — also known as energy conservation — is less than the cost of building new generating plants.

Since 1982, when the Council issued its first Northwest Power Plan, energy efficiency improvements have topped 4,000 average megawatts — enough power for four cities the size of Seattle or, put another way, enough for all of the present-day power use of Idaho and western Montana combined.

In the Sixth Power Plan, issued in February 2010, the Council predicts that up to 85 percent of the new demand for electricity over the next 20 years in the Northwest can be met through energy efficiency. The anticipated demand growth is about 7,000 average megawatts. The plan's target for the first five years, 1,200 average megawatts, is the energy equivalent of the power use of a city the size of Seattle. Over time, the energy-efficiency target in the plan — 5,900 average megawatts over 20 years — would be the most aggressive regional target in the nation.

Investments in energy-efficient equipment and products will cost less than half as much as buying electricity from new power plants, saving consumers millions of dollars. Additionally, investments in energy efficiency will reduce greenhouse gas emissions from the region's power supply by 17 million tons per year by 2030 and create as many as 47,000 new jobs in the Northwest according to calculations by the Council staff.

The Council's analysis in the Sixth Plan shows that efficiency gains are available in a number of new places over the next 20 years compared to the Fifth Plan, which was completed in 2004. These include, for example, 954 average megawatts in consumer electronics, particularly flat-screen television sets, which are more energy-efficient than older sets that have cathode ray tubes. Industrial lighting and motors and more efficient electricity distribution equipment also contribute large savings in the plan.

Power Planning

1. The Northwest Conservation and Electric Power Plan: Background

The Northwest Power Act directs the Council to prepare a plan to assure the Pacific Northwest region an adequate, efficient, economical, and reliable power supply. The Council adopted its first power plan in January 1983 and has revised it five times since then. The sixth revision was completed in 2009.

While each of the Council's power plans has fulfilled the mandate in the Power Act, each plan evolved from a different set of circumstances and addressed a different set of challenges. For example, the Fifth Power Plan, adopted by the Council in December 2004, was a much different document than the Fourth Northwest Power Plan, adopted by the Council in 1998.

The Fourth Plan was, in essence, a blueprint for how the electricity industry of the Northwest should be restructured to accommodate increasing competition. The Fourth Plan followed on the 1996 Comprehensive Review of the Northwest Energy System, an effort convened by the four Northwest governors to develop recommendations for changes in the institutional structure of the region's electric utility industry "…to protect the region's natural resources and distribute equitably the costs and benefits of a more competitive marketplace, while at the same time assuring the region of an adequate, efficient, economical and reliable power system."

The Fifth Power Plan provided additional recommendations for dealing with the impacts of competition, particularly the dilemma of how to ensure an adequate supply of affordable electricity in a competitive marketplace where price competition among power suppliers discourages investments in new generating and energy efficiency resources. The Fifth Plan responded to the problem of high prices and reduced supply of power that prompted the West Coast electricity crisis of 2000/2001. The plan recommended aggressive energy efficiency and demand-reduction investments through about 2010 and, after that, investments in new generating resources. The plan also discussed the future role of the Bonneville Power Administration, following on a similar discussion in the Fourth Plan.

The key theme of the Fifth Plan was that the future is uncertain. Therefore, plans and policies must be developed that allow the region to manage uncertainty and the risks it entails. Many of the uncertainties the region faces are familiar — uncertainty about demand for electricity, hydropower conditions, and forced outages of major power plants. Other uncertainties are new or have greater importance. The increased role of natural gas-fired generation and changes in the nature of the natural gas industry mean gas price uncertainty and volatility is a significant factor. Increasing concerns about global climate change pose new uncertainties for resource choices. The wholesale electric power market is still important, but it also is uncertain and volatile.

In short, major changes have occurred, and are occurring, in the energy environment. The region's electricity supply no longer is provided solely by the Bonneville Power Administration and regulated public and investor-owned utilities. It is now provided by a mix of regulated and unregulated utilities and private businesses.

From a physical standpoint, the region today (in 2010) has a modest generation surplus under critical water conditions. That surplus is the result of reduced demand that has not yet returned to pre-2001 levels and a significant amount of new generation, most

of which was built by independent power producers (IPPs). But in terms of generation owned by or contracted to the region's utilities, the region is deficit. The IPP generation is available to the region but, unless purchased long-term, it will be sold at market prices and subject to market risk. The role the IPPs will play in the region's electricity future is unclear.

In addition, those making resource decisions may be a more varied group than in the past. In 2008, Bonneville signed new power-supply contracts with its utility customers consistent with the new role Bonneville created for itself in the regional-dialogue process that culminated in 2006. Under the new contracts, Bonneville will sell only the output of the Federal Columbia River Power System. This is not enough power to meet all of the demand placed on Bonneville, and so the customers are responsible for any additional power they may need. Or, the customers may purchase that additional power from Bonneville, but at a higher price because Bonneville will have to buy it on the wholesale market. Thus, the new contracts imposed a tiered-rate schedule. The FCRPS power, called Tier-One power, is priced lower than additional increments, which is called Tier-2 power. Under the new contracts, many of Bonneville's customers will be making their own resource decisions if they need more power than they are allotted from the pool of Tier 1 power. Coincidentally, the Fifth Power Plan described a robust and flexible resource strategy that could perform well under the expanded and intensified range of future uncertainties and be useful to utilities that will be in the market for power beyond their allocation from Bonneville.

The Fifth Plan also addressed key policy issues that affect the ability to assure an adequate, efficient, economical, and reliable power system. These included issues such as standards for resource adequacy; how the region plans, pays for, and operates transmission; the interaction of fish and wildlife and hydropower; and, as discussed above, recommendations for the future role of the Bonneville Power Administration in power supply.

2. The Sixth Northwest Power Plan

Each of the Council's five previous power plans was organized around a general theme. Sometimes these were explicitly stated, and other times they were implicitly suggested. The implicit theme of the Fifth Power Plan, as discussed above, was dealing with electricity price volatility and risk. That power plan was developed following the West Coast energy crisis of 2000-2001. The plan focused on adequacy of power supplies and the value of improved efficiency as a low-cost and low-risk approach to meeting demand for power.

Today, nine years later, climate-change policies are issues of special interest in the hydropower-dependent Northwest, and elsewhere in the United States where a greater percentage of electricity is generated using fossil fuels. Renewable portfolio standards and carbon-control regulations have been established in many western states, and the Western Climate Initiative adopted CO_2 emissions targets. Several states have adopted similar emissions targets.

The Council's 2007 paper entitled *Carbon Dioxide Footprint of the Northwest Power System* (http://www.nwcouncil.org/library/2007/2007-15.htm), illustrated the difficult challenge the region faces to achieve these goals and maintain an economical and reliable power system. In response, the Council decided that the cost-effective

reduction of carbon-dioxide emissions from the Northwest power system should be a major theme of the Sixth Power Plan.

In February 2010, following two years of work including numerous public meetings and an extensive public-comment period, the Council adopted the Sixth Plan. The plan addresses future risks, uncertainties, and growth in demand for electricity with strategies and an action plan that minimize the expected cost of the regional power system over the 20-year planning period, 2010-2029, and ensure that the power supply remains affordable and reliable.

According to the plan, demand for electricity will grow by about 7,000 average megawatts during that time period, and about 85 percent of that amount — 5,900 average megawatts — can be met with cost-effective energy efficiency. The plan's efficiency target for the first five years, 1,200 average megawatts, is roughly equal to the power use of Seattle. Over time, the energy-efficiency target in the plan would be the most aggressive regional target in the nation. The remaining new power would come from renewable resources, particularly wind power, and new generating plants that burn natural gas.

Importantly, the plan assesses the risks and costs associated with climate-change policies. According to the plan, three things must happen in order to meet existing regional and state carbon-reduction targets for the year 2030: 1) acquire all of the energy efficiency in the plan; 2) meet renewable-energy portfolio standards adopted in three of the four Northwest states; and 3) reduce the future use of existing coal-fired power plants by half compared to present-day use. As well, hydropower generation must be preserved as much as possible within the limits of legal requirements to protect fish and wildlife. The Sixth Plan is posted on the Council's website, www.nwcouncil.org.[2]

Climate-change issues and policies in the Sixth Plan

Climate change presents a daunting challenge for regional power planners. There are at least two ways in which climate can affect the power plan. First, warming trends will alter electricity demand and change precipitation patterns, river flows, and hydroelectric generation. Second, policies enacted to reduce greenhouse gases will influence future resource choices. There remains a great deal of uncertainty surrounding both of these issues.

Chapter 11 and Appendix L of the Sixth Plan describe how current and potential new policies affect the plan's resource strategy and what actions will be needed to achieve greenhouse gas emission-reduction goals. The issue of potential changes to electricity demand and hydroelectric generation is discussed in Appendix L.

The focus of climate policy, especially for the power sector, will be on carbon dioxide emissions. Nationally, carbon dioxide accounts for 85 percent of greenhouse gas emissions, with about 38 percent originating from electricity generation. For the Pacific Northwest, the power-generation share is only 23 percent because most of our electricity comes from hydroelectric generation.

[2] In July 2010, the Northwest Resource Information Center petitioned the U.S. Ninth Circuit Court of Appeals to review the power plan, raising issues of "due consideration" for fish and wildlife and the "methodology for quantifying environmental costs and benefits" as that concept might relate to fish and wildlife cost considerations in the power plan. The court scheduled briefings and arguments for the fall of 2010.

Analysis by others has shown that substantial and inexpensive reductions in carbon emissions can come from more efficient buildings and vehicles. More expensive reductions can come from substituting non- or reduced-carbon electricity generation such as renewable resources, natural gas, and nuclear power, or from sequestering carbon. Reductions in carbon emissions can be encouraged through various policy approaches such as regulatory mandates (e.g. renewable portfolio standard or emission standards), emissions cap-and-trade systems, emissions taxation, and efficiency-improvement programs.

Climate change policies enacted in the Northwest states have focused on renewable energy and new generation-emission limits. National and western-state proposals have focused on cap-and-trade systems, although none has been implemented successfully. Although carbon taxes are easier to implement than cap-and-trade systems, none has been proposed. Washington and Oregon have adopted specific greenhouse gas-reduction targets. Similar targets exist for the Western Climate Initiative and in proposed national legislation. These goals imply reductions of 30 to 40 percent from 2005 levels by 2030. The Sixth Power Plan explores, through various scenario analyses, what actions must be taken to meet these targets in the most cost-effective manner.

There are four critical elements to those actions. First is acquiring all of the efficiency improvements (which are significant) indentified in the plan's resource strategy. Second is reducing reliance on coal-fired generation to about half of current levels. Third is meeting renewable portfolio standards that already exist in three of the four Northwest states. Finally, the region needs to preserve the capability of the hydroelectric system to the greatest extent possible within the limits of fish and wildlife and other obligations.

A modern challenge: Meeting loads on a daily and hourly basis

In the past, regional planning focused mainly on meeting annual energy requirements. However, we have recognized for many years that a time would come when assessing annual energy needs would not be sufficient. Accordingly, the Sixth Plan addresses not just energy planning, but also how the region can best meet electricity requirements on an hourly and daily basis.

The Northwest Power Act was created to respond when the region began to outgrow the energy capability of the hydroelectric system. Successful energy-efficiency efforts in the region have slowed the growth of electricity demand, but over 25 years the hydroelectric system has become a smaller share of the electricity supply. The region now has a diverse array of generating resources. However, much of the added non-hydropower generation resources have been for the purpose of baseload generation. Baseload generation is not designed to vary operating levels on an hourly or daily basis. The region has continued to rely on the hydroelectric system for the flexibility to shape energy to meet fluctuating electricity use and to provide ancillary services.

Eventually the region is bound to outgrow the flexibility available from the hydroelectric system, just as it did the energy capability of the system. Some utilities in the region already have turned to construction of new generation for the purpose of serving capacity needs. It is still not clear when new flexibility resources will be needed, but the time has been hastened by limitations on the flexibility of the hydroelectric system to help mitigate the impacts of the dams on salmon and steelhead, and more recently by significant additions to wind generation capacity.

Wind generation is intermittent, subject to the whims of nature, and requires increased generation flexibility from other resources to integrate it into the power system, both on an hourly and sub-hourly basis. Renewable portfolio standards are expected to add much more wind into the regional generation mix and further hasten the need to address increased flexibility in the regional generation and use of electricity. The Council recognizes a growing need to analyze generation and load on a finer temporal scale. In the past, the Council developed models to assess the shape of demand, simulate resource operation, evaluate regional market prices of electricity. and determine loss-of-load probability — all on an hourly basis. The Fifth Power Plan began to assess demand response as a way of providing flexibility on the demand side. Conservation cost-effectiveness has been assessed based on a time-of-day and seasonal basis since the 1996 Power Plan. The Resource Adequacy Forum developed both capacity and energy adequacy standards for the region. In addition, the Council has assessed the effects of climate-change forecasts on the seasonal patterns of hydroelectric generation and electricity demand.

These developments, although they contributed to parts of past power plans, were not consistently and completely integrated into the plans. Thus, the Council developed a new demand-forecasting system that better addresses both short-term and long-term patterns of demand. Some flexible resources such as simple-cycle turbines or water storage behind dams are traditional and well understood. However, other alternatives are less well-understood and more difficult to assess with traditional models. Some examples include demand-response programs, various electricity pricing strategies, plug-in hybrid cars that can be charged or drawn down as needs vary, innovative storage technologies, improved wind forecasting, and ramping controls on wind turbines.

There are likely many other approaches to be considered and compared on the basis of cost, risk, and other characteristics. Many of these alternatives can contribute to wind integration but may affect the flexibility of the power system in other ways as well. However, the issue is broader than wind integration and should be analyzed in a more comprehensive manner.

Expanding the Menu of Resource Choices

The Council's paper on the CO_2 footprint of the regional power system (Council Document 2007-15, www.nwcouncil.org/library/2007/2007-15.htm) demonstrated that significant effort will be required to reach Western Climate Initiative, state, and potential national greenhouse gas-reduction targets. Conventional low-carbon resource alternatives are limited in potential and are expensive. Natural gas-fired generation is subject to substantial fuel-availability and price risk. Some technologies for reducing carbon dioxide releases to the atmosphere, such as post-combustion carbon separation, carbon sequestration, and advanced nuclear power, remain under development and may be difficult to put in place, certainly in the first decade of the power plan.

Higher prices and CO_2 limitations mean that efficiency improvements will be especially important. It is an objective of the Sixth Power Plan to expand the efficiency supply curve to provide additional options at higher avoided cost levels. The Council will take a fresh look at renewable and low-carbon generating technologies, system operation strategies, and sequestration technology to see if some of them have become viable sources of cost-effective approaches to meeting renewable portfolio standards and CO_2 reduction targets.

Traditional resource choices are limited in the carbon-constrained world that is developing. These conventional sources of generation and conservation have been well-characterized in past power plans. In the new power plan, the Council explores further resource alternatives holding promise in this new world including:

- What efficiency options are available at higher avoided cost levels?
- What are the cost-effectiveness and feasibility of "smart grid" options including opportunities for savings based on smart meters and automated evaluation of savings from real time pricing incentives that consider not only electricity cost savings but overall business efficiency and profitability?
- What are the cost, commercial status, and potential for emerging renewable resources including wave, tidal current, and solar thermal options?
- What is the availability of "conventional" renewable resources including wind, geothermal, biomass, and solar photovoltaics at higher avoided-cost levels?
- What are the most promising advanced natural gas and coal technologies? What carbon-separation technologies are available for new and retrofit applications? What are the prospects for carbon sequestration in the Northwest?
- What are the most promising nuclear generation designs, and what are the current state of and future prospects for nuclear waste processing, storage, and disposal?

The Sixth Power Plan highlights these resources where promising and explores ways to encourage their development if they are cost-effective and contribute to meeting other policy goals.

Transmission constraints and impacts

Adequate transmission capacity and its efficient operation and management are essential to a reliable and economical power system. The Fifth Power Plan addressed a list of transmission problems and encouraged the region to move forward to resolve them. There has been progress over the last few years to address some of the most urgent problems. These efforts are headed by different regional and West-wide organizations, such as Columbia Grid, the Northern Tier Transmission Group, WECC, NTAC, and perhaps others in the West.

The Sixth Power Plan assesses the progress in improving transmission capacity and operation. Some resource alternatives continue to be transmission-constrained, which will affect their timing and cost. The role of transmission may be especially important in determining the feasibility of acquiring enough renewable resources to meet RPS requirements within proposed cost limitations. To the extent that generating plant locations, distributed generation, efficiency improvements, or demand response contribute to alleviating transmission constraints, they have additional value that should be considered.

Transmission decisions and impacts both are highly location- and situation-specific and often not just regional but multi-regional. Transmission expansion planning studies that would be analogous to what the Council does in resource planning would require analytical capability and models that the Council does not now possess. However, the Council is actively involved in a number of regional and West-wide transmission planning forums that are involved in such analysis. The intent of this involvement is, among other things, to help ensure that the resource actions of the power plan are carried out as well as possible.

Power plan Interactions with the Fish and Wildlife Program

By law, the Council's fish and wildlife program is incorporated into the power plan. The linkages have been relatively limited in the past. Most importantly, hydrosystem operations to improve fish passage in the fish and wildlife program act as constraints on the capability of the hydroelectric system, except in defined power emergency situations. In emergencies, which rarely occur, hydropower operations can have adverse effects on fish. The Council has attempted to minimize these events further by selecting a low-risk resource plan with adequacy standards intended to provide a low-risk power system, as well as a system unlikely to require emergency operations that might affect fish.

The Sixth Power Plan increases the coordination between the Fish and Wildlife Program and the power plan. Many of these opportunities are related to the growing concern about climate change, CO_2 mitigation, and increased use of wind power. For example, the power plan addresses how hydrosystem operations might be affected by 1) climate change, 2) increased needs to shape intermittent wind generation, and 3) the possible effects on fish-passage operations.

3. Energy efficiency acquisition

In the Council's power plan, energy conservation is defined as the more efficient use of electricity. This definition means that less electricity is used to produce a given service at a given amenity level. Energy efficiency resources are measures that ensure the efficient use of electricity for new and existing residential buildings, household appliances, new and existing commercial buildings, commercial-sector appliances, commercial infrastructure such as street lighting and sewage treatment, and industrial and irrigation processes. For example, buildings in which heat loss is reduced through insulating and air tightening require less electricity for heating to provide the same comfort level. These energy efficiency efficiencies mean that less electricity needs to be generated, saving operating costs and ultimately requiring less new power plant construction. Energy efficiency also includes measures to reduce electrical losses in the region's generation, transmission, and distribution system.

Energy efficiency has been a central ingredient in the resource portfolios of all previous Council power plans for meeting future electrical energy needs. Each kilowatt-hour of electricity used more efficiently means that one less kilowatt-hour needs to be generated. Since the Council issued its first power plan, in 1982, demand for electricity in the Northwest has been reduced through energy efficiency by approximately 4,000 average megawatts (through the end of 2009).

Conservation resources carry costs and risks, as do generation and demand response resources available to the region for development. The Council uses a portfolio model to determine what resources to develop on what schedule in order to minimize power system costs and risks.

In order for the portfolio model to identify how much energy efficiency is appropriate to develop, the Council first estimates the amount, cost, and availability of energy efficiency. The amount of conservation available to develop depends on future growth patterns, economic cycles, the success of energy-efficiency programs, timing of codes and standards, power prices, and a host of other factors. For example, more energy efficiency would be available if the region grows at a faster pace than the medium-

demand forecast, and less if the region grows more slowly as a result of the current economic downturn.

The Sixth Power Plan's assessment reflects program accomplishments, changes in codes and standards, technological evolution, and the overall adoption of more energy-efficient equipment and practices since the Fifth Plan was adopted in 2004. There are five significant changes:

- Accounting for utility energy-efficiency program savings since 2004,
- Adjustment of both the load forecast and the energy-efficiency assessment to reflect improvements in federal and state standards for lighting and appliances,
- Adding potential savings from utility distribution efficiency improvements,
- Increasing potential industrial savings resulting from a more in-depth analysis, and;
- Adding potential savings from new technologies and practices that have matured to commercial readiness since the Fifth Plan's estimates were developed.

The Fifth Plan called upon the region to develop at least 700 average megawatts of energy-efficiency savings from 2005 through the end of 2009. Based on surveys conducted by the Council's Regional Technical Forum, regional energy efficiency programs were likely to achieve a total savings of at least 875 average megawatts by the end of 2009. Savings from these accomplishments no longer represent potential future energy-efficiency opportunities.

Since the Fifth Plan was adopted, Congress enacted the *Energy Independence and Security Act of 2007* (EISA) and the Department of Energy has promulgated several new standards. The EISA legislation revised several existing federal efficiency standards, as well as established new standards. The most significant impact of the standards imposed by EISA is its requirement that "general service lighting" (e.g., 40- to 100-watt lamps) be at least 30-percent more efficient beginning in 2012, and 60-percent more efficient beginning in 2020. The Fifth Plan estimated that the conversion of standard incandescent bulbs used in the residential sector to compact fluorescent lamps (CFLs) could save the region 625 average megawatts by 2025. While the EISA standard does not cover all incandescent lamps (e.g., lamps over 100 watts and three-way lamps are exempt), it does cover 70-80 percent of the residential sector's applications. Consequently, roughly 75 percent of the savings from CFLs are now accounted for by a lower load forecast, leaving approximately 150 average megawatts of residential lighting potential.

EISA also set minimum standards for certain commercial lighting products that were incorporated into the energy-efficiency assessment and the load forecast. In addition, new efficiency standards were developed and adopted since 2004 for a suite of residential and commercial appliances regulated by federal law or state standards. Baseline assumptions for energy use of new appliances and equipment have been updated in the new energy-efficiency assessment to reflect these improved standards.

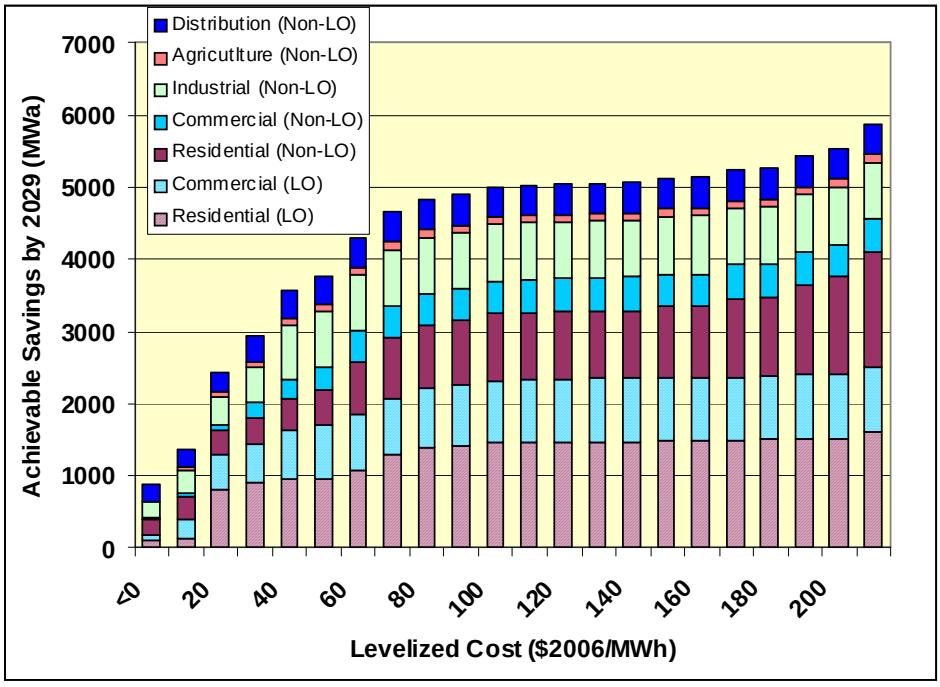
The third significant change in the Council's Sixth Plan assessment of regional energy-efficiency potential is the identification of savings on utility distribution systems. Distribution system savings, including voltage management and system optimization, add just over 420 average megawatts of energy-efficiency potential that was not included in the Fifth Power Plan assessment.

The fourth major adjustment resulted from a more in-depth analysis of the energy-efficiency potential in the industrial sector. This assessment more than doubled the energy-efficiency potential identified in the industrial sector in the Fifth Plan.

In addition to these four major adjustments, the Sixth Plan energy efficiency assessment incorporates new opportunities brought about by technological advances since the adoption of the Fifth Plan. For example, recent advances in solid-state lighting (light emitting diodes (LEDs) and organic LEDs) and the arrival in the U.S. market of ductless heat pumps both appear to offer significant opportunities for savings in some applications.

The figure below shows the Sixth Plan's estimate of the amount of energy efficiency available by sector and levelized life-cycle cost. The Council identified just under 6,000 average megawatts of technically achievable conservation potential in the base-demand forecast by the end of the forecast period at levelized life-cycle costs up to $200 megawatt-hour (in 2006 dollars). New sources of potential savings more than offset reductions from previous estimates due to already-achieved efficiency or new codes and standards. The net result is about 10 percent more technical potential identified compared to the Fifth Power Plan.

Achievable energy efficiency by 2030 by Sector and Levelized Cost



LO stands for lost-opportunity — efficiencies that are not discretionary because they only are feasible or cost-effective when, for example, a building is constructed or an appliance is purchased. Thus, if they are not captured at that time they are lost opportunities.

Achievable energy efficiency by sector in the Sixth Power Plan

Energy-efficiency resources are measures that ensure that new and existing residential buildings, household appliances, new and existing commercial buildings, commercial-sector appliances, commercial infrastructure such as street lighting and sewage treatment, and industrial and irrigation processes are energy-efficient. These

efficiencies reduce operating costs and ultimately decrease the need to build new power plants. Energy efficiency also includes measures to reduce electrical losses in the region's generation, transmission, and distribution system.

Most of the potential energy efficiency identified in the Sixth Power Plan is available at a levelized (net) life-cycle cost of up to $200 per megawatt-hour (2006 dollars). Sources of achievable potential savings are about 50 percent higher than in the Fifth Power Plan.[3] The assessment is higher for two principle reasons. First, the Council identified new sources of savings in areas not addressed in the Fifth Power Plan: consumer electronics, outdoor lighting, and the utility distribution system. Second, savings potential has increased significantly in the residential sector as a result of technology improvements and in the industrial sector as a result of a more detailed energy-efficiency assessment.

Not all of the identified efficiency is cost-effective to develop. The achievable savings up to $200 per average megawatt break down as follows:

- About 2,600 average megawatts technically are achievable in the residential buildings and appliances sector. Most of the savings come from improvements in water-heating efficiency and heating, ventilating, and air-conditioning efficiency.
- More than 800 average megawatts are estimated in the fast-growing consumer electronics sector. These savings come from more efficient televisions, set-top boxes, desktop computers, and monitors primarily in homes but also in businesses.
- Approximately 100 average megawatts are available in the agriculture sector through irrigation system efficiency improvements, improved water management practices, and dairy milk processing.
- More then 1,400 average megawatts are available from the commercial sector. Nearly two-thirds of commercial savings are in lighting systems. New technologies like light-emitting diodes and improved lighting fixtures and controls offer added potential savings in both outdoor and indoor lighting.
- Potential savings in the industrial sector are estimated to be nearly 800 average megawatts by 2029. The industrial assessment found that effective business-management practices could significantly increase savings from equipment and system optimization measures.
- Finally, potential savings from improved efficiency in utility distribution systems are estimated to be about 400 average megawatts by the end of the forecast period.

While there are a number of barriers to achieving these savings, the Council believes these challenges can be met.

[3] 1 For purposes of comparison, the Council's Fifth Power Plan estimated that the achievable energy efficiency was approximately 3,900 average megawatts at a cost up to $120 per megawatt-hour. The Sixth Plan's estimate of achievable potential is 5,860 average megawatts at an equivalent levelized life-cycle cost.

Fish and Wildlife Planning

1. The Columbia River Basin Fish and Wildlife Program

In February 2009, the Council culminated a 15-month public process by approving a revision of its Columbia River Basin Fish and Wildlife Program, the nation's largest regional effort to protect and enhance fish and wildlife.

The Council's program directs more than $220 million per year in electricity ratepayer funding to address the impacts of hydropower dams on fish and wildlife from the estuary of the Columbia to its highest mountain tributaries in the four Northwest states. The 2009 Program revision was the first since 2005.

The program revision began in November 2007 when the Council called for recommendations from the region's fish and wildlife agencies and Columbia River Basin Indian tribes. Using the recommendations as a foundation, the Council and its staff developed a draft program for public comment in 2008. The final version of the program reflects extensive public comments on the original recommendations and on the draft program. Key themes of the program include:

- Emphasizing implementation of fish and wildlife projects based on needs identified in locally developed subbasin management plans (these plans are included in the program) and also on actions described in federal biological opinions on hydropower operations, hatcheries, and harvest, Endangered Species Act recovery plans, and the 2008 Columbia Basin Fish Accords signed by federal agencies, Indian tribes, the Columbia River InterTribal Fish Commission, and the states of Idaho, Montana, and Washington
- Continuing the Council's commitment to independent scientific review of all projects proposed for funding through the program, including those actions described in the biological opinions and the 2008 Fish Accords
- Focusing on protecting and restoring habitat in order to rebuild healthy, naturally producing fish and wildlife populations
- Further review of specific issues such as the impacts of global climate change, toxic substances, and invasive species on fish, wildlife, and habitat

In the 2008 Fish Accords, Bonneville and other federal agencies committed to extensive, 10-year implementation plans, with associated actions and funding commitments, based on the foundation built by the Council's program over the last 26 years. This foundation includes water management and fish-passage measures (in the original, 1982 Program), mainstem and off-site mitigation measures (1987 and subsequent program amendments), the program framework (2000 amendment), and the subbasin plans (2004-2005 amendment). With the additional funding commitments in the 2008 Fish Accords, funding of projects through the Council's program likely will average more than $220 million per year from 2010 forward.

Thus, in the revised fish and wildlife program, the Council's focus turned from planning to implementation and performance. The program:

- Increases project performance and fiscal accountability by establishing reporting guidelines and using adaptive management to guide decision-making
- Commits to a periodic and systematic exchange of science and policy information; and
- Emphasizes a more focused monitoring and evaluation framework coupled with a commitment to use the information obtained to make better decisions

- Calls for a renewed regional effort to develop quantitative biological objectives for the program
- Retains an interim objective recommended by the region's fish and wildlife managers of increasing salmon and steelhead runs to 5 million fish by 2025 and achieving smolt-to-adult return rates of 2 to 6 percent
- Addresses passage problems for lamprey and sturgeon at the mainstem dams
- Proposes changes in some hatchery practices to create a more balanced, ecological approach to fish production
- Retains a crediting formula for wildlife losses of two new units of habitat for each lost habitat unit

Recent program history

The Council comprehensively revised the program in 2000 with the addition of the current program framework, added specific measures and objectives for the mainstem in 2003, and then developed and adopted the subbasin management plans into the Program in 2004-05. Together, these elements provide a coordinated and integrated plan for fish and wildlife actions across the basin. Federal, state, and tribal governments have been working since then with local partners to expand the subbasin plans into ESA recovery plans for areas of the basin that include ESA-listed populations.

In 2007-08, Bonneville and other agencies of the federal government signed the Columbia Basin Fish Accords (see www.salmonrecovery.gov), in which the agencies agreed to implement a number of fish and wildlife projects and guaranteed more than $900 million in funding over the 10-year period of the Accords — through 2019. The Accords build on the Council's broader planning foundation. Accords projects will benefit listed and unlisted anadromous fish, resident fish, and wildlife across the Columbia River Basin. The projects include mainstem, estuary, and tributary habitat, production, harvest, and monitoring actions.

The agencies committed to these actions as part of the consultation resulting in the 2008 Biological Opinion for the Federal Columbia River Power System, and in the Columbia Basin Fish Accords executed with three states (Idaho, Montana, and Washington) and five Indian tribes (Colville, Yakima, Warm Springs, Shoshone-Bannock, and Umatilla), and the Columbia River Inter-Tribal Fish Commission. The federal agencies committed the following amounts of funding to the Accords: Bonneville Power Administration, $917 million over 10 years; U.S. Army Corps of Engineers, approximately $50 million over 10 years; Bureau of Reclamation, a suite of actions to be funded from congressional appropriations (budget not specified).

Many areas of the Council's program already are covered by these multi-year implementation commitments. But these commitments do not cover all areas of the program. Given the Council's obligation to adopt and oversee the implementation of the program to protect, mitigate, and enhance all the fish and wildlife affected by the Columbia hydrosystem, including related spawning grounds and habitat, the Council is adopting appropriate measures and will oversee the development of multi-year action plans for all areas of the program.

All these implementation commitments are built on the mainstem and off-site mitigation foundations developed in the Council's program over the past 27 years. The program has identified the basin's biological potential and the opportunities for improvements. As a consequence of the Columbia Basin Fish Accords and the biological

opinions, there are significant financial commitments to implement actions during the next 2010-2019 period to try to capture that potential.

The 2009 Program renewed the emphasis on periodic scientific review of new and ongoing actions; increased requirements for reporting of results and accountability; emphasized adaptive management as a way to solve continuing uncertainties; renewed the push to develop a better set of quantitative objectives for the regional program; committed to a periodic and systematic exchange of science and policy information; and expanded the monitoring and evaluation framework with a commitment to use the information to make better decisions and report frequently on program progress.

Vision of the Program

The vision for the 2009 Program is a Columbia River ecosystem that sustains an abundant, productive, and diverse community of fish and wildlife, mitigating across the basin for the adverse effects to fish and wildlife caused by the development and operation of the hydrosystem. This ecosystem provides abundant opportunities for tribal trust and treaty-right harvest and for non-tribal harvest and the conditions that allow for the recovery of the fish and wildlife affected by the operation of the hydrosystem and listed under the Endangered Species Act.

Wherever feasible, the vision will be accomplished by protecting and restoring the natural ecological functions, habitats, and biological diversity of the Columbia River Basin. Where this is not feasible, other methods that are compatible with naturally reproducing fish and wildlife populations will be used, including certain forms of artificial production. Where impacts have irrevocably changed the ecosystem, the program will protect and enhance the habitat and species assemblages compatible with the altered ecosystem. Actions taken under the program must be cost-effective and consistent with an adequate, efficient, economical, and reliable electrical power supply.

The development and operation of the hydrosystem is not the only human cause of adverse effects to fish and wildlife in the Columbia River Basin. However, improving conditions for fish and wildlife affected by the hydrosystem is a responsibility that the Council and its program share with citizens, private entities, and government agencies throughout the region.

As part of the vision, the Council adopted the following policy judgments and planning assumptions for the 2009 Program:

- No single activity is sufficient to recover and rebuild fish and wildlife species in the Columbia River Basin.
- Successful protection, mitigation, and recovery efforts must involve a coordinated strategy for habitat protection and improvement, hydrosystem reform, artificial production, and harvest management. There also must be coordination with actions not funded under the program.
- Bonneville and its ratepayers shall bear the cost of measures designed to deal with adverse impacts caused only by the development and operation of the hydroelectric facilities.
- The hydroelectric power system is only one factor in the loss of fish and wildlife in the Columbia River Basin. The Council's program includes measures that directly address the impacts of the hydrosystem on fish and wildlife. The program also includes measures that address limiting factors *not* caused by the hydrosystem, as the Northwest Power Act authorizes the program to contain and

Bonneville to fund off-site protection and mitigation measures to compensate for losses arising from the development and operation of the hydroelectric facilities of the Columbia River and its tributaries.

- The "nexus" to the hydrosystem that allows a measure to be an appropriate part of the program is whether the measure will provide protection or mitigation benefits for fish or wildlife adversely affected by the hydrosystem, benefits that can be said to compensate for effects not already mitigated. On that basis, the program identifies a comprehensive set of interrelated fish and wildlife problems and responsive strategies. While all such strategies are within Bonneville's authority to fund as offsite mitigation to address its mitigation obligation, the extent of Bonneville's funding obligations in any particular rate period will be determined through the program's implementation provisions. At any one time, program implementation will include both measures addressing the direct impacts of the hydrosystem and off-site mitigation measures. Together they must be sufficient to mitigate for the impacts of the Columbia hydropower system on fish and wildlife.
- The Council will work with Bonneville, the fish and wildlife managers, and others to develop budgets, implementation plans, and project recommendations that provide sufficient guidance to Bonneville about the level of effort necessary in any particular period to be acting in a manner consistent with the program.
- The Council will also work with Bonneville and others on an appropriate application of the *in-lieu* provision in Section 4(h)(10)(A) of the Northwest Power Act. The Council expects Bonneville to apply the *in-lieu* prohibition on Bonneville funding only when the proposed expenditure of Bonneville funds would clearly substitute for expenditures actually authorized from another funding source.

<u>Key strategies in the program</u>

Habitat

- The program is habitat-based, aiming to rebuild healthy, naturally producing fish and wildlife populations by protecting, mitigating, and restoring habitats and the biological systems within them. Artificial production and other non-natural interventions should be consistent with this effort and avoid adverse impacts to native fish and wildlife species.
- Because ecosystems are highly complex and variable, actions addressing ecosystem problems must be taken in an adaptive, experimental manner. Where the efficacy of management actions is uncertain and may involve significant risk, actions must include experimental designs and techniques as well as monitoring and research to evaluate ecosystem effects. The program's specific mainstem plans and subbasin management plans each contain an adaptive management framework for implementing habitat actions.
- Ocean conditions should be considered in evaluating freshwater habitat management to understand all stages of the salmon and steelhead life cycle.
- Climate change could have significant impacts on mainstem Columbia and Snake river flows in terms of water quality, water quantity, and temperature. Possible changes in regional snowpack, river flows, and reservoir elevations due to climate change could have a profound impact on the success of restoration efforts and the

status of Columbia Basin fish and wildlife populations. The Council acknowledges that global climate change is not directly caused by the Federal Columbia River Power System (FCRPS). However, to the extent climate change may adversely impact fish and wildlife affected by the hydrosystem, it is appropriate for the Council to seek the best available scientific knowledge regarding the effects of climate change on Columbia River Basin fish and wildlife and to consider that scientific data when recommending strategies and implementing measures to mitigate losses arising from the development and operation of the hydroelectric facilities of the Columbia River and its tributaries.

- Planning efforts must also take into account the potential effects that increases and shifts in human population may have on the condition of fish and wildlife habitats.

Hydrosystem

- Mainstem hydrosystem operations and fish-passage efforts should be directed at optimizing the survival of focal species. Such efforts should include re-establishing natural river processes to the extent feasible and consistent with the Council's responsibility to maintain an adequate, efficient, economical, and reliable power supply.
- Actions to improve juvenile and adult fish passage through mainstem dams, including fish-transportation actions and capital-improvement measures, should protect biological diversity by benefiting the range of species, stocks, and life-history types in the river and should favor solutions that best fit natural behavior patterns and river processes, while maximizing fish survival through the hydroelectric projects. Survival in the natural river should be the baseline against which to measure the effectiveness of other passage methods.
- Systemwide water management, including flow augmentation from storage reservoirs, should balance the needs of anadromous fish species with those of resident fish species in upstream storage reservoirs so that actions taken to advance one species do not unnecessarily disadvantage other species.

Artificial Production

- There is an obligation to provide fish and wildlife mitigation where habitat has been permanently lost due to hydroelectric development. Artificial production of fish may be used to replace capacity, bolster productivity, and alleviate harvest pressure on weak, naturally spawning resident and anadromous fish populations. Restoration of anadromous fish into areas blocked by dams should be actively pursued where feasible.
- Artificial production actions must have an experimental, adaptive-management design. This design will allow the region to evaluate benefits, address scientific uncertainties, and improve hatchery survival while minimizing the impact on and if possible benefiting fish that spawn naturally.

Harvest

- Harvest can provide significant cultural and economic benefits to the region, and the program should seek to increase harvest opportunities consistent with sound biological management practices. Harvest rates should be based on population-

specific adult escapement objectives designed to protect and recover naturally spawning populations.

Project selection, independent scientific review, program budget

Measures implementing the program are funded by the Bonneville Power Administration through revenues collected from electricity ratepayers. Under the Northwest Power Act, the Council is responsible for recommending projects to Bonneville for funding to implement the program. This responsibility is relatively new in the history of the Act.

In a 1996 amendment to the Act adding Section 4(h)(10)(D), Congress added to the Council's responsibilities a review of the projects proposed for funding by Bonneville to implement the program. The Council is to conduct this review with the assistance of an Independent Scientific Review Panel appointed by the Council (members are nominated by the National Academy of Sciences). The panel is to "review a sufficient number of projects to adequately ensure that the list of prioritized projects recommended is consistent with the Council's program," and then to make project recommendations to the Council "based on a determination that projects: are based on sound scientific principles; benefit fish and wildlife; and have a clearly defined objective and outcome with provisions for monitoring and evaluation of results." The statute requires the Council to release the panel's findings for public review and comment. The Council is to "fully consider" the recommendations of the panel.

After considering the panel's recommendations, and the recommendations and comments of other entities and the public, the Council completes the review process by deciding on its project-funding recommendations to Bonneville to implement the program. If the Council decides not to accept a recommendation of the ISRP, the Council must explain in writing its reasons. The Council is also to "consider the impact of ocean conditions on fish and wildlife populations" and "determine whether the projects employ cost-effective measures to achieve program objectives" when deciding on its project-funding recommendations. The Act provides that "[t]he Council, after consideration of the recommendations of the Panel and other appropriate entities, shall be responsible for making the final recommendations of projects to be funded through BPA's annual fish and wildlife budget."

Although Bonneville has fish and wildlife responsibilities under both the Endangered Species Act and the Northwest Power Act, in many cases these responsibilities can be met by the same set of actions. Therefore, in recommending projects to Bonneville for funding under the program, the Council addresses both sets of responsibilities wherever feasible. Knowledge of the plans and activities of other regional participants is essential for the Council to be able to assure that the projects it recommends for funding are coordinated with, and do not duplicate, the actions of others.

Until 2000, the Council and the ISRP annually reviewed all projects in the program — there are more than 400 — plus proposals for new projects. This proved to be burdensome, and so to provide for a more detailed review the Council initiated a three-year sequential provincial review process in 2000 that solicits project proposals by ecological province (there are 11 provinces in the Columbia River Basin) and provides three-year project funding recommendations to Bonneville. The initial round was completed in 2003 when the Council adopted recommendations for the Mainstem/Systemwide category of projects. In 2006, the Council completed the first full

project-selection and recommendation process based on subbasin plans. Projects were recommended for funding for three years, Fiscal Years 2007-2009.

Today, in 2010, the program budget averages $220 million per year. This is for the direct, or "expense" funding portion of the program. In addition, Bonneville borrows from the U.S. Treasury to fund capital projects. For Fiscal Year 2009, this amount was $28 million. The direct-program budget reflects financial commitments made by Bonneville and other federal agencies in the 2008 Columbia Basin Fish Accords, which promised some $900 million over 10 years to projects that focus on water-management and fish-passage measures, mainstem and off-site mitigation measures, and the subbasin plans. Projects funded under the Accords are reviewed by the ISRP and the Council and recommended to Bonneville just like non-Accords projects.

Mainstem plan

The mainstem plan in the fish and wildlife program is a coordinated plan of operations, habitat improvements, and monitoring and evaluation for the mainstem Columbia and Snake rivers. It contains specific objectives and action measures for the federal operating agencies and others to implement in the mainstem Columbia and Snake rivers to protect, mitigate, and enhance fish and wildlife affected by the development and operation of hydroelectric facilities. It does so consistent with the basinwide vision, objectives, and strategies in the program and the underlying scientific foundation, while assuring the region an adequate, efficient, economical, and reliable power supply. The mainstem plan includes objectives and measures relating to:

- The protection and enhancement of mainstem habitat, including spawning, rearing, resting, and migration areas for salmon and steelhead and resident salmonids and other fish
- System water management
- Passage spill at mainstem dams
- Adult and juvenile passage modifications at mainstem dams
- Juvenile fish transportation
- Adult fish survival during upstream migration through the mainstem
- Reservoir elevations and operational requirements to protect resident fish and wildlife
- Water quality conditions, and
- Research, monitoring, and evaluation.

Context of the mainstem plan

At one time the Council's fish and wildlife program included detailed hydrosystem operations for fish and wildlife. This is no longer necessary. The federal agencies that manage, operate, and regulate the federal dams on the Columbia and Snake rivers now have detailed plans for system operations and for each hydroelectric facility intended to improve conditions for fish and wildlife affected by the hydrosystem.

These federal agency plans are described and reviewed largely in biological opinions issued by NOAA Fisheries and the U.S. Fish and Wildlife Service for the operation of the Federal Columbia River Power System and the Bureau of Reclamation

projects in the Upper Snake River basin.[4] The main focus of these federal plans is to benefit populations of salmon, steelhead, bull trout, and Kootenai River white sturgeon listed as threatened or endangered under the federal Endangered Species Act. The plans also contain objectives and actions to benefit other fish and wildlife affected by the hydrosystem, consistent with the federal agencies' obligations under other authorities, including obligations to the fish and wildlife program under the Northwest Power Act.

Additional mainstem operations and actions to benefit these species are found in the Columbia Basin Fish Accords described earlier in this section of the Briefing Book. Finally, operators of non-federal dams on the mainstem Columbia and Snake are implementing, or will soon implement, increasingly detailed plans to benefit Columbia and Snake fish and wildlife, agreed upon through the regulatory and relicensing processes at the Federal Energy Regulatory Commission.

The hydrosystem measures in these plans and opinions contain hundreds of pages of detail and hundreds of measures on system configuration, river flows, reservoir management, passage improvements, spill, juvenile transportation, predator management and more. These measures are built on foundations developed in the Council's fish and wildlife program over the last 28 years. In turn, the Council's mainstem plan is now built on recognizing these other plans and the biological opinions as containing the baseline objectives and measures for the mainstem portion of the program. In this context, the purpose of the mainstem plan is to:

- Set forth a systematic set of biological objectives, habitat considerations, principles and strategies to protect, mitigate, and enhance all the fish and wildlife of the Columbia River Basin affected by the development, operation, and management of the hydrosystem, whether listed or not. Various ESA recovery plans and draft recovery plans across the basin incorporate these hydrosystem objectives and measures as well.
- Recognize the objectives and measures already committed to by the federal agencies
- Identify additional objectives and measures as necessary to protect and improve conditions for fish and wildlife in the mainstem that are not listed under the Endangered Species Act and thus are not the systematic focus of the current federal and non-federal plans
- Identify power system impacts and optimum strategies to improve both the power supply and the conditions for fish and wildlife

[4] The relevant biological opinions include NOAA Fisheries, Consultation on Remand and Biological Opinion for Operation of the Federal Columbia River Power System, 11 Bureau of Reclamation Projects in the Columbia Basin and ESA Section 10(a)(I)(A) Permit for Juvenile Fish Transportation Program (May 2008); NOAA Fisheries, Consultation and Biological Opinion for the Operation and Maintenance of 10 U.S. Bureau of Reclamation Projects and 2 Related Actions in the Upper Snake River Basin above Brownlee Reservoir (May 2008); U.S. Fish and Wildlife Service, Biological Opinion regarding the effects of Libby Dam operations on the Kootenai River White Sturgeon, Bull Trout and Kootenai Sturgeon Critical Habitat (February 2006); U.S. Fish and Wildlife Service, Biological Opinion: Effects to Listed Species from Operations of the Federal Columbia River Power System (December 2000); NOAA Fisheries, Biological Opinion: Consultation on the "Willamette River Basin Flood Control Project" (July 2008); U.S. Fish and Wildlife Service, Biological Opinion on the Continued Operation and Maintenance of the Willamette River Basin Project and Effects to Oregon Chub, Bull Trout, and Bull Trout Critical Habitat Designated Under the Endangered Species Act (July 2008).

- Emphasize the need for rigorous monitoring and evaluation of these measures and for public reporting and accountability, and
- Describe broader planning considerations consistent with a long-term program for protection and mitigation beyond the immediate requirements of the ESA.

Vision of the mainstem plan

The vision for the mainstem plan is consistent with the program's broader basinwide vision. Hydrosystem operations, fish-passage efforts, habitat improvement investments and other actions in the mainstem should be directed toward optimizing fish survival through the mainstem, largely by protecting, enhancing, restoring, and connecting natural river processes and habitats, especially spawning, rearing, resting, and migration habitats for salmon, steelhead, sturgeon, and important resident fish populations. This will allow for abundant, productive, and diverse fish and wildlife populations.

The vision includes providing conditions within the hydrosystem for adult and juvenile fish that: 1) most closely approximate natural physical and biological conditions; 2) support the expression of life-history diversity; 3) allow for adequate levels of mainstem survival to support fish population recovery in the subbasins; and 4) ensure that water-management operations are optimized to meet the needs of anadromous and resident fish species, including those in upstream storage reservoirs, with the least cost so that actions taken maximize benefits to all species while ensuring an adequate, efficient, economical, and reliable power supply.

"Restore" as used in the mainstem plan means to take an action in a particular area that currently has no habitat value for spawning or rearing or other desired population condition (because, for example, the area has been blocked, inundated or dewatered at an inopportune time), so that the area will have value for that purpose. It does not mean to re-establish the conditions that existed at any particular point in time, including the time before non-Indian settlement and development of the Columbia River Basin.

"Enhance," by contrast, when referring to habitat conditions, means to take an action in an area that currently has some value for spawning or rearing or other desired condition so as to increase that value. "Connecting" habitat becomes important when a migrating population has areas of productive habitat that it cannot use to full advantage (or use at all) because the habitat is inaccessible to the population or because the areas in between productive habitat are not productive without improvements. It also does not mean or imply a Council position in support of the breaching of dams in the mainstem. Throughout the provisions of these mainstem amendments, the Council's position is consistent with the position of NOAA Fisheries' 2008 FCRPS Biological Opinion with reference to breaching of the federal dams on the lower Snake River or other mainstem dams.

Any system changes needed to achieve these goals must be implemented in such a way and over a sufficient time period to allow the region to make whatever power-system adaptations are needed, if any, to maintain an adequate, efficient, economical, and reliable power supply. Actions taken under the program also will provide conditions that should meet water quality standards under the Clean Water Act.

2. Fish Passage Center

The 2009 Program calls for continuing the fish-passage functions currently conducted by the Fish Passage Center. The primary purpose of this provision is to provide technical assistance and information to fish and wildlife agencies and tribes in particular, and the public in general, on matters related to the implementation of water management, spill, and passage measures in the program's mainstem plan. These functions shall include:

- Assemble, organize, make publicly available, and maintain the primary archive of the smolt-monitoring program data.
- Participate in the development of the annual smolt-monitoring program implementation plan, and assist in the implementation of the program.
- Assemble, organize and make publicly accessible, data from other primary sources, and conduct analyses as requested, to meet the information needs of the fish and wildlife agencies, tribes, and public with respect to water management, spill, and fish passage.
- Provide technical information necessary to assist the agencies and tribes in formulating in-season flow and spill requests that implement the measures in the Council's program, while also assisting the agencies and tribes in making sure that operating criteria for storage reservoirs are satisfied.
- Provide the technical assistance necessary to coordinate recommendations for storage reservoir and river operations that, to the extent possible, avoid potential conflicts between anadromous and resident fish, and
- Archive and make publicly accessible the data used in developing all analytical results, associating the specific data with the respective analyses.

Many questions pertaining to water management and fish passage in the mainstem Columbia and Snake rivers contain both scientific and policy aspects. The program says the center should confine itself to dealing only with the scientific aspects of issues. The Council established an oversight board for the center, with representation from NOAA Fisheries, state fish and wildlife agencies, tribes, the Council, and others to ensure that the functions are implemented consistent with the program. The oversight board conducts an annual review of the performance of the Center and develops a goal-oriented implementation plan to assure regional accountability and compatibility with the regional data-management system, as well as program consistency. The oversight board also works with the center and the ISAB to organize a regular system of independent and timely scientific review of analytical products.

The Oversight Board determines the requirements for peer review of analytical products. The Center prepares an annual report to the oversight board and the Council, summarizing its activities and accomplishments. The program stipulates that there will be no other oversight board or board of directors for the center.

According to the program, the center provides an empirical data base of fish-passage information for use by the region, not just by fish and wildlife managers. No information or analyses are considered proprietary. The oversight board and the fish and wildlife managers ensure that the data base conforms to appropriate standards for data management, including review of the data base by an appropriate scientific or data-review group. In the program, the Council reserves the right to revise the center's functions as the region develops a comprehensive data-management system.

3. Protected Areas

In August 1988, the Council amended the fish and wildlife program with criteria that designate some 44,000 miles of Northwest streams as "protected areas" because of their importance as critical fish and wildlife habitat.

The protected-areas amendment was a major step in the Council's efforts to protect and enhance fish and wildlife populations from the impacts of hydropower. By designating areas as protected against future hydroelectric development, the Council protects fish and wildlife habitat.

Designation as a protected area does not prohibit hydropower development, but it serves as a signal and justification for proceeding with caution because of the potential impacts on intact, important fish and wildlife habitat. While the Council does not license hydroelectric projects, the Federal Energy Regulatory Commission, which grants licenses to nonfederal hydropower projects, and the Bonneville Power Administration, which can acquire and transmit electricity from FERC-licensed projects, are required to take the Council's fish and wildlife program into account when making decisions.

The Council sees protected-area designation as playing a positive role in the efficient development of environmentally benign hydropower. New hydropower development in the region's most critical fish and wildlife habitat is likely to generate divisive, time-consuming and costly controversy. By identifying this habitat as "protected," the Council hopes to point developers to less sensitive areas, where the time and cost of development will be lower. Ratepayers should benefit from both more productive fish and wildlife investments and from reduced hydropower development costs.

The Council periodically designates new protected areas and removes the designation from other areas, based on analysis and public comment. The Council last amended the protected-areas rule in June 1992.

Legal Issues

1. What kind of legal creature is the Council?

The Northwest Power Act specifies that the Council is not a federal agency. The Council is also not a state agency in the usual meaning of the word because it acts on behalf of more than one state. So what is it?

The Council is one of a small group of hybrid organizations known as interstate compact agencies. These multi-state organizations are created by an agreement among the participating states with the consent of Congress. The Council was authorized by Congress in December 1980 and came into being when each of the legislatures of the participating states passed a law agreeing to participate in the Council, subject to the conditions in the Northwest Power Act.

Interstate compact agencies are usually created to deal with issues or to manage resources that involve more than a single state. The Constitution gives most of the authority over matters between states to the federal government exclusively. In the Northwest Power Act, however, Congress gave back to the Northwest states some of this federal authority. In other words, although the Council is not a federal agency, it exercises certain powers granted to it by the federal government.

In particular, the Council has authority to adopt plans and programs that guide the actions of federal agencies. The Bonneville Power Administration is required to ensure that its actions are "consistent" with these plans and programs. Other federal agencies are required to take the Council's fish and wildlife program into account "at each relevant stage of decision-making processes to the fullest extent practicable." The Council also must make recommendations on Bonneville's annual expenditure of fish and wildlife funds, based on advice of an independent scientific panel. These are unique authorities. The Northwest Power Act is one of only a few instances in which Congress has granted states significant power over federal agencies.

<u>Federal laws applicable to the Council</u>

State agencies are governed by state law. Federal agencies are governed by federal law. For interstate compact agencies, there is no general body of governing law.

When Congress created the Council, it solved this problem by making a number of laws regulating federal agencies applicable to the Council. In Section 4(a)(4) of the Northwest Power Act, the open meetings law applicable to the Federal Energy Regulatory Commission, and federal laws applicable to Bonneville relating to contracts, conflicts of interest, financial disclosure, advisory committees, disclosure of information, judicial review, and "related matters" are made generally applicable to the Council.

However, Congress recognized that not all of these laws would fit the Council exactly and therefore gave the Council yet another unique authority, the power to adapt federal laws to fit its own circumstances. The Northwest Power Act says that the specified federal laws "shall apply to the Council to the extent appropriate." The legislative history of the Act explains that the Council is to determine when it is and is not "appropriate" to follow the federal law, and explains that the Council has discretion to depart from the requirements of federal law where it has good reason to do so.

For the most part, the applicable federal laws have proved to be workable, and the Council has followed them as written. However, various administrative details have been modified to fit the Council. For example, financial disclosure forms are filed with the

Council's General Counsel, not with the U.S. Department of Energy. When the Council has departed from the federal laws, it usually has made written findings explaining why the law as written was inappropriate, and how the adaptation was more appropriate.

There are a few rules regarding financial disclosure and ethics laws that apply to the Council. First, Council members and staff are required to file financial disclosure forms, some parts of which are public records and some parts of which are confidential. Second, Council members and staff may not participate in particular Council matters that will have a direct and predictable effect on their own financial interests, including, among others, those of their spouses and dependent children. Participation will be permitted in the case of *de minimis* holdings and/or if the individual is granted a waiver. The Council always has observed a blanket prohibition on holding a financial interest in some firms, primarily energy companies and fish and wildlife concerns doing business in the western United States. Third, Council members and staff generally cannot accept anything of more than nominal financial value from people whose interests stand to be affected by Council actions. The Council's Legal Division always has advised that political activity is not disallowed, provided a member is not a candidate for partisan office and does not use the Council position for political purposes. In addition, the Legal Division seeks guidance from other federal laws and regulations as issues arise. The Legal Division is available for advice on any questions that may arise with Council members and staff.

State laws applicable to the Council

While federal laws govern most of what the Council does as a body, some state laws are still applicable to individual Council members and Council staff. In particular, Council members are officers of their respective states, and, if paid by their states, are state employees subject to the various state laws and regulations that apply to state officers and employees, including requirements governing how much time must be devoted to Council activities, state salary schedules, and the like. These state laws apply to Council members so long as they do not conflict with the federal laws that are made applicable under Section 4(a)(4).

The two Oregon Council member are Oregon state employees, and the eastern Washington Council member and the eastern Washington staff members of the Council are all employees of Eastern Washington University. All of the other Council members and staff are employees of the Council. The Council sets the salaries, benefits, employment conditions, and the retirement plans for the central office staff. In questions of labor laws and workers compensation, the Council follows the applicable laws of each state as applied to non-profit and governmental organizations.

In some instances, state and federal laws applicable to Council members may overlap or have conflicting requirements. Only rarely has such overlap resulted in a public debate. In 1988, for example, an Oregon member who was leaving the Council was offered employment with a public utility. Under the federal conflict of interest law, the member was allowed to take the job. Under Oregon conflict of interest law, the member was not allowed to take the job. The Council took the position that the federal law preempted state law on this point. A protective lawsuit was filed by the utility based on threats of prosecution by the Oregon Attorney General. However, nothing further came of the matter, and the suit eventually was withdrawn.

Liability and indemnification

As of 1988, the attorneys general of each of the Northwest states had confirmed in writing that Council members from their state were considered state employees for liability purposes, and that each state was obligated to defend Council members and pay judgments rendered against them in the same manner as with other state employees. Thus, it is unlikely that any Council member would be subject to personal liability for an official action taken while a Council member.

The Council also has entered into an indemnification agreement with each of its members, promising to defend claims and pay judgments. The indemnification appears in Chapter 20 of the Council's bylaws (www.nwcouncil.org/library/2003/2003-19.htm).

For the first several years of its existence, the Council was able to obtain an insurance policy to cover such claims. However, as a result of the Washington Public Power Supply System (WPPSS) nuclear power plant bond default, the premiums for this type of insurance increased enormously, and the available policies contained exclusions removing coverage for decisions relating to nuclear plants and other power-planning decisions. For these reasons, the Council chose to adopt an indemnification agreement rather than continue to purchase this type of insurance.

The Council continues to maintain a normal commercial liability policy, which covers such matters as personal injuries on Council premises. This policy also covers Council members and staff while driving rental cars on Council business. It is therefore not necessary for Council members to purchase the optional additional insurance offered by rental car companies when renting cars on Council business.

2. Procedures for Amending the Power Plan and Fish and Wildlife Program

In developing the power plan and the fish and wildlife program, the Northwest Power Act directs the Council to observe certain procedures unique to the Power Act, the informal rulemaking procedures of the federal Administrative Procedure Act (APA) and any other procedures the Council may adopt. The Council must hold public hearings in each of the member states before adopting the plan or program or substantial, non-technical amendments to either. The Council must review the plan at least every five years.

Power plan amendments

For purposes of power plan amendments, the federal APA requires public notice of proposed amendments or a description of the subjects and issues involved, and a statement of how the public may participate in the process. The public must be given an opportunity to submit written material.

Once the period for public comment has closed, people outside the Council may be foreclosed from communicating with the staff and Council members on the subject of the rulemaking. In some rulemakings the Council has allowed limited, additional public comment up to the time of decision, although the Council must have enough time to analyze all comments before taking final action.

An agency must give a concise general statement of the basis and purpose of the rules it adopts. The Council, following an approach approved by the courts, has satisfied this requirement by publishing a Response to Comments, which briefly summarizes the major comments received and explains how the Council has dealt with them.

Fish and wildlife program amendments

The fish and wildlife program is published separately from the power plan, although it is legally an element of the plan. But the Act sets out specific procedural requirements for developing and amending the fish and wildlife program that make it quite distinct from the power plan.

In amending the fish and wildlife program, the Act requires the Council to request from the region's fish and wildlife agencies and appropriate Indian tribes recommendations for measures for fish and wildlife affected by hydropower in the Columbia and its tributaries. Section 4(h)(2) of the Act provides that recommendations must be solicited prior to the development or review of the power plan, or any major revision to the plan. Others may also make such recommendations. Once the Council has received these recommendations, along with supporting documentation, it must make them available for comment. Typically, the Council also issues its own draft fish and wildlife amendments, which reflect the Council's attempt to fit the recommendations into a systemwide context, and invites public comment. The Council must act on the recommendations within one year. The Council may reject a recommendation only for certain reasons spelled out in Section 4(h)(7) of the Act. If the Council rejects a recommendation, it must give its reasons in writing.

The role of the fish and wildlife agencies and Indian tribes is particularly important. Not only must the Council solicit their recommendations for fish and wildlife measures, but if there are conflicting recommendations, the Council must consult with the tribes and agencies and give "due weight" to "their recommendations, expertise and legal rights and responsibilities" in resolving the inconsistency. In determining which recommendations to accept, moreover, the Council must determine whether a proposed measure would: 1) "complement the existing and future activities" of the agencies and tribes, and 2) be consistent with the tribes' legal rights. In 1994, the federal appeals court said, in dicta, that the Council must give a "high degree of deference" to the fish and wildlife agencies and tribes. The 1994 court opinion also said that the program must include sound biological objectives to structure the program and guide Council decisions.

Because the Fish and Wildlife Program must be based on recommendations submitted to the Council, and because the Council must make findings on any recommendations it rejects, program amendment processes are organized around the recommendations. Most of the comments the Council receives are directed to recommendations, and most of the Council's responses to comments are made in findings.

Petitions for rulemaking

The APA also requires administrative agencies to give interested persons the right to petition for the issuance, amendment or repeal of an administrative rule, such as changes in the power plan or fish and wildlife program. The Council has adopted a policy for how it will treat such petitions. A petition must set forth the substance or text of a proposed amendment or identify the provision to be repealed; explain the interest of the petitioner; and set forth the facts, reasons and new information that support the petitioner's request. The Council will conduct such study as it deems appropriate and within 120 days of receipt of the petition, grant or deny it. If an amendment process

results from the petition process, the Council has committed to completing the process within seven months from the decision to begin the amendment process.

3. Council interpretations of the Northwest Power Act

Section 6(c)

In November 1986, the Council and Bonneville each issued complementary policy statements on the implementation of Section 6(c) of the Northwest Power Act. Section 6(c) requires Bonneville to submit certain proposals related to major resources to a public review process to determine whether they are consistent with the Council's Northwest Power Plan. The Council then has the right to make its own determination regarding consistency. If either Bonneville or the Council finds a resource inconsistent with the power plan, the resource can be acquired only after congressional action. The Act identifies as "major" resources those over 50 megawatts with more than five years' duration.

The purpose of review under Section 6(c) is to ensure that a major resource is needed and is cost-effective before the Northwest invests a great deal of money in it. The process speaks directly to the balance of power between state and federal interests. The Northwest Power Act established Bonneville's authority to acquire resources, but it also gave the states, through the Council, the right to review those acquisitions before committing ratepayers to large expenditures.

In March 1993, the Council and Bonneville completed a five-year review of their respective 6(c) policies. The region had had little experience under Section 6(c) in the years since the adoption of the original policies, and therefore, little was changed. The revised policies were expanded, however, to cover all the Bonneville proposals made subject to review under the terms of the Act. In early 1998, in light of the restructuring occurring in the utility industry, the Council and Bonneville decided to postpone for five years further review of their 6(c) policies. That subsequent review, and another in advance of the amendment process that culminated in the Sixth Power Plan, both were informal and arrived at the same conclusion: that no further policy changes are needed.

Section 5(d)

Bonneville was authorized under Section 5(d) of the Act to sign power-sales contracts on special terms with existing direct-service industrial customers (DSIs) for an amount of power that each customer was receiving under its earlier contract. The DSIs are customers that had industrial firm power contracts with Bonneville in 1975. The Act expressly precluded sales to new direct-service industrial customers, but did permit Bonneville to sell additional power to existing DSIs, provided Bonneville and the Council made certain findings.

In late 1989, Bonneville tentatively agreed to sell additional power to an existing DSI customer without the review called for under Section 5(d), provided the customer could arrange an assignment of unused contract demand from another existing direct-service customer. Bonneville took the position that Section 5(d) review was not required so long as the total amount of power it sold to the DSIs did not exceed the aggregate amount to which all the DSIs were entitled when the Act was passed. Public comment brought this proposed transaction to the Council's attention.

The Council has adopted an interpretation of Section 5(d) that requires review whenever a proposed sale to an individual DSI would result in that DSI receiving more power than it received under its initial entitlement. The Council's interpretation does not call for review if an existing DSI assigns its power-sales contract to a successor in interest for use at the same location for purposes similar to those established under the original contract. Except for transfers of the sort just described, an amendment or assignment of a contract that results in the delivery of additional power to an existing DSI is a sale subject to Section 5(d) review.

4. Litigation history

Seattle Master Builders Association v. Northwest Power Planning Council

On April 10, 1986, the United States Court of Appeals for the Ninth Circuit decided this challenge to the Council's model conservation standards (MCS) brought by several construction-related organizations. The petitioners had advanced two principal lines of argument. First, with respect to the Council's model conservation standards, petitioners challenged the cost effectiveness of the measures to make new residential buildings more energy efficient, and the methodologies used by the Council to determine cost effectiveness. Petitioners also argued that the Council should have prepared an environmental impact statement regarding promulgation of the standards.

Second, petitioners challenged the constitutionality of the Council, citing the appointments clause of the U.S. Constitution, which requires officers of the United States to be appointed by the executive branch of government. Council members are officers of an interstate compact agency appointed by the governors of the four Northwest states and not by the president.

The Bonneville Power Administration intervened in the case and ultimately argued that the Council's adoption of the MCS did not violate the constitution. Bonneville said that the Council's model conservation standards did not impose a legal obligation on anyone, and therefore adoption of the standards was not the sort of exercise of significant authority over a federal agency that might require Council members to be appointed by the executive branch.

In earlier communications, however, regarding what posture the Department of Justice should adopt, the Department of Energy had taken a more aggressive position. The Secretary of Energy, Don Hodel, wrote to Justice in early 1985 and urged that if the Council were, indeed, anything more than advisory, and if it could, in fact, significantly limit Bonneville's actions, it ought to be found unconstitutional and replaced by a federal council. John Dingell, the Chairman of the House Energy and Commerce Committee, one of the committees that drafted the Northwest Power Act, wrote a strong letter in opposition to Energy's request. Mr. Dingell fully supported the view that the Council was intended to be more than an advisory body, with functions that are more significant than the Secretary of Energy had contended. He also concluded that the Council was properly formed and was operating according to the expectations of Congress.

In a two-to-one decision, the Ninth Circuit ruled for the Council on all the issues. With respect to the model conservation standards, the court held that the Council had adopted a proper approach to determining the cost effectiveness of conservation measures; that the methodology the Council used for determining conservation value was within the Council's discretion; and that the Council was not obliged to prepare an environmental impact statement on the standards, pursuant to the laws of the states that

are members of the interstate compact. On the constitutional question, the court noted that the functions of the Council and Bonneville "directly overlap," and held that the Council "violates neither the compact nor appointments clauses of the United States Constitution. The Act established an innovative system of cooperative federalism under which the states, within limits provided by the Act, can represent their shared interests in maintenance and development of a power supply in the Pacific Northwest and in related environmental concerns."

The Master Builders petitioned the Ninth Circuit for rehearing en banc (before a larger panel of judges in the circuit) on the ground that the panel overlooked material laws and facts. The United States also petitioned for rehearing or for rehearing en banc, arguing that the court decided constitutional questions not presented by the case. The Ninth Circuit denied both petitions. The Master Builders' subsequent petition for certiorari was denied by the Supreme Court of the United States.

Northwest Conservation Act Coalition v. Northwest Power Planning Council

The Coalition and the Natural Resources Defense Council filed a petition for review in the Ninth Circuit challenging the model conservation standards amended in 1986, in an effort to make the requirements of the amended standards more rigorous. In particular, petitioners alleged that the Council's standards for conservation in new commercial buildings ought to be more stringent; that a surcharge is necessary if the standards governing the energy efficiency of buildings that convert to electric space heat are to be effective; and that the Council's amended standards ought to contain standards for utility-financed incentives to conserve electricity in existing residences. Upon petitioners' request, the Council entered rulemaking to amend the standards in the respects summarized above. Petitioners then dismissed their suit in the Ninth Circuit.

Cascade Natural Gas Corp. v. Evans

In 1983, six regional natural gas companies brought suit challenging the Council's plan, arguing, among other things, that the Council had unfairly ignored natural gas as a conservation resource. The case was settled before trial and the Council agreed to modify the plan to make clear that the model conservation standards apply only to electrically heated homes. The Council also said that it would consider modifying the plan if significant fuel switching from natural gas to electricity were demonstrated. The terms of this settlement expired on April 27, 1988.

CASE, et al, v. Northwest Power Planning Council

In May 1986, CASE (Citizens for an Adequate Supply of Energy), The Utility Reform Project and Michael Rose filed suit in the Ninth Circuit, challenging certain portions of the 1986 model conservation standards. Petitioners also asked the Council to enter rulemaking to address the matters raised in the Ninth Circuit. In response to these two actions, the Council: Clarified that its then current MCS rulemaking addressed model standards for new residential and commercial buildings at federal agency facilities; committed to assess the conservation potential of existing buildings and other electricity uses at federal agency facilities as part of the next major plan revision; and extended the period for comment and consultation on MCS for federal agency customers beyond the deadline for the then current MCS rulemaking. The Council also agreed to defer action

on the CASE petition to enter rulemaking to develop model conservation standards for the direct-service industries, pending further analysis of increased interruptibility of the direct-service industries, which the Council agreed to conduct before calling for Bonneville acquisition of new resources or before the next major revision of the power plan, whichever was first. As a result of these actions by the Council, the petitioners agreed to settle the case.

NRIC, Inc., et al v. Northwest Power Planning Council

To act as quickly as possible to improve conditions for salmon and steelhead, which were then proposed for listing under the Endangered Species Act, beginning in August 1991 the Council began a multi-phase rulemaking on salmon and steelhead measures. In January 1992, the Council published its notice of final action on measures dealing with increased flows and drawdown of the lower Snake River. Three petitions were subsequently filed challenging the measures, one by the Northwest Resource Information Center, Trout Unlimited, the Oregon Natural Resources Council, Idaho Steelhead and Salmon Unlimited, and The Wilderness Society, represented by the Sierra Club Legal Defense Fund; a second petition was filed by the Yakama Tribe; and a third was filed by a group of aluminum companies and other industrial customers of the Bonneville Power Administration. After the petitions had been filed, 15 to 20 additional parties intervened, including Oregon Trout, the United States government, a number of utilities, and the State of Idaho.

On September 9, 1994, the Court ruled that the Council had not adequately explained its reasons for rejecting amendment recommendations because the Council's findings on the recommendations were put in a separate document, rather than in the fish and wildlife program itself. The Court also held that the Council's findings in an early phase of the amendment process were voided by findings in a later phase. While the Court's holdings were limited to these procedural matters, the opinion offered extensive interpretations (called "dicta" because they are not strictly binding) of the Northwest Power Act. Some of the dicta told the Council that it should give a "high degree of deference" to the fish and wildlife agencies' and Indian tribes' recommendations and expertise, and that the Council's discretion to reject these recommendations is narrow. The Court remanded the Strategy for Salmon for the Council to develop new findings.

A.H. Canada v. Northwest Power Planning Council

In 1994, Mr. Alfred H. Canada, a retired power engineer, sued the Council in federal district court. Mr. Canada sought to overturn the Council's denial of a petition for rulemaking he had earlier filed. The rulemaking would have considered replacing the plan's call for conservation with an equivalent amount of solar photovoltaics. The District Court dismissed, reaffirming the established rule that suits challenging final actions of the Council are to be brought in the Ninth Circuit Court of Appeals.

Nez Perce and other tribes v. Northwest Power Planning Council

In 1997, four Indian tribes challenged the Council's recommendations pursuant to Section 4(h)(10)(D) of the Northwest Power Act regarding the Bonneville Power Administration's fish and wildlife expenditures. The petitioners and the Council agreed to withdraw the case in 2000 and asked the Ninth Circuit Court of Appeals to dismiss it.

NRIC v. Northwest Power and Conservation Council

In 2010, the Northwest Resource Information Center challenged the Council's Sixth Northwest Power Plan, raising issues — according to the petition — of "due consideration" for fish and wildlife in the power plan and the "methodology for quantifying environmental costs and benefits" as that term might relate to fish and wildlife cost calculations, and similar matters. The Ninth Circuit Court of Appeals set a schedule of briefs and responses for late (calendar year) 2010 and early 2011.

Administrative Issues

1. Finance and Administration

Council funding

Expenses of the Council necessary for carrying out its functions and responsibilities under the Northwest Power Act are paid from funds received from the Bonneville Power Administration. Funds are advanced to the central office from Bonneville on a monthly request basis. Each state, in turn, requests funds to be advanced from the central Council office to the state to cover the operating expenses of the state Council offices and personnel.

Costs associated with the operation of the Council's central office in Portland are paid from the central office budget. State expenses are paid directly from the central office accounting and payroll systems. Some Council members are paid through state agencies or universities with reimbursements from the central office.

Budgets

The Council is required to develop annual (state and central office) budgets for transmittal to the Bonneville Power Administration and which are included in Bonneville's budget submittal to the Department of Energy, Office of Management and Budget, and Congress.

The Council's budget is limited to an amount equal to 0.02 mills multiplied by the kilowatt hours of firm power forecast to be sold by the Bonneville administrator during the year to be funded. In most years, this limitation represents approximately $2 million. However, based on an annual showing by the Council that such limitation will not permit the Council to carry out its functions and responsibilities under the Act, the Administrator may raise such limit to any amount not in excess of 0.10 mills. The most recent firm-sales forecast projects a little over $11 million per year for budget years 2011 through 2018.

The Council's annual budget process occurs between the months of March and June. Each state Council office develops its budget, and these are integrated with the Council's central office budget. The Council's draft budget is distributed for a 30- to 60-day public-review and comment period during which time consultations are held with interested parties regarding the Council's proposed funding requirements. Following final revision and adoption by the Council, the budget is transmitted to Bonneville.

In 1997 the Council agreed (with Bonneville) to plan to make budget cuts totaling approximately $5.4 million over four years — fiscal years 1998 through 2001. At that time, it was anticipated that the Council's role would diminish in power planning and fish and wildlife program development. Much of the Council's budget cuts in 1997 were based on these predictions.

Instead, the Council's role and workload have increased substantially. Electricity industry restructuring is far from being fully implemented, and as a result the Council continues to be heavily involved in regional power resource planning, hydrosystem operations analysis, energy system reliability/adequacy, and energy-efficiency resource issues. In addition, the Council has been given increased accountability for fish and wildlife spending, implemented a new project-selection process including site review at the ecological-province level by the Independent Scientific Review Panel, guided development of subbasin plans throughout the region (these were amended into the fish

and wildlife program in 2004 and 2005), and amended the fish and wildlife program in 2009 and the power plan in 2010 — both processes that lasted more than a year and included extensive public involvement. In short, the Council has an enhanced role and new responsibilities in the region for fish and wildlife mitigation since the Power Act became law.

From 1997 through 2006, the Council worked with Bonneville to adopt budget agreements resulting in approximately $6.1 million of savings between Fiscal Year 1998 and Fiscal Year 2006. Actions taken to accomplish these savings included reductions in force, elimination of vacant FTEs, reduced travel expenditures, reduced contract funding, reduced administrative costs, and curtailed lower-priority activities.

Today, in 2010, it is clear that the Power Act, while visionary with respect to future power supplies and mitigation of hydropower impacts on Columbia River Basin fish and wildlife, did not foresee, and could not have foreseen, changes that have occurred in the electric utility industry and with regard to fish and wildlife recovery in the Northwest. These changes affected firm-power sales of the Bonneville Power Administration, and therefore calculation of the Council's budget, and also resulted in increased responsibilities for the Council. For example, the load growth envisioned for Bonneville has not materialized and the energy-efficiency investments mandated by the Act have reduced Bonneville's firm-power sales.

Basing the Council's funding methodology only on the forecasted sales of firm power ignores the new responsibilities related to fish and wildlife recovery that the Council must now budget, such as the requirement in the 1996 amendment to the Power Act for independent scientific review of projects that implement the fish and wildlife program and the application of cost-effectiveness principles when recommending fish and wildlife projects for funding. Because of the funding limitation in the Act, the Council has absorbed nearly 36 percent in inflation costs from 1982 to 2010.

As noted above, since 1997 the Council has responded to the circumstances that have flawed the funding methodology of the Act by negotiating annual budget ceilings with Bonneville that cover specific Bonneville rate periods. These negotiated agreements incorporate various budgetary constraints such as current-level service budgets from the preceding budget period, restrictive cost-of-living adjustments for personal services expenditures, cost-cutting actions to cushion the impact of inflation, and individual justification of program-improvement costs. With these measures, the Council has confined its budget growth to less than 3 percent per year since 1998.

Here is a summary of the draft budgets for fiscal years 2007 through 2010, plus proposed amounts for 2011 and 2012 with the increases over the previous years indicated:

2007: $9,085,000
2008: $9,276,000 (2.1%)
2009: $9,467,000 (2.1%)
2010: $9,683,000 (2.3%)
2011: $9,891,000 (2.1%)
2012: $10,114,000 (2.3%)

The Council is aware of the economic challenges facing the four-state region, and the need to maintain healthy financial conditions for the Bonneville Power Administration. In an effort to be responsive, the Council made the following

commitments for fiscal years 2011 2012: 1) continue to adhere to the budget constraints initiated in 1998; 2) identify efficiencies in operations and administration in order to limit inflationary increases to an annual average of 3 percent; 3) reallocate staffing where possible to absorb new workload without increasing the number of employees; 4) re-prioritize resources as necessary to respond to new requests for technical analysis; and 5) reschedule or postpone work anticipated during the budget-development process in order to respond to the most essential requests for studies and analyses.

Audits of the Council

The U.S. Government Accountability Office (GAO) is the government entity authorized to audit the Council's fiscal and program operations. However, the Council, through an agreement with Bonneville, engages an independent accounting firm to conduct annual financial audits of the Council's operations. A copy of each audit is forwarded to the Seattle office of the General Accounting Office and to other interested parties and also posted on the Council's website.

In 1996, the GAO conducted an extensive audit of the Council's business policies and practices in response to a request by six members of the U.S. House of Representatives. The inquiry was prompted by the disclosure of a controversial severance package offered to the Council's former executive director. The GAO audit focused on two questions: 1) Are the Council's program activities consistent with congressional direction, and 2) is the Council following sound business practices and exercising adequate oversight of business operations?

The GAO concluded that, with the exception of the outplacement policy then in effect, the Council's policies and procedures covering business operations were generally adequate and effective. The GAO noted that in response to widespread criticism that accompanied the disclosure of the settlement agreement, the Council took several steps to increase its involvement in business operations and oversight, including:

- Changing its bylaws to ensure that the full Council is involved in major personnel decisions and that severance agreements are consistent with the severance policy and approved by the full Council
- Establishing a formula to calculate any severance agreement and a cap on any severance payment
- Establishing an executive committee comprising one Council member from each state to develop and oversee Council policies, and
- Reviewing other Council personnel policies and procedures to determine whether revisions are necessary

The GAO reviewed these steps in its audit and commented that they "appear appropriate to help ensure that the Council meets its responsibility for overseeing business operations and that its policies are not substantially out of line with federal agencies' practices." The GAO also recommended greater public access to the Council's business policies. The Council now publishes its policies on its website on the "About Us" page, www.nwcouncil.org/about/.

2. Council organization

The Act provides that the Council shall determine its organization and prescribe its practices and procedures for carrying out its functions and responsibilities under the Act.

State offices

Council members organize and staff their state offices based on the level of support they determine necessary. This typically includes technical assistants and/or policy analysts in the areas of power planning, fish and wildlife, and public information and public involvement. Administrative support is also provided.

Council members also may use outside contractors or the technical services of state agencies to conduct special studies and analyses regarding issues stemming from the power plan and the fish and wildlife program as they impact their respective states.

Where state staff are employees of the state, state laws, rules, and regulations are applicable. There are some exceptions where state support for Council members is administered (payroll, travel, and office expenses) by the central office.

Central office

The central office provides overall support to the Council in the areas of power planning, fish and wildlife, public affairs, legal matters, and finance and administration.

Staffing levels for the central office are established by the Council in its budget. All personnel actions are authorized by the executive director after consultation/approval by the Council chair. Staff compensation plans and benefit programs are established by the Council based on recommendations by outside consultants, and are subject to periodic reviews by the consultant with the Council.

Travel rules and expense reimbursement policies for central staff are set by the Council.

Contracts to assist the Council in carrying out its responsibilities are awarded on a competitive basis. Contracts over $25,000 require approval by the full Council.

The central office also provides computing and information systems support to the state offices augmented by occasional assistance from state agencies and local vendors.

Council name change

In January 2003, the Council officially changed its name to the Northwest Power and Conservation Council to emphasize the conservation aspect of its energy and fish and wildlife responsibilities.

In the Northwest Power Act, the legal name of the agency is “Pacific Northwest Electric Power Planning and Conservation Council.” While “conservation” in the Power Act specifically refers to energy efficiency, the concept of conserving natural resources is embodied in the Council’s Columbia River Basin Fish and Wildlife Program in terms of enhancing, or conserving, fish and wildlife of the basin that have been affected by hydropower dams.

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Glossary of terms

1. Terms in the Fish and Wildlife Program

Action Agencies - U. S. Army Corps of Engineers, the Bonneville Power Administration, and the U.S. Bureau of Reclamation that own, operate, or manage the Federal Columbia River Power System dams and related infrastructure.

Adaptive management - A scientific policy that seeks to improve management of biological resources, particularly in areas of scientific uncertainty, by viewing fish and wildlife program actions (projects) as vehicles for learning. Projects that implement the program are designed and implemented as experiments so that even if they fail, they provide useful information for future actions. Monitoring and evaluation are emphasized so that the interaction of different elements of the system is better understood.

Alluvial - Detrital material, such as clay, sand, and gravel that is deposited along the river or stream channel.

Anadromous fish - Fish that hatch in freshwater, migrate to the ocean, mature there and return to freshwater to spawn; for example, Chinook salmon, Pacific lamprey, and or steelhead salmon.

Artificial production - Any assistance provided by human technology to animal reproduction. In the context of Pacific salmon, this assistance may include, but is not limited to, spawning and rearing in hatcheries, stock transfers, creation of spawning habitat, egg bank programs, captive broodstock programs, and cryopreservation of gametes.

B-run steelhead - Summer steelhead crossing Bonneville Dam after August 25.

Baseline monitoring - In the context of subbasin, recovery, or other program planning, baseline monitoring is done to establish historical and/or current conditions against which progress (or lack of progress) can be measured. The lack of baseline monitoring should not be a reason to take no actions under the program. Enough baseline information should be gathered as quickly as possible to be reasonably certain the actions proposed are addressing priority limiting factors to benefit focal species in priority reaches.

Basinwide - An activity or an issue that extends over the entire Columbia River watershed.

Biological diversity - Biological diversity within and among populations of salmonids is generally considered important for three reasons. First, diversity of life history patterns is associated with a use of a wider array of habitats. Second, diversity protects a species against short-term spatial and temporal changes in the environment. And third, genetic diversity is the so-called raw material for adapting to long-term environmental change. The latter two are often described as nature's way of hedging its bets – a mechanism for

dealing with the inevitable fluctuations in environmental conditions – long and short term. With respect to diversity, more is better from an extinction-risk perspective.

Biological indicators - The general measures of success for the regional effort that in some cases will extend beyond the narrow responsibility of the federal hydropower system. These indicators will focus on fish populations, productivity, fish survival, artificial production, predation, harvest, and wildlife habitat.

Biological objectives - The initial assessments along with the vision will guide the focus of the biological objectives. Biological objectives should clearly describe physical and biological changes needed to achieve the vision in a quantifiable fashion. They will serve as a benchmark to evaluate progress toward the subbasin vision and should have measurable outcomes. Biological objectives should 1) describe and quantify the degree to which the limiting factors will be improved, and 2) describe and quantify changes in biological performance of populations that will result from actions taken to address the limiting factors.

Biological Opinion - A document that is the product of formal consultation under Section 7 of the Endangered Species Act (ESA), stating the opinion of the U.S. Fish and Wildlife Service or National Oceanic and Atmospheric Administration on whether or not a federal action is likely to jeopardize the continued existence of ESA-listed species or result in the destruction or adverse modification of critical habitat.

Biological performance - The responses of populations to habitat conditions, described in terms of capacity, abundance, productivity, and life history diversity.

Biological potential - The biological potential of a species means the potential capacity, productivity, and life history diversity of a population in its habitat at each life stage.

Blocked areas - Areas in the Columbia River Basin where hydroelectric projects have created permanent barriers to anadromous fish runs. These include the areas above Chief Joseph and Grand Coulee dams, the Hells Canyon Complex and other smaller locations.

Bonneville Power Administration (Bonneville) - The sole federal power marketing agency in the Northwest and the region's major wholesaler of electricity. Created by Congress in 1937, Bonneville sells power to public and private utilities, direct-service customers, and various public agencies in the states of Washington, Oregon, Idaho, Montana west of the Continental Divide, (and parts of Montana east of the Divide) and smaller adjacent areas of California, Nevada, Utah, and Wyoming. The Northwest Power Act charges Bonneville with additional duties related to energy conservation, generating resource acquisition, and fish and wildlife.

Bureau of Reclamation, U.S. Department of the Interior - An agency that administers some parts of the federal program for water resource development and use in western states. The Bureau of Reclamation owns and operates a number of dams in the Columbia River Basin, including Grand Coulee, Hungry Horse, and several projects on the Yakima River.

Bypass system - A channel or conduit in a dam that provides a route for fish to move through or around the dam without going through the turbine units.

Carrying capacity - The number of individuals of one species that the resources of a habitat can support. That is, the upper limit on the steady-state population size that an environment can support. Carrying capacity is a function of both the populations and their environments.

Clean Water Act - A federal law, the Act employs a variety of regulatory and nonregulatory tools to regulate direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. The goal is to restore and maintain the chemical, physical, and biological integrity of the nation's waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Climate - The average weather (usually taken over a 30-year time period) for a particular region and time period. Climate is not the same as weather, but rather it is the average pattern of weather for a particular region. Weather describes the short-term state of the atmosphere. Climatic elements include precipitation, temperature, humidity, sunshine, wind velocity, phenomena such as fog, frost, and hail storms, and other measures of the weather.

Climate change (also referred to as "global climate change") - The term "climate change" is sometimes used to refer to all forms of climatic inconsistency, but because the Earth's climate is never static, the term is more properly used to imply a significant change from one climatic condition to another. In some cases, climate change has been used synonymously with the term, "global warming;" scientists, however, tend to use the term in the wider sense to also include natural changes in climate.

Columbia Basin Project - A multipurpose development on the Upper Columbia River in central Washington. The major facilities of the Columbia Basin Project are Grand Coulee Dam and its impoundment, Lake Roosevelt, the Grand Coulee Powerplant complex, the John Keys pump/generating plant, Banks Lake, and Potholes Reservoir. In addition, the project includes a well-developed system of canals, dams, reservoirs, drains, wasteways, laterals, and other structures. Current irrigated acreage is about 671,500 acres.

Columbia River Basin - The Columbia River and its tributaries.

Columbia River Basin Fish Accords - The Accords are agreements between the action agencies, several tribes and states, which are 10-year action-agency commitments for projects to benefit fish affected by the FCRPS. The focus is on ESA-listed anadromous fish and actions to support the FCRPS Biological Opinion. The accords also include some other actions for non-listed fish.

Columbia River Treaty - The *Treaty Between the United States of America and Canada Relating to Cooperative Development of the Water Resources of the Columbia River Basin*, 1964. The Canadian Entity (B.C. Hydro) and the U.S. Entity (represented by the

Northwestern Division Commander of the U.S. Army Corps of Engineers and the administrator of the Bonneville Power Administration) are responsible for ensuring the provisions of the Columbia River Treaty are fulfilled. It became effective on September 16, 1964. The treaty also authorized the construction of Libby Dam on the Kootenai River in Montana, which creates a reservoir that extends into British Columbia.

Conservation easement - A deed in which a property owner (grantor) grants a real-property interest to another entity (grantee) to conserve natural values of the property such as water quality or unique native habitats. The grantor retains all rights not restricted by the easement. Conservation easements often have perpetual terms and offer the grantee the right to enforce the easement's terms against both the grantor and successor owners.

Consultation - All federal agencies must consult with the U.S. Fish and Wildlife Service or National Marine Fisheries Service (NOAA Fisheries) when any activity permitted, funded, or conducted by that agency may affect a listed species or designated critical habitat, or is likely to jeopardize proposed species or adversely modify proposed critical habitat. There are two stages of consultation: informal and formal.

Conversion rate - The survival rate of adult salmon as they migrate upstream past dams and reservoirs.

Coordination - Within the fish and wildlife program, coordination is not an action or a subject by itself — it is incidental to the need to make progress on a substantive program area that requires the coordinated work of more than one entity. What type of "coordination" needs to occur in any particular instance is wholly dependent on the work that needs to be accomplished and the particular entities identified that need to work together to accomplish it.

Corps of Engineers, U.S. Department of the Army (the Corps) - An agency with the responsibility for design, construction, and operation of civil works, including multipurpose dams and navigation projects.

Cost-effective - As defined in the Northwest Power Act, with regard to actions that implement the Council's Fish and Wildlife Program, where equally effective alternative means of achieving the same sound biological objective exist, the cost-effective alternative is the one with the lowest economic cost.

Direct mortality - Direct mortality is that which occurs directly from some event along the downriver passage through (or around) the hydropower system, that is, mortality directly associated with the hydropower system.

Dissolved gas - The amount of chemicals normally occurring as gases, such as nitrogen and oxygen, that are held in solution in water, expressed in units such as milligrams of the gas per liter of liquid. Supersaturation occurs when these solutions exceed the saturation level of the water (beyond 100 percent).

Drawdown - The distance that the water surface of a reservoir is lowered from a given elevation as water is released from the dam for various purposes. It can also refer to the act of lowering reservoir levels below their normal operating elevations.

Ecological function - The role, or function, that species have within the community or ecosystem in which they occur.

Ecosystem - The set of species and biological communities, including all biotic and abiotic factors and their interactions, existing in a particular environment and geographic area.

Effectiveness monitoring - Monitoring set up to test cause-and-effect hypotheses about actions: Did the management actions achieve their direct effect or goal? For example, did fencing a riparian area to exclude livestock result in recovery of riparian vegetation?

Endangered - The classification provided to an animal or plant in danger of extinction within the foreseeable future throughout all or a significant portion of its range.

Endangered Species Act of 1973 as amended - Federal legislation intended to provide a means whereby the ecosystems upon which endangered and threatened species depend may be conserved, and provide programs for the conservation of those species, thus preventing extinction of native plants and animals.

Environmental characteristics - The environmental conditions or changes sought to achieve the desired changes in population characteristics.

Environmental Impact Statement - A report that states the potential environmental effects of federally controlled projects (for example, through federal licensing, funding, or undertaken by the federal government) that may impact the environment. Environmental impact statements are required by Section 102(2)(C) of the National Environmental Policy Act of 1969 (PL91-190).]

Environmental risk assessment - Process to identify and evaluate the potential negative impacts of proposed actions on the environment.

Escapement - The numbers of salmon and steelhead that return to a specified point of measurement after all natural mortality and harvest have occurred. Spawning escapement consists of those fish that survive to spawn.

Estuary - The part of the wide lower course of a river where its current is met and influenced by the tides. In the both the vertical and horizontal planes, the estuary is a complex transitional zone without sharp boundaries between freshwater and marine habitats.

Evolutionarily Significant Unit (ESU) - A distinct population segment for Pacific salmon (the smallest biological unit considered to be a “species” under the Endangered Species Act). A population will be considered an ESU if: 1) it is substantially

reproductively isolated from other co-specific units, and 2) it represents an important component in the evolutionary legacy of the species.

Extinction - The natural or human-induced process by which a species, subspecies or population ceases to exist.

Federal Columbia River Power System (FCRPS) - The Federal Columbia River Power System comprises 31 federal dams and one non-federal nuclear power plant located primarily in the Columbia River Basin. The Bonneville Power Administration sells the output of the FCRPS and also constructed and operates a regional transmission system. Fourteen federal multipurpose hydropower projects are at the core of the FCRPS. Twelve of the projects are operated and maintained by the U.S. Army Corps of Engineers: Bonneville, The Dalles, John Day, McNary, Chief Joseph, Albeni Falls, Libby, Ice Harbor, Lower Monumental, Little Goose, Lower Granite, and Dworshak dams. The Bureau of Reclamation operates and maintains Hungry Horse Dam and the Columbia Basin Project, which includes Grand Coulee Dam. The FCRPS also includes the mainstem effects of other Reclamation projects in the Columbia and Snake river basins, Corps projects in the Willamette River Basin, and other power-producing federal projects in the Northwest.

Federal Energy Regulatory Commission (FERC) - The Commission issues and regulates licenses for construction and operation of non-federal hydroelectric projects and advises federal agencies on the merits of proposed federal multipurpose water development projects.

Fish and wildlife agencies - This category includes the Fish and Wildlife Service, U.S. Department of the Interior; the Idaho Department of Fish and Game; Montana Fish, Wildlife & Parks; the National Marine Fisheries Service of NOAA Fisheries, a division of the U.S. Department of Commerce; the Oregon Department of Fish and Wildlife; and the Washington Department of Fish and Wildlife.

Fish Guidance Efficiency - The proportion of juvenile fish passing into the turbine intakes that are diverted away from the turbines and into bypass facilities.

Floodplain - Land adjacent to stream or river that is periodically flooded.

Flow(s) - The rate at which water passes a given point in a stream or river, usually expressed in cubic-feet per second (cfs).

Flow augmentation - Increased flow from release of water from storage dams

Forebay - The part of a dam's reservoir that is immediately upstream of the powerhouse.

Gas supersaturation - The overabundance of gases in turbulent water, such as at the base of a dam spillway. Gas supersaturation can cause a fatal condition in fish similar to the bends in humans.

Genetic diversity - All of the genetic variation within a species. Genetic diversity includes both genetic differences among individuals in a breeding population and genetic differences among different breeding populations.

Genetic integrity - The ability of a breeding population or group of breeding populations to remain adapted to its natural environment.

Habitat - The locality or external environment in which a plant or animal normally lives and grows. As used in the fish and wildlife program, habitat includes the ecological functions of the habitat structure.

Habitat Conservation Plan - An agreement between the Secretary of the Interior and either a private entity or a state that specifies conservation measures that will be implemented in exchange for a permit that would allow taking of a threatened or endangered species.

Habitat unit (HU) - A value derived from multiplying the Habitat Suitability Index (HSI) for an evaluation species by the size of the areas for which the HSI was calculated (HU = HSI x size of habitat)

Harvest - The total number or poundage of fish caught and kept from an area over a period of time. Note that landings, catch, and harvest are different.

Harvest management - The process of setting regulations for the commercial, recreational, and tribal fish harvest to achieve a specified goal within the fishery.

Harvest rates - The portion of an evolutionarily significant unit (ESU) that is expected to be harvested based on the management goals set by the fish managers.

Hatchery - An artificial production facility designed to produce fish for harvest or spawning escapement. A conservation hatchery differs from a production hatchery in that a conservation hatchery specifically seeks to supplement or restore naturally spawning populations.

Hatchery population - A population of fish that depends on spawning, incubation, hatching, or rearing in a hatchery or other artificial production facility.

Hydroelectric power or hydropower - The generation of electricity using falling water to turn turbo-electric generators.

Hydrosystem - The federal and non-federal hydroelectric dams on the Columbia River and its tributaries.

Implementation monitoring - Monitoring conducted to determine whether an activity was performed and completed as planned. All actions under the fish and wildlife program must have implementation monitoring that must be reported to Bonneville. In some cases this may be as simple as a photo point and a brief description.

Irrigation - Water diverted from surface-water bodies or pumped from groundwater and applied to agricultural lands though ditches, canals, dikes, pumps, pipes, and other water-conveyance systems for the purpose of raising crops in areas that do not have sufficient moisture under natural conditions.

Juvenile - Fish from approximately one year of age until sexual maturity.

Kelt - Steelhead that return to the sea after spawning and may return to natal streams to spawn again.

Kokanee - A land-locked form of sockeye salmon.

Lamprey or Pacific lamprey - Pacific lamprey are dark bluish gray or dark brown in color and can reach 30 inches in length and weigh over a pound. Pacific lamprey are anadromous. They enter freshwater streams of the Columbia River Basin from July to October and spawn the following spring. Juvenile lamprey will stay burrowed in the substrate of the streams for 4 to 6 years, During their ocean phase of two to three years, Pacific lamprey are scavengers, parasites, or predators on larger prey such as salmon and marine mammals.

Life history diversity - The multitude of life history pathways (temporally and spatially connected sequences in life history segments) available for a species to complete its life cycle.

Limiting factors - Physical, biological, or chemical features (for example, inadequate spawning habitat, high water temperature, insufficient prey resources) experienced by fish that result in reductions in abundance, productivity, spatial structure, or diversity. Key limiting factors are those with the greatest impacts on a population's ability to reach its desired status.

Listed species - A species, subspecies, or distinct vertebrate population segment that has been added to the federal lists of Endangered and Threatened Wildlife and Plants as they appear in sections 17.11 and 17.12 of Title 50 of the Code of Federal Regulations (50 CFR 17.11 and 17.12).

Mainstem - The main channel of the river in a river basin, as opposed to the streams and smaller rivers that feed into it. In the fish and wildlife program, mainstem refers to the entirety of the main channels of the Columbia and Snake rivers.

Mainstem passage - The movement of salmon and steelhead around or through the dams and reservoirs in the Columbia and Snake rivers.

Mainstem survival - The proportion of anadromous fish that survive passage through the dams and reservoirs while migrating in the main channels of the Columbia and Snake rivers.

Metadata - Data exist in two forms — primary data and metadata. Primary data are numbers or counts — for example, the number of adult fish counted in a given time

period, interval, and location. Metadata describe how those numbers were obtained, including the monitoring design (selection of times and locations), objectives, and methods.

Mid-Columbia Public Utility Districts - PUD No. 1 of Grant County, PUD No. 2 of Chelan County, and PUD No. 1 of Douglas County.

Mixed-stock fishery - A fish-harvest management technique by which different species, strains, races, or stocks are harvested together.

Native species - A population of fish that has not been substantially impacted by genetic interactions with non-native populations, or by other factors, that persists in all or part of its original range. In limited cases a native population may also exist outside its original range (for example, in a captive broodstock program).

Natural production - Spawning, incubating, hatching, and rearing fish in rivers, lakes, and streams without human intervention.

Naturally spawning populations - Populations of fish that have completed their entire life cycle in the natural environment and may be the progeny of wild, hatchery, or mixed parentage.

Nez Perce Water Rights Settlement Agreement - A 30-year agreement executed in 2004 between the United States, the Nez Perce Tribe, and the State of Idaho settling water rights claims by the Nez Perce Tribe in the Snake River Basin. Among other provisions, the settlement agreement required the State of Idaho to establish minimum instream flows in the Snake River and to extend the provision of state law that authorizes the U.S. Bureau of Reclamation to lease up to 427,000 acre-feet of water in the upper Snake Basin to augment flows in the lower river, plus authorization for the Bureau to acquire an additional 60,000 acre-feet for the same purpose. These provisions increase the long-term probability of obtaining 427,000 acre-feet, and in some years providing as much as 487,000 acre-feet. Another component of the settlement agreement provides for use of 200,000 acre-feet of water stored in Dworshak Reservoir for flow augmentation and temperature control (cooling) in the lower Snake River in August and September.

Non-native species - Introduced species (especially invasive exotic species). These can have a distinct advantage in competing with native species because they escape a large percentage of the pathogens and parasites from their native range and are slow to pick up new infections in their newly invaded range. There is convincing evidence that non-native species are continuing to increase in the Columbia Basin aquatic habitats, and climate change is likely to further accelerate their expansion, often at the expense of native species.

Northern pikeminnow - A giant member of the minnow family, the Northern pikeminnow (formerly known as squawfish) is native to the Columbia River and its tributaries. Studies show a Northern pikeminnow can eat up to 15 young salmon a day.

Northwest Power Act - The Pacific Northwest Electric Power Planning and Conservation Act of 1980 (16 U.S.C. 839 et seq.), which authorized the creation of the Northwest Power and Conservation Council. The Act directs the Council to develop the Columbia River Basin Fish and Wildlife Program to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat on the Columbia River and its tributaries, to establish an Independent Scientific Review Panel to review projects implementing the program that are proposed for funding by the Bonneville Power Administration, and to make final recommendations to Bonneville on implementation of projects.

Nutrient - An element (oxygen, nitrogen, and phosphorus) or compound required for the growth and development of an organism.

Nutrient cycling - Process by which nutrients are continuously transferred between organisms within an ecosystem.

Off-site mitigation - The improvement in conditions for fish or wildlife species away from the site of a hydroelectric project that had detrimental effects on fish and/or wildlife, as part or total compensation for those effects. An example of off-site mitigation is the fish passage restoration work being conducted in the Yakima River Basin for the detrimental effects caused by mainstem hydroelectric projects.

Operational losses - The direct wildlife losses caused by the day-to-day fluctuations in flows and reservoir levels resulting from the operation of the hydropower system.

Passage - The movement of migratory fish through, around, or over dams, reservoirs, and other obstructions in a stream or river.

Passage efficiency - The percentage of the total number of fish that pass a dam without passing through the turbine units.

Performance measures, standards and targets - Performance measures are metrics that are monitored and evaluated relative to performance standards (benchmarks) and performance targets (longer-term goals) to assess progress of actions and inform future decisions.

Pinniped - Any of an order or suborder Pinnipedia of aquatic carnivorous mammals with all four limbs modified into flippers. California sea lions, Steller sea lions and harbor seals are predators of salmon, steelhead, lamprey, and sturgeon. Pinnipeds congregate annually below Bonneville Dam in the spring to eat adult salmon and steelhead returning to spawn.

Piscivorous - Fish-eating, as in piscivorous birds such as Caspian terns, gulls, and cormorants.

PIT-tags - Passive Integrated Transponder tags are used for identifying individual salmon for monitoring and research purposes. This miniaturized tag consists of an

integrated microchip that is programmed to identify individual fish. The tag is inserted into the body cavity of the fish and decoded at selected monitoring sites.

Plume - The area of the Pacific Ocean that is influenced by discharge from the Columbia River, up to 500 miles beyond the mouth of the river.

Population - A group of organisms belonging to the same species that occupy a well-defined locality and exhibit reproductive continuity from generation to generation.

Predator - An animal that lives by killing and eating other animals for food.

Productivity - A measure of a population's ability to sustain itself or its ability to rebound from low numbers. The terms "population growth rate" and "population productivity" are interchangeable when referring to measures of population production over an entire life cycle. Productivity can be expressed as the number of recruits (adults) per spawner or the number of smolts per spawner.

Range - Species have areas of occurrence (ranges) that are limited by suitable climatic conditions, especially temperature and moisture availability. Thus, as temperature and precipitation patterns change, species will disappear from parts of their former ranges that have become unsuitable for their existence, and they may appear in new areas where they formerly were absent. Whether or not the ranges move or expand depends on the ability of organisms to disperse or migrate to the areas that become suitable.

Rearing - The juvenile life stage of fish spent in freshwater rivers, lakes, and streams or hatcheries before they migrate to the ocean.

Recovery/restoration - The re-establishment of a threatened or endangered species to a self-sustaining level in its natural ecosystem to the point where the protective measures of the Endangered Species Act no longer are necessary.

Recovery plan - A strategy for conserving and restoring a threatened or endangered species. An Endangered Species Act recovery plan refers to a plan prepared under section 4(f) of the Act and approved by the Secretary, including: 1) A description of site-specific management actions necessary for recovery; 2) objective, measurable criteria that can be used as a basis for removing the species from threatened or endangered status; and 3) estimates of the time and cost required to implement recovery. (For Pacific salmon, "Secretary" refers to the U.S. Secretary of Commerce.)

Recruitment - The number of young fish entering a population in a given year.

Removable Spillway Weir (RSW) - A fish-passage technology that is an overflow structure installed in a dam's spillway bay. It provides a more surface-oriented passage route with less delay and stress for juvenile anadromous fish.

Reservoir - A body of water collected and stored in an artificial lake behind a dam.

Resident fish - Fish that spend their entire life cycle in freshwater. For purposes of the fish and wildlife program, resident fish include landlocked anadromous fish (for example, white sturgeon, kokanee and coho), as well as traditionally defined resident fish species.

Resident fish substitution - The enhancement of resident fish to address losses of salmon and steelhead in those areas permanently blocked to anadromous (ocean-migrating) fish as a result of hydroelectric dams.

Riparian areas - Riparian areas and wetlands are habitats where terrestrial and aquatic ecosystems are most closely linked. They are among the most diverse and dynamic habitats on the Earth, and are especially important sources of plant and animal species diversity in arid areas such as the interior Columbia River Basin. These habitats are critical to a broad range of wildlife.

Riparian habitat - Habitat along the banks of streams, lakes, or rivers.

Rule curves - Water levels, represented graphically as curves, which guide the use of reservoir storage. They are developed to define certain operating rights, entitlements, obligations, and limitations for each reservoir.

Run - A population of fish of the same species consisting of one or more stocks migrating at a distinct time.

Salmonid - A fish of the Salmonidae family, which includes soft-finned fish such as salmon, trout, and whitefish.

Section 7 - The section of the Endangered Species Act that requires all federal agencies, in "consultation" with NOAA Fisheries or the U.S. Fish and Wildlife Service, to insure that their actions are not likely to jeopardize the continued existence of listed species or result in destruction or adverse modification of critical habitat.

Self-sustaining population - A population of salmonids, sturgeon, lamprey, native, or non-native fish or wildlife that exists in sufficient numbers to replace itself through time without supplementation with hatchery fish or other type of human intervention. It does not necessarily produce surplus fish or wildlife for harvest.

Settlement - An agreement between natural resource trustees and responsible parties that specifies the terms under which liability is resolved.

Smolt - A juvenile salmon or steelhead migrating to the ocean and undergoing physiological changes (smoltification) to adapt its body from a freshwater to a saltwater existence, typically in its second year of life.

Spatial - Spatial, in the context of the program, refers to the geographic distribution of individuals in a population unit and the processes that generate that distribution.

Spawn - The act of fish releasing and fertilizing eggs.

Species - A group of individuals of common ancestry that closely resemble each other structurally and physiologically and that can interbreed, producing fertile offspring. For purposes of the Endangered Species Act (ESA), a species is defined to include "any distinct population segment of any species of vertebrate fish or wildlife that interbreeds when mature." A population (or group of populations) will be considered "distinct" (and hence a "species") for purposes of the ESA if it represents an evolutionarily significant unit (ESU) of the biological species. A population must satisfy two criteria to be considered an ESU:

1. It must be reproductively isolated from other populations of the same species, and
2. It must represent an important component in the evolutionary legacy of the species.

Spill - Releasing water through spillways at a dam rather than through the turbines.

Spillway - The channel or passageway around or over a dam through which excess water is released or "spilled" past the dam without going through the turbines. A spillway is a safety valve for a dam and, as such, must be capable of discharging major floods without damaging the dam while maintaining the reservoir level below some predetermined maximum level.

Stock - A population of fish spawning in a particular stream during a particular season. Stocks of fish generally do not interbreed with stocks spawning in a different stream or at a different time.

Straying - The act of a fish breeding in a population other than that of its parents.

Subbasin - A set of adjoining watersheds with similar ecological conditions and tributaries that ultimately connect, flowing into the same river or lake. Subbasins contain major tributaries to the Columbia and Snake rivers. There are 62 subbasins in the Columbia River Basin.

Subbasin assessment - The assessment is the technical evaluation of the biological and physical characteristics of the subbasin. Its primary purpose is to bring together technical information for the analysis needed to develop biological objectives.

Subbasin management plans - Management plans sets forth the desired direction for the subbasin taking into account the science, local conditions, concerns, Treaty rights, and applicable law and policy. It is where the science and the social aspects come together. Management plans begin with a *vision* for the subbasin, then outline *biological objectives* describing the desired environmental conditions, and then identify a set of *strategies* to achieve the objectives. In addition, management plans include a *monitoring and evaluation plan* for the strategies that may be implemented. Plans should have a 10-15 year horizon recognizing that additional information and analysis may indicate the need for periodic refinement.

Subbasin planning - A coordinated systemwide approach to planning in which each subbasin in the Columbia system is evaluated for its potential to produce fish in order to

contribute to the goal of the overall system. Subbasin planning emphasizes the integration of fish and wildlife habitat, fish passage, harvest management, and production.

Subyearling - Fish that are less than 1 year old

Supplementation - The use of artificial production to re-establish or increase the abundance of naturally reproducing populations through the release of hatchery fry and juvenile fish in the natural environment.

Tailrace - The canal or channel that carries water away from the dam.

Tailwater - The water surface immediately downstream from a dam.

Take - From Section 3(18) of the Federal Endangered Species Act: "The term 'take' means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

Target species - A species singled out for attention because of its harvest significance or cultural value, or because it represents a significant group of ecological functions in a particular habitat type.

Technical Management Team - A technical working group established by the National Marine Fisheries Service (of NOAA Fisheries) to provide advice on how to operate the federal dams in the Columbia River Basin in a manner that minimizes fish and wildlife impacts. The TMT deals with issues such as reservoir storage levels, flow augmentation, and spill.

Terrestrial - Of or relating to the earth or its inhabitants. Non aquatic.

Threatened - The classification provided to an animal or plant likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Transboundary - Refers to the United States and Canadian border.

Transboundary stocks - Stocks whose range and/or migratory routes cross the United States-Canada border.

Transportation - Collecting migrating juvenile fish and transporting them around the dams using barges or trucks.

Treaty rights - Rights of Indian tribes that were reserved by the 1855 Stevens Treaties between certain Northwest Indian tribes and the United States government. These reserved rights include "… the exclusive right of taking fish in the streams running through and bordering said reservation … and at all other usual and accustomed stations in common with citizens of the United States …" The treaties also reserved for the Indians the "privilege of hunting, gathering roots and berries, and pasturing horses on

open and unclaimed lands" (this language is from the Treaty of Walla Walla, June 9, 1855, Article 1). Certain of these rights have been well defined by judicial decisions, such as those pertaining to treaty-right fishing.

Tribes - In the Council's Fish and Wildlife Program, these include the Burns-Paiute Tribe; the Coeur d'Alene Tribes; the Confederated Tribes of the Colville Reservation; the Confederated Tribes of the Grand Ronde; the Confederated Salish-Kootenai Tribes of the Flathead Reservation; the Confederated Tribes of the Umatilla Reservation of Oregon; the Confederated Tribes of the Warm Springs Reservation of Oregon; the Confederated Tribes and Bands of the Yakama Nation; the Kalispel Tribe of Indians; the Kootenai Tribe of Idaho; the Nez Perce Tribe of Idaho; the Shoshone-Paiutes of the Duck Valley Reservation; the Shoshone-Bannock Tribes of the Fort Hall Reservation; and the Spokane Tribe of Indians.

Turbidity - A measure of light penetration in a body of water. Higher turbidity indicates "murkier" water conditions.

Uplands - Land at higher elevations than the alluvial plain or low stream terrace; all lands outside the riparian-wetland and aquatic zones.

***U.S. v Oregon* -** The 1969 federal court decision that reaffirmed Indian treaty rights to fish. The decision only applies to Washington and Oregon treaty tribes and is the basis for allocating harvest of salmon in the Columbia River to those tribes.

VARQ - Variable outflows for flood control (VAR for variable and Q, which is the mathematical symbol for flow) from a storage reservoir during the spring, which are tied to the water supply forecast, which can provide additional water releases for fish requirements and improve a project's refill probability.

Water right - A legal authorization to use a certain amount of public water for specific beneficial use or uses.

Watershed - The area that drains into a stream or river. A subbasin typically is composed of several watersheds.

Weak stock - A stock of fish of which the long-term survival is in doubt. Typically this is a stock in which the population is small and is barely reproducing itself or is not reproducing itself. While ESA-listed stocks are considered weak stocks, the term also includes other populations that do not yet qualify for ESA listing.

Wild fish - Fish that have maintained successful natural reproduction with little or no supplementation from hatcheries.

Wildlife - Animals living in a natural state, unimpeded and undomesticated by humans.

Wildlife management - The application of scientific or technical principles to the practice of manipulating wildlife populations, either directly through regulating the

numbers, ages, and sex ratios harvested, or indirectly by providing favorable habitat conditions and alleviating limiting factors.

Yearling - A juvenile fish between one and two years old.

2. Terms in the power plan

administrative costs
Certain overhead costs related to conservation or generating resources, such as project management and accounting costs incurred by utility or contractor staff.

alternating current (AC)
An electric current in which the electrons flow in alternate directions. In North American electrical grids, this reversal of flow is governed at 60 cycles per second (Hertz). With some exceptions (see "direct current"), commercial electric generation, transmission and distribution systems operate on alternating current.

anadromous fish
Fish that hatch in freshwater, migrate to the ocean, mature there, and return to freshwater to spawn. For example, salmon or steelhead trout.

available technology
In the power plan, the term "available technology" refers to equipment or facilities for generating and conservation resources, including electrical appliances, that currently are available and are expected to be generally available in the marketplace during the 20-year planning period.

average cost pricing
A concept used in pricing electricity. The average cost price is derived by dividing the total cost of production by the total number of units sold in the same period to obtain an average unit cost. This unit cost is then directly applied as a price.

average megawatt or average annual megawatt
Equivalent to the energy produced by the continuous operation of one megawatt of capacity over a period of one year. (Equivalent to 8.76 gigawatt-hours, 8,760 megawatt-hours or 8,760,000 kilowatt-hours.)

avoided cost
An investment guideline, describing the value of conservation and generation resource investments in terms of the cost of more expensive resources that would otherwise have to be acquired.

base loaded resources
Base loaded electricity generating resources are those that generally are operated continually except for maintenance and unscheduled outages.

billing credit
Under the Northwest Power Act, a payment by Bonneville to a customer (in cash or offsets against billings) for actions taken by that customer to reduce Bonneville's obligations to acquire new resources.

Bonneville Power Administration (Bonneville)
A federal agency that markets the power produced by Federal Base System resources and resources acquired under the provisions of the Northwest Power Act of 1980. Bonneville sells power to public and private utilities, direct-service industrial customers and various public agencies. The Northwest Power Act charges Bonneville with other duties, including pursuing conservation, acquiring sufficient resources to meet its contract obligations, funding certain fish and wildlife recovery efforts, and implementing the Council's power plan and fish and wildlife program.

Btu (British thermal unit)
The amount of heat energy necessary to raise the temperature of one pound of water one degree Fahrenheit (3,413 Btus are equal to one kilowatt-hour).

Buy-back program
A conservation program that, in effect, purchases electrical energy in the form of conservation measures installed by a consumer. The consumer is paid a certain amount per kilowatt-hour of energy saved.

callback
A power sale contract provision that gives the seller the right to stop delivery of power to the buyer when it is needed to meet other specified obligations of the seller.

capacity
The maximum power that a machine or system can produce or carry under specified conditions. The capacity of generating equipment is generally expressed in kilowatts or megawatts. In terms of transmission lines, capacity refers to the maximum load a line is capable of carrying under specified conditions.

climate zone
As part of its model conservation standards, the Council has established climate zones for the region based on the number of heating degree days, as follows: Zone 1: 4,000 to 6,000 heating degree days (the mild maritime climate west of the Cascades and other temperate areas); Zone 2: 6,000 to 8,000 heating degree days (the somewhat harsher eastern parts of the region); and Zone 3: more than 8,000 heating degree days (western Montana and higher elevations throughout the region).

coal gasification
The process of converting coal to a synthetic gaseous fuel.

cogeneration
The sequential production of electricity and useful thermal energy. This is frequently accomplished by the recovery of excess heat from an electric generating plant for use in industrial processes, space or water heating applications. Conversely, cogeneration can be

accomplished by using excess heat from industrial processes to power an electricity generator.

combined-cycle power plant
The combination of a gas turbine and a steam turbine in an electric generation plant. The waste heat from the gas turbine provides the heat energy for the steam turbine.

combustion turbine
A turbine engine generator, often fired by natural gas or fuel oil, used to generate electricity. The turbine generator is turned by combustion gases rather than heat-created steam.

conductor
Wire or cable for transferring electric power.

conservation
According to the Northwest Power Act, any reduction in electric power consumption as a result of increases in the efficiency of energy use, production or distribution.

construction lead time
The length of time between a decision to construct a resource and when the resource is expected to deliver power to the grid. Generally defined for purposes of this plan as the interval between detailed engineering and equipment order to completion of start-up testing.

cost-effective
According to the Northwest Power Act, a cost-effective measure or resource must be forecast to be reliable and available within the time it is needed, and to meet or reduce electrical power demand of consumers at an estimated incremental system cost no greater than that of the least-costly, similarly reliable and available alternative or combination of alternatives.

cost of debt
The amount paid to the holders of debt (bonds and other securities) for use of their money. Generally expressed as an annual percentage in the power plan.

cost of equity
Earnings expected by a shareholder on an investment in a company. Generally expressed as an annual percentage in this plan.

critical period
The sequence of low-water conditions during which the regional hydropower system's lowest amount of energy can be generated (see "critical water") while drafting storage reservoirs from full to empty. Under the Pacific Northwest Coordination Agreement, critical period is based on the lowest multi-month streamflow observed since 1928. Based on analysis of streamflows at The Dalles Dam, this is also the lowest streamflow since recordkeeping began in 1879.

critical water
The sequence of streamflows in the critical period under which the hydropower system will generate about 12,500 average megawatts. In an average year, the Northwest hydropower system will produce about 16,600 average megawatts.

curtailment
An externally imposed reduction of energy consumption due to a shortage of resources.

debt
Investment funds raised through the sale of securities having fixed rates of interest.

debt/equity ratio
The ratio of debt financing to equity financing used for capital investment.

demand forecast
An estimate of the level of energy that is likely to be needed at some time in the future. The Council's demand forecast contains a range of estimated consumption based on various assumptions about demographics and the state of the economy.

direct application renewable resource
Technologies that use renewable energy sources to perform a task without converting the energy into electricity. These sources and their functions may include wood for space heat, solar for space heat and drying, geothermal space and water heating, and wind machines used for mechanical drive (such as pumping).

direct current (DC)
An electrical current in which the electrons flow continuously in one direction. Direct current is used in specialized applications in commercial electric generation and in transmission and distribution systems.

direct-service industry
An industrial customer that buys power directly from the Bonneville Power Administration. Most direct-service industries are aluminum smelting plants.

discount rate
The rate used in a formula to convert future costs or benefits to their present value.

dispatch
Operating control of an integrated electrical system involving operations such as control of the operation of high-voltage lines, substations or other equipment.

distribution
The transfer of electricity from the transmission network to the consumer. Distribution systems generally include the equipment to transfer power from the substation to the customer's meter.

drawdown

Release of water from a reservoir for purposes of power generation, flood control, irrigation or other water-management activity.

economic feasibility
The Northwest Power Act requires all conservation measures to be "economically feasible" for consumers. The Act does not define this concept. In this plan, the Council considers a program or measure to be economically feasible if the measure or program results in the minimum life-cycle costs to the consumer, taking into account financial assistance made available pursuant to other provisions of the Act.

end use
A term referring to the final use of energy. In the aggregate, it is used the same as "energy demand." In a more detailed use, it often refers to the specific energy services (for example, space heating), or the type of energy-consuming equipment (for example, motors).

energy
That which does, or is capable of doing, work. Energy is measured in terms of the work it is capable of doing. Electrical energy is commonly measured in kilowatt-hours, or in average megawatts (8,760,000 kilowatt-hours).

Energy Northwest
The utility formerly known as the Washington Public Power Supply System (WPPSS) is a municipal corporation and joint operation agency in Washington comprising representatives of public utility districts and municipal utilities. Based on power purchase contracts of its members or other utilities, WPPSS has the power to acquire, construct and operate facilities for the generation or transmission of electric power.

energy services
The actual service energy is used to provide (for example, space heat, refrigeration, transportation).

equity
Investment funds raised through the sale of shares of company ownership.

equivalent availability
The ratio of the maximum amount of energy a generating unit can produce in a fixed period of time, after adjustment for expected maintenance and forced outage, to the maximum energy it could produce if it ran continuously over the fixed time period. This represents an upper limit for a long-run (annual or longer) capacity factor for a generating unit. For example, a unit with an equivalent availability of 70 percent and a capacity of 500 megawatts could be relied on to produce 350 average megawatts of energy over the long term, if required.

externality
Any costs or benefits of goods or services that are not accounted for in the price of the goods or services. Specifically, the term given to the effects of pollution and other environmental effects from power plants or conservation measures.

Federal Base System
The system includes the Federal Columbia River Power System hydroelectric projects, resources acquired by the Bonneville Power Administration under long-term contracts prior to the Northwest Power Act, and resources acquired to replace reductions in the capability of existing resources subsequent to the Act.

Federal Energy Regulatory Commission (FERC)
A federal agency that regulates interstate aspects of electric power and natural gas industries. It has jurisdiction over licensing of hydropower projects and setting rates for electricity sold between states. FERC formerly was the Federal Power Commission.

firm capacity
That portion of a customer's capacity requirements for which service is assured by the utility provider.

firm energy
That portion of a customer's energy load for which service is assured by the utility provider. That portion for which service is not assured is referred to as "interruptible."

firm energy load carrying capability (FELCC)
The amount of firm energy that can be produced from a hydropower system based on the system's lowest recorded sequence of streamflows and the maximum amount of reservoir storage currently available to the system.

firm surplus
Firm energy in excess of the firm load.

fuel cycle
The series of steps required to produce electricity from power plants. The fuel cycle includes mining or otherwise acquiring the raw fuel source, processing and cleaning the fuel, transporting, generating, waste management, and plant decommissioning.

generation
The act or process of producing electricity from other forms of energy.

geothermal
Useful energy derived from the natural heat of the earth as manifested by hot rocks, hot water, hot brines or steam.

head
The vertical height of water in a reservoir above the turbine.

heat engines
Devices that convert thermal energy to mechanical energy. Examples include steam turbines, gas turbines, internal combustion engines, and Stirling engines.

heat rate

The amount of input (fuel) energy required by a power plant to produce one kilowatt-hour of electrical output. Expressed as Btu/kWh.

heating degree days
A measure of the amount of heat needed in a building over a fixed period of time, usually a year. Heating degree days per day are calculated by subtracting from a fixed temperature the average temperature over the day. Historically, the fixed temperature has been set at 65 degrees Fahrenheit, the outdoor temperature below which heat was typically needed. As an example, a day with an average temperature of 45 degrees Fahrenheit would have 20 heating degree days, assuming a base of 65 degrees Fahrenheit.

hydroelectric power (hydropower)
The generation of electricity using falling water to turn turbo-electric generators.

independent power producer (IPP)
An independent power producer is a power-production facility that is not part of a regulated utility. Power-production facilities that qualify under PURPA (see "qualifying facility") are considered independent power producers, together with other independent power production facilities such as independently owned coal-fired generating plants.

infiltration control
Conservation measures, such as caulking. better windows and weatherstripping, which reduce the amount of cold air entering or warm air escaping from a building.

insolation
The rate of energy from the sun falling on the earth's surface, typically measured in watts per square meter.

integrated resource planning
See "least-cost planning."

interruptible power
Power that, by contract, can be interrupted in the event of a power deficiency.

Intertie
A transmission line or system of lines permitting a flow of electricity between major power systems.

investor-owned utility
A utility that is organized under state law as a corporation to provide electric power service and earn a profit for its stockholders.

ISAAC
A computer model used by the Council to simulate system operation, decisions to option and build resources, and the associated costs of providing power across a large number of possible load forecasts. ISAAC accounts for the effects of uncertainty on the load forecast variations in hydropower availability for analyzing various resource strategies.

The Council uses the model to help choose the best mix of resources and to establish the power plan Action Plan.

kilowatt (kW)
The electrical unit of power that equals 1,000 watts.

kilowatt-hour (kWh)
A basic unit of electrical energy that equals one kilowatt of power applied for one hour.

lead time
The length of time it takes to move a resource from concept to completion.

least-cost planning
Least-cost planning or, as it is often called, "integrated resource planning," is a name given to the power planning strategy and philosophy adopted by the Council. This strategy recognizes load uncertainty, embodies an emphasis on risk management, and reviews all available and reliable resources to meet current and future loads. The term "least-cost" refers to all costs, including capital, labor, fuel, maintenance, decommissioning, known environmental impacts, and difficult-to-quantify ramifications of selecting one resource over another.

levelized life-cycle cost
The present value of a resource's cost (including capital, financing, and operating costs) converted into a stream of equal annual payments. This stream of payments can be converted to a unit cost of energy by dividing them by the number of kilowatt-hours produced or saved by the resource in associated years. By levelizing costs, resources with different lifetimes and generating capabilities can be compared.

life-cycle costs See "levelized life-cycle cost."

load
The amount of electric power required at a given point on a system.

load forecast
An estimate of the level of energy that must be generated to meet a need. This differs from a demand forecast in that transmission and distribution losses from the generator to the customer are included.

load path
One future scenario for electric load growth, as opposed to a range that accommodates multiple forecasts of future load growth.

lost-opportunity resources
Resources that, because of physical or institutional characteristics, may lose their cost-effectiveness unless actions are taken to develop these resources or to hold them for future use.

major resource

According to the Northwest Power Act, a resource with a planned capability greater than 50 average megawatts and, if acquired by Bonneville, acquired for more than five years.

manufactured home
A structure, such as a mobile home, that is transportable in one or more sections, and that is built on a permanent chassis and designed to be used as a dwelling, with or without a permanent foundation, when connected to the required utilities. These homes must comply with the Manufactured Home Construction and Safety Standards issued by the U.S. Department of Housing and Urban Development. This does not include other categories of homes whose components are manufactured, such as modular, sectional, panelized and pre-cut homes. These homes must comply with state and local building codes.

marginal cost
The cost of producing the last unit of energy (the long-run incremental cost of production). In the plan, "regional marginal cost" means the long-run cost of additional consumption to the region due to additional resources being required. It does not include consideration of such additional costs to any specific utility due to its purchases from Bonneville at average cost.

measure
In the power plan, a measure refers to either an individual conservation measure or action or a combination of actions.

megawatt (MW)
The electrical unit of power that equals one million watts or one thousand kilowatts.

mill
A tenth of a cent. The cost of electricity is often given in mills per kilowatt-hour.

model conservation standards
Any energy-efficiency program or standard adopted by the Council, including, but not limited to: 1) new and existing structures; 2) utility, customer, and governmental programs; and 3) other consumer actions for achieving conservation. The most well-known are the energy-efficient building standards developed by the Council for new electrically heated buildings.

Monte Carlo simulation
The mathematical simulation of uncertain events having known probability characteristics by random sampling from a known probability distribution function.

municipal solid waste (MSW)
Refuse offering the potential for energy recovery. Technically, residential, commercial and institutional discards. Also included in the definition of municipal solid waste for purposes of this plan are non-hazardous processable byproducts from manufacturing activities. Not included are combustible byproducts of the lumber, wood products, paper, and allied products industries. These are considered separately as mill residue.

net billed plants

Refers to the 30-percent share of the Trojan Nuclear Plant, all of Washington Public Power Supply System's nuclear project 1 (WNP-1) and WNP-2, and 70 percent of WNP-3.

net billing
A financial arrangement that allowed Bonneville to underwrite the costs of electric generating projects. Utilities that owned shares in thermal projects, and paid a share of their costs, assigned to Bonneville all or part of the generating capability of these resources. Bonneville, in turn, credited and continues to credit the wholesale power bills of these utilities to cover the costs of their shares in the thermal resources. Bonneville then sells the output of the thermal plants, averaging the higher costs of the thermal power with lower-cost hydropower.

nominal dollars
Dollars that include the effects of inflation. These are dollars that, at the time they are spent, have no adjustments made for the amount of inflation that has affected their value over time.

non-firm energy
Energy produced by the hydropower system that is available with water conditions better than critical and after reservoir refill is assured. It is available in varying amounts depending upon season and weather conditions.

non-utility generator
A generic term for non-utility power plant owners and operators. Non-utility generators include qualifying facilities, small power producers, and independent power producers.

option
As used in the power plan, a project that has been sited, licensed and designed, but not yet constructed. Options are held in inventory until new resources are clearly needed.

overnight cost
Total of all direct and indirect project construction costs, including engineering, overhead costs, fees, and contingency. Exclusive of costs attributable to interest and escalation incurred during construction.

Pacific Northwest (the region)
According to the Northwest Power Act, the area consisting of Oregon, Washington, Idaho, and Montana west of the Continental Divide, and those portions of Nevada, Utah, and Wyoming that are within the Columbia River Basin. It also includes any contiguous areas not more than 75 miles from the above areas that are part of the service area of a rural electric cooperative served by Bonneville on the effective date of the Act and whose distribution system serves both within and outside of the region.

Pacific Northwest Coordination Agreement

An agreement between federal and nonfederal owners of hydropower generation on the Columbia River system. It governs the seasonal release of stored water to obtain the maximum usable energy subject to other uses.

Pacific Northwest Utilities Conference Committee (PNUCC)
Formed by Pacific Northwest utilities to coordinate policy on regional power supply issues, PNUCC lacks contractual authority, but it does play a major role in regional power planning through its policy, steering, fish and wildlife, and lawyers committees, and the Technical Coordination Group. PNUCC publishes the Northwest Regional Forecast containing information on regional loads and resources.

peak capacity
The maximum capacity of a system to meet loads.

peak demand
The highest demand for power during a stated period of time.

penetration rate
One annual share of a potential market for conservation that is realized, as in "7 percent of the region's homes have been weatherized this year." Thus, a 7-percent penetration rate.

photovoltaic
Direct conversion of sunlight to electric energy through the effects of solar radiation on semi-conductor materials.

post-operational capital replacement costs
The cost of major equipment replacements occurring during the operating life of a project. In practice, these costs generally are capitalized (i.e., financed by debt or equity). For resource cost-effectiveness analyses, these costs are frequently treated as expenses.

preference
Priority access to federal power by public bodies and cooperatives.

present value
The worth of future returns or costs in terms of their current value. To obtain a present value, an interest rate is used to discount these future returns and costs.

public utility commissions
State agencies that regulate, among others, investor-owned utilities operating in the state with a protected monopoly to supply power in assigned service territories.

Public Utility Regulatory Policies Act of 1978 (PURPA)
Federal legislation that requires utilities to purchase electricity from qualified independent power producers at a price that reflects what the utilities would have to pay for the construction of new generating resources (see "avoided cost"). The Act was designed to encourage the development of small-scale cogeneration and renewable resources.

qualifying facility (QF)
Qualifying facility is a power production facility that qualifies for special treatment under a 1978 federal law—Public Utility Regulatory Policies Act (PURPA). PURPA requires a utility to buy the power produced by the qualifying facility at a price equal to that which the utility would otherwise pay if it were to build its own power plant or buy the power from another source. A qualifying facility must generate its power using cogeneration, biomass, waste, geothermal energy, or renewable resources such as solar and wind, and, depending on the energy source and the time at which the facility is constructed, its size may be limited to 80 megawatts or smaller. PURPA prohibits utilities from owning majority interest in qualifying facilities.

quantifiable environmental costs and benefits
Environmental costs and benefits capable of being expressed in numeric terms (for example, in dollars, deaths, reductions in crop yields).

quartile
The direct-service industries load is divided into four quartiles. The top quartile is the portion of that load most susceptible to interruption.

R-value
A measure of a material's resistance to heat flow. The higher the R-value, the higher the insulating value.

real dollars
Dollars that do not include the effects of inflation. They represent constant purchasing power.

region
See "Pacific Northwest."

reliability
The ability of the power system to provide customers uninterrupted electric service. Includes generation, transmission, and distribution reliability. The power plan deals only with generation reliability.

renewable resource
Under the Northwest Power Act, a resource that uses solar, wind, water (hydropower), geothermal, biomass, or similar sources of energy, and that either is used for electric power generation or for reducing the electric power requirements of a customer.

reserve capacity
Generating capacity available to meet unanticipated demands for power, or to generate power in the event of outages in normal generating capacity. This includes delays in operations of new scheduled generation. Forced outage reserves apply to those reserves intended to replace power lost by accident or breakdown of equipment. Load growth reserves are those reserves intended for use as a cushion to meet unanticipated load growth.

resource
Under the Northwest Power Act, electric power, including the actual or planned electric capability of generating facilities, or actual or planned load reduction resulting from direct application of a renewable resource by a consumer, or from a conservation measure.

retrofit
To modify an existing generating plant, structure or process. The modifications are done to improve energy efficiency, reduce environmental impacts or to otherwise improve the facility.

sectors
The economy is divided into four sectors for energy planning. These are the residential, commercial (e.g., retail stores, office and institutional buildings), industrial, and irrigation sectors.

simple payback
The time required before savings from a particular investment offset costs. For example, an investment costing $100 and resulting in a savings of $25 each year would be said to have a simple payback of four years. Simple paybacks do not account for future cost escalation, nor other investment opportunities.

siting agencies
State agencies with the authority for issuing permits to locate generating plants of defined types and sizes to utilities at specific locations.

siting and licensing
The process of preparing a power plant and associated services, such as transmission lines, for construction and operation. Steps include locating a site, developing the design, conducting a feasibility study, preliminary engineering, meeting applicable regulatory requirements, and obtaining the necessary licenses and permits for construction of the facilities.

space conditioning
Controlling the conditions inside a building in order to maintain human comfort and other desired environmental conditions through heating, cooling, humidification, dehumidification, and air-quality modifications.

sunk cost
A cost already incurred and therefore not considered in making a current investment decision.

supply curve
A traditional economic tool used to depict the amount of a product available across a range of prices.

surcharge

Under the Northwest Power Act, an additional sum added to the usual wholesale power rate charged to a utility customer of Bonneville to recover costs incurred by Bonneville due to the failure of that customer (or of a state or local government served by that customer) to achieve conservation savings comparable to those achievable under the Council's model conservation standards. Surcharges can range from 10 to 50 percent of a customer's bill.

System Analysis Model (SAM)
A computer model used by the Council to determine resource cost-effectiveness. SAM performs a detailed simulation of the Northwest generating system to estimate the cost associated with a specific set of loads and resources. It incorporates uncertainty associated with hydropower, thermal availability, resource arrival and load fluctuation due to economic cycles.

system cost
According to the Northwest Power Act, all direct costs of a measure or resource over its effective life. It includes, if applicable, distribution and transmission costs, waste disposal costs, end-of-cycle costs, fuel costs (including projected increases) and quantifiable environmental measures. The Council is also required to take into account projected resource operations based on appropriate historical experience with similar measures or resources.

thermal resource
A facility that produces electricity by using a heat engine to power an electric generator. The heat may be supplied by burning coal, oil, natural gas, biomass, or other fuel, by nuclear fission, or by solar or geothermal sources.

tipping fee
The fee assessed for disposal of waste. This fee is used when estimating the cost of producing electricity from municipal solid waste.

transformer
A device for transferring energy from one circuit to another in an alternating-current system. Its most frequent use in power systems is for changing voltage levels.

transmission
The act or process of long-distance transport of electric energy, generally accomplished by elevating the electric current to high voltages. In the Pacific Northwest, Bonneville operates a majority of the high-voltage, long-distance transmission lines.

U-value
The measure of a material's ability to conduct heat, numerically equal to 1 divided by the R-value of the material.

water budget
A means of increasing survival of downstream-migrating juvenile fish by increasing flows during spring and early summer migrations. The water budget was proposed by the Council and is overseen by it in conjunction with the U.S. Army Corps of Engineers, the

fishery agencies and Indian tribes, the Bonneville Power Administration, and the Bureau of Reclamation.

watt
The electrical unit of power or rate of energy transfer. One horsepower is equivalent to approximately 746 watts.

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