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Northwest **Power** and **Conservation** Council

Northwest Electricity System Background

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 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 more than 30 hydropower dams (many have other purposes in addition to power generation) in the Pacific Northwest. In addition to the federal dams, 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, beginning in the Bonneville Project Act of 1937, to market electricity from the federal generating projects on the river and to build and operate transmission lines to deliver the power from the dams. The first federal dam on the Columbia, Bonneville, was completed in 1938. Bonneville, the agency, is to sell the power at rates set only high enough to cover the costs of operating the system and to repay the federal investment in the hydropower system over a reasonable period of time.

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

Name	River, State	In-service year	Capacity (MW)
Albeni Falls	Pend Oreille, ID	1955	42
Anderson Ranch	Boise, ID	1950	40
Big Cliff	Santiam, OR	1953	18
Black Canyon	Payette, ID	1925	10
Boise River Diversion	Boise, ID	1912	3
Bonneville	Columbia, OR/WA	1938	1,224
Bonneville Fishway	Columbia, OR/WA	1981	26
Chandler	Yakima, WA	1956	12
Chief Joseph	Columbia, WA	1958	2,456
Cougar	McKenzie, OR	1963	26
Detroit	Santiam, OR	1953	100
Dexter	Willamette, OR	1954	15
Dworshak	Clearwater, ID	1973	400
Foster	Santiam, OR	1967	20
Grand Coulee	Columbia, WA	1942	6,495
Green Peter	Santiam, OR	1967	80
Green Springs	Rogue, OR	1960	17
Hills Creek	Willamette, OR	1962	30
Hungry Horse	Flathead, MT	1953	428
Ice Harbor	Snake, WA	1962	603
John Day	Columbia, OR/WA	1971	2,160
Keys Pumping St.	Grand Coulee, WA	1941	314
Libby	Kootenai, MT	1975	525
Little Goose	Snake, WA	1970	810
Lookout Point	Willamette, OR	1953	120
Lost Creek	Rogue, OR	1977	49
Lower Granite	Snake, WA	1975	810
Lower Monumental	Snake, WA	1969	810
McNary	Columbia, OR/WA	1952	990
Minidoka	Snake, ID	1909	27
Palisades	Snake, ID	1958	176
Roza	Yakima, WA	1958	11
The Dalles	Columbia, OR/WA	1957	1,818

Total: 20,670 MW

The Columbia River Treaty with Canada, 1964

Following World War II, as the demand for power grew in the Northwest, 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. The treaty called for three dams in Canada to store 15.5 million acre-feet of water for optimizing power generation downstream in the United States. The treaty also authorized a fourth dam, this one in the United States. The three Canadian dams are Keenleyside and Mica on the mainstem Columbia, and Duncan on the Duncan River, which flows into the north end of Kootenay Lake. The Duncan River flows into the northern end of Kootenay Lake. The lake is a natural impoundment of the Kootenay River, which begins in British Columbia, flows south and then west and north through Montana and Idaho, enters the south end of Kootenay Lake near Creston, B.C., then flows out the west arm of the lake near Nelson and into the Columbia downstream at Castlegar. The American dam is Libby, which is on the Kootenai River (spelled with an 'i' in the United States), in Montana.

The three Canadian treaty dams were completed by 1973, and Libby was completed in 1975 by the U.S. Army Corps of Engineers. The Treaty is implemented by what are known as the U.S. and Canadian entities. 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 provincial power-generating, marketing, and transmission authority. Together the entities, with the aid of a Treaty Operating Committee made up of employees of these agencies, plan for the operation of the treaty dams in Canada. Operation of Libby Dam by the Corps of Engineers is coordinated by the United States with the operation of the treaty dams in Canada.

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 began to be returned to Canada annually.

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 uses it for its own firm-power customers.

Since 1964, when the treaty was ratified, the United States and Canada have coordinated river management. 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 beginning in 2024.

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 flood control is requested, the United States will have to pay Canada for its operational costs and any economic losses resulting from the requested 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, 2024 would have been the first year a notice of termination could have taken effect assuming written notice of termination had been given by the Canadian or United States governments in 2014. By August 2016, when this briefing book last was updated, no notice had been given. Unless the treaty is terminated or the federal governments elect to modify the treaty, its provisions continue indefinitely, except for the change to called-upon 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 2008 to understand these implications. This effort was called the 2014/2024 Columbia River Treaty Review.

Operations under the treaty are complex. Implementing the required treaty changes in flood control provisions in 2024 and considering the consequences of possible treaty termination was a major challenge for both countries. Due to the scope and complexity of these issues, the U.S. Entity took a phased approach to studying the treaty and the issues related to its future. Each phase provided 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 completed in August 2010, was a joint effort between the U.S. and Canadian entities. Its purpose was 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 were 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 followed by additional studies to better understand how requirements in the Federal Columbia River Power System Biological Opinion affect current and potential future treaty operations.

In 2011, Bonneville and the Corps of Engineers conducted five "public listening sessions" on behalf of the United States Entity to present the results of the Phase 1 studies and receive public comments. At the same time, the agencies were conducting extensive evaluations of flood-risk management under the various treaty scenarios, and the Sovereign Review Team, which included representatives of the four Northwest states, met regularly to discuss issues raised in the studies and advise the U.S. Entity. Three then-current Council members and one former member represented the states on the Team. The U.S. Entity also conducted workshops on issues such as how water quality might be affected by future treaty scenarios, and how climate-change impacts might affect river operations under the future scenarios.

In 2011, 2012, and 2013, the U.S. and Canadian entities conducted studies, addressed the various issues, and formulated draft and then final recommendations to submit to their respective national governments. In December 2013, the U.S. Entity released its recommendation. The recommendation was developed by the entity with input from representatives of sovereign governments (organized as the Sovereign Review Team comprising representatives of the states of Washington, Oregon, Idaho, and Montana, 10 federal agencies, and 15 tribes), and regional stakeholders through a process that involved extensive meetings and consultations throughout the Northwest.

The U.S. Entity took the position that its recommendation seeks to formalize, provide certainty, and build on the many ecosystem actions already undertaken through annual or seasonal mutual agreements between the countries, while also providing a net increase in U.S. power benefits based on the actual value of coordinated operations with Canada, preserving an acceptable level of flood risk to the people of the

Columbia River Basin, and continuing to recognize and implement the other authorized purposes in the basin. In the recommendation, the term "modernization" of the treaty refers to the construct of a post-2024 arrangement. According to the entity, this construct could include amendments or revisions to the existing treaty, diplomatic notes or protocols, or other means resulting in a "modernized" treaty.

The following nine key principles underlie the U.S. Entity's recommendation:

1. Treaty provisions should enable the greatest possible shared benefits in the United States and Canada from the coordinated operation of treaty reservoirs for ecosystem, hydropower, and flood risk management, as well as water supply, recreation, navigation, and other pertinent benefits and uses, as compared to no longer coordinating treaty storage operations.
2. The health of the Columbia River ecosystem should be a shared benefit and cost of the United States and Canada.
3. The minimum duration of the treaty post-2024 should be long enough to allow each country to rely on the treaty's planned operations and benefits for purposes of managing their long-range budgets, resource plans, and investments, but adaptable enough to allow responses to new information and changing conditions.
4. All operations of the treaty should be based on the best available science, and, to the extent practicable, measurable outcomes.
5. U.S. federal reservoirs/projects will continue to meet authorized uses consistent with applicable legislation, Indian treaties and tribal rights, the U.S. government's trust responsibility to the tribes, and other U. S. laws such as the Clean Water Act and the Endangered Species Act. Non-federal U.S. dams will continue to meet their responsibilities pursuant to their Federal Energy Regulatory Commission licenses.
6. The United States and Canada should pursue a more coordinated use of Treaty and Canadian non-treaty storage under the treaty to increase the flexibility to, and benefits of, meeting ecosystem-based function, power, flood risk management, and other authorized water management purposes in both countries.
7. The region anticipates impacts from climate change to all of the elements described in the recommendations. The strategy for adapting the treaty to future changes in climate should be resilient, adaptable, flexible, and timely as conditions warrant.
8. It is recognized that modifications to the treaty could result in new benefits and/or costs to both Canada and the United States. U.S. interests should ensure that costs associated with any treaty operation are aligned with the appropriate party.
9. Implementation of ecosystem-based functions in the treaty should be compatible with rebalancing the Canadian entitlement (downstream benefit) and reducing U.S. power costs.

In March 2014, the Province of British Columbia released its recommendation, based on a draft produced by the Canadian Entity in late 2013. The Province asserted that the treaty should continue but should be improved within the existing treaty framework consistent with the following 14 principles:

1. The primary objective of the Treaty should be to maximize benefits to both countries through the coordination of planning and operations.
2. The ongoing impacts to the Canadian Columbia Basin to meet treaty requirements should be acknowledged and compensated for. The level of benefits to the province, which is currently solely in the form of the Canadian Entitlement, does not account for the full range of benefits in the United States (U.S.) or the impacts in British Columbia.
3. All downstream U.S. benefits, such as flood risk management, hydropower, ecosystems, water

supply (including municipal, industrial and agricultural uses), recreation, navigation, and any other relevant benefits, including associated risk reduction arising from coordinated operations compared to alternatives available to each country, should be accounted for and such value created should be shared equitably between the two countries.

4. Treaty provisions post-2024 should be fixed for a sufficient duration to provide planning and operational certainty while allowing for adaptive mechanisms to address significant changes to key components and interests.

5. Implementation of post-2024 flood control obligations will be consistent with the treaty requirements that a called-upon flood control request can only be made when forecasts of potential floods indicate there is a reasonable risk of exceeding 600,000 cubic feet per second at The Dalles, Oregon, the U.S. must make effective use of all related storage in the U.S. before seeking additional help from British Columbia, and the U.S. must pay Canada compensation due as result of a called-upon operation.

6. To supplement called-upon flood control, a coordinated flood-risk management approach should maximize the benefits and mitigate impacts and risks to multiple U.S. interests as compared to a called-upon flood control regime post 2024 that includes effective use of U.S. reservoirs.

7. Ecosystem values are currently, and will continue to be, an important consideration in the planning and implementation of the treaty.

8. The province will explore ecosystem-based improvements recognizing that there are a number of available mechanisms inside and outside the treaty.

9. Current and future operating conditions of Canadian Columbia Basin dams and reservoirs are subject to provincial and federal licensing including water use plans, where they exist, and consideration of aboriginal rights under the Canadian constitution.

10. The province will seek improved coordination on Libby Dam and Koocanusa reservoir operations.

11. Salmon migration into the Columbia River in Canada was eliminated by the Grand Coulee Dam in 1938 (26 years prior to treaty ratification), and is currently not a treaty issue. British Columbia's perspective is that the management of anadromous salmon populations is the responsibility of the Government of Canada and that restoration of fish passage and habitat, if feasible, should be the responsibility of each country regarding their respective infrastructure.

12. Adaptation to climate change should be incorporated in treaty planning and implementation.

13. The Canadian entities (Province of British Columbia, and BC Hydro) will continue to consult with First Nations on a government-to-government basis and engage with basin communities throughout any negotiation process.

14. Canadian Columbia River Basin issues not related to the treaty will be addressed through other government programs and initiatives.

The next step in both countries is for the U.S. State Department and Global Affairs Canada to review the recommendations and decide whether and when 1) to begin negotiating a revised or new treaty, and 2) issue the 10-year notice of intention to terminate those parts of the treaty not related to flood control requirements. The first opportunity for either country to announce its intention regarding the future of the Treaty was September 16, 2014. By the spring of 2016, neither country had done so.

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

Regional intertie, public preference

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 Federal Columbia River Power System when it is not needed here and would otherwise be lost in the form of water spilled over dams without generating electricity, and they allow utilities to buy power from California when power is needed here during shortages and periods of heavy use.

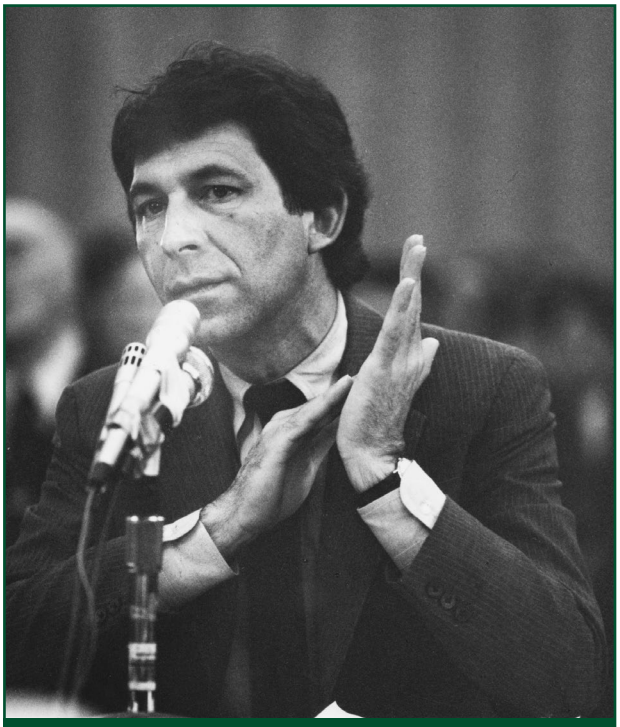
But by law, public utilities have priority access to federal hydropower. The Bonneville Project Act of 1937 directed that electric cooperatives and other publicly owned utilities of the region be given highest priority for the available federal power. They consequently came to be called "preference customers." 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. Sales to California and the desert Southwest 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.

By the mid-1960s it began to be clear that the vast hydropower supply would not be sufficient to meet future needs if the region continued to grow as expected. In October 1966, the newly appointed administrator of Bonneville, David S. Black, told utility officials meeting in Portland that the agency was "looking toward the region's very imminent transition into a new era of thermal-electric generation." Demand for power was growing in the region, Black said. He warned that the region would develop most of the available hydropower sites by 1975, which was just nine years in the future, and therefore would need "at least one million kilowatts of new thermal generation each year thereafter." He said that without new thermal plants, Bonneville would not be able to meet the demand of its customers after the mid-1980s and would gradually reduce and ultimately halt power sales to privately owned utilities.

But Black had a plan, a staggering construction project of new dams and thermal plants, both coal and nuclear, that would result in 32,000 megawatts of new generating capacity over 20 years to be melded with existing hydropower – huge plants that would take advantage, he said, of economies of scale and solve the region's growing energy crisis. All that was lacking was a means of paying for the new plants.

The Hydro-Thermal Power Plan and WPPSS: Why we have the Council

The genesis of the Northwest Power Act lies largely in our region's disastrous experiment with building nuclear power plants in the 1970s and early 1980s. Bonneville and the Pacific Northwest Utilities Conference Committee acted to address the perceived, looming crisis of demand and resources – federal hydropower supplied most of the electricity consumed in the Northwest,



Charles Royer, 48th mayor of Seattle, Washington from 1978 to 1990. Photo: Northwest Power and Conservation Council Archives.

demand was growing as the economy and population grew, and new generating plants would be needed to meet increasing demand for power. Bonneville and PNUCC predicted demand would grow annually by several percentage points and set out to implement Black's vision through what was called the Hydro-Thermal Power Plan.

The plan was conceived in two phases. The first phase (approved in 1969 by utilities and Bonneville, the partners) was supposed to include seven projects: the two coal-fired generators at Centralia, Washington, and five nuclear plants that would be built over a period of 10 years. One of the nuclear plants never got off the ground, at least not as part of Phase One. So Phase One included six plants: four nuclear plants – three to be built on the Hanford Nuclear Reservation in central Washington plus the Trojan nuclear plant on the Columbia River in Oregon – and the two Centralia coal-fired generators.

Phase Two was planned to add more coal and nuclear plants, and some new hydropower dams. Ultimately only two of the Phase Two nuclear plants began construction. The Washington Public Power Supply System (WPPSS) in Richland, Washington, the only regional utility with experience operating a nuclear power plant – one of the original, World War II-era Hanford Works reactors had been converted to power generation – became the managing agency for construction of five of the nuclear plants. WPPSS did not build the Trojan plant.

As construction got under way in the early 1970s, the energy picture changed dramatically. The anticipated demand growth did not materialize, cost overruns and construction mismanagement plagued WPPSS, energy conservation evolved as a low-cost alternative to building new power plants (discussed elsewhere in this briefing book), and over a period of just a few years in the late 1970s construction of four of the five WPPSS plants collapsed. Bonneville continues to pay the debt on the one plant that was finished and two of the plants that were not. The cost of that debt is responsible for about one-third of the wholesale power rate Bonneville charges to this day and will not be fully retired until almost 2050. The entire output of that plant, known today as the Columbia Generating Station, is sold to Bonneville.

The other two plants were backed by Northwest utilities, and their collapse triggered the largest municipal bond default in U.S. history to that point.

The WPPSS disaster in large part triggered the Congressional response that culminated in the Northwest Power Act in 1980. This history is discussed in more detail in an entry on the Council's Columbia River history website: www.nwcouncil.org/history/HydroThermal

The Northwest Power Act

As the WPPSS disaster unfolded through the late 1970s, Congress reacted with a series of legislative proposals beginning in 1976 and culminating with the Pacific Northwest Electric Power Planning and Conservation Act of 1980. The Act includes several purposes concerning the supply of electricity in the Northwest. Among other things, the Act is intended to:

- Assure the Northwest of an adequate, efficient, economical and reliable power supply
- Provide for the participation and consultation of the Pacific Northwest states, local governments, consumers, customers, users of the Columbia River System (including federal and state fish and wildlife agencies and Indian tribes), and the public
- Ensure development of regional plans and programs related to energy conservation; renewable and other resources; protecting, mitigating, and enhancing fish and wildlife resources; facilitating the planning of the region's power system; and providing environmental quality
- Protect, mitigate, and enhance the fish and wildlife, including related spawning grounds and habitat, of the Columbia River and its tributaries, particularly anadromous fish including salmon, steelhead, lamprey, and sturgeon

In the Power Act, Congress devised methods for protecting the preference to Bonneville's federal hydropower 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.

The Act directs that Bonneville should continue its traditional role of marketing and transmitting 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 conservation and electric power plan with a fish and wildlife component, Congress provided a regional decision-making system emphasizing local control of resource development and power planning, and expert advice in devising fish and wildlife mitigation for the effects of hydropower.

Here are some other major provisions of the Act:

The Council

- 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 energy efficiency to meet future demand for electricity. Cost-effective renewable sources of energy must be given next-highest priority in the region's power planning, ranking ahead of conventional thermal generating resources. Among thermal options, fuel-efficient methods of producing energy, such as cogeneration, must be given priority. For the first time in regional power planning, the region and the public were inserted into the process (Section 4C of the Act).
- 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 (Section 4.(H)(10)(A)). 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. Bonneville and the other federal agencies operating or regulating the Columbia hydropower facilities (Corps of Engineers, Bureau of Reclamation and FERC) have a separate obligation to take the Council's program into account at every stage of decision-making "to the fullest extent practicable," and in general to provide equitable treatment for fish and wildlife with other purposes for managing the dams and the power system. 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.
- In creating and periodically revising the fish and wildlife program, the Council is required to seek the recommendations of the region's tribal, state, and federal fish and wildlife agencies. In addition, the measures in the program must be consistent with the legal rights of the region's tribes. It must also be based on the "best available scientific knowledge."

Bonneville Power Administration

- Bonneville retains its responsibility to serve most of the region's electricity demand (Power Act Section 5). The plan adopted by the Council, which is amended periodically, is the basis for Bonneville's actions in meeting loads of its customers - Bonneville is required by the Act to acquire conservation and generation resources consistent with the Council's power plan except

under certain specified circumstances (Section 6 of the Act). Bonneville must have a conservation program to meet and reduce load consistent with the Council's plan. If Bonneville decides to acquire major generating 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 energy efficiency 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 energy efficiency 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.

- Bonneville acquires resources consistent with the Council's power plan not only to meet load but also to assist in meeting the fish and wildlife mitigation requirements of the Act – to protect, mitigate, and enhance fish and wildlife in a manner consistent with the Council's fish and wildlife program. Congress implicitly recognized that the flow and passage measures in the program would derate the hydropower potential to some extent and would need to be addressed in resource planning and acquisition. This is why the Act requires that when the Council revises the power plan at least every five years the process begins with a revision of the fish and wildlife program. Measures to assist fish migration, such as spilling water over dams rather than using it to generate power, reduce the output of the hydropower system, and so the Council accounts for this loss with resources in the power plan, such as energy efficiency.
- Bonneville sells electricity at a rate that reflects the melded cost of federal hydropower, 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.
- Bonneville's administrator must make decisions that are consistent with the Council's power plan to meet load and help implement the fish and wildlife requirements; other federal agencies that operate or license hydropower dams in the Northwest must take the Council's power plan and fish and wildlife program into account at every relevant stage of decision-making to the fullest extent practicable. Bonneville and these agencies are required to afford "equitable treatment" to fish and wildlife of the Columbia River Basin as to other authorized purposes of the dams.
- The supply preference and resulting price advantage to co-ops and publicly owned utilities by federal law is protected and enhanced. Bonneville is given the responsibility of meeting the full future requirements of preference customers – something Bonneville was not previously authorized to do.

Investor-owned utilities: the "residential exchange"

- Residential and small-farm customers of investor-owned utilities receive rate relief. The Act authorized utilities to sell to Bonneville an amount of electricity equal to their residential and small-farm loads at their cost. In return, Bonneville sells them enough energy at Bonneville's standard rates to cover the residential and farm loads. The rate advantages cannot enhance company profits, but must be passed on directly to the customers.
- Direct service industries, primarily aluminum companies in 1980, received new 20-year contracts for power from Bonneville, but at a higher price than they paid under previous, shorter-term contracts. In effect, they paid the cost of rate relief to residential and small-farm customers of investor-owned utilities (see above) during the first four years following passage of the Act, and a substantial portion thereafter, which they agreed to do in exchange for assurances of long-term power-supply contracts.

The Public

- 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.

Power Planning

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 six times since then. The sixth revision was completed in 2010 and the Seventh in 2016.

While each of the Council's power plans fulfilled the mandate in the Power Act, each plan evolved from a different set of circumstances and addressed a different set of challenges. Yet there are many similarities across the plans:

- Planning under future uncertainty
- Highest priority to energy efficiency to meet future demand for power
- Fewer new generating plants, largely because of the load-reducing effect of energy efficiency, and no new large thermal (coal, nuclear) plants
- Regional understanding and acceptance that it is not necessary for Bonneville to build whatever new generating plants might be needed to meet future demand
- All of the Council's discussion and decision-making is done in public.

The first power plan, 1983: Setting a new course

Where to start? From its first meeting in April 1981, the Council worked simultaneously on the two major documents required by the Power Act – the Columbia River Basin Fish and Wildlife Program and the Northwest Power Plan. Following a requirement of the Power Act, the Council focused first on the fish and wildlife program, completing the first program in November 1982. But by then the Council also had initiated six major energy studies that would inform the first power plan, due by April 28, 1983 – two years after the Council's first meeting. These were completed in 1982 and totaled more than 4,000 pages.

The final plan that emerged – and was approved by the Council as required in April 1983 – was like nothing seen before in the Northwest – or the nation for that matter. The plan pioneered a new approach to power planning, one that, according to the plan text, "consciously factor(ed) uncertainties into the decisions embodied in the plan," a distinct departure from the straight-line demand forecasting that supported the decisions to build the five WPPSS nuclear plants, only one of which actually was completed. According to the First Plan:

The Council has planned for enough options and resources to meet a high level of economic growth. If the region actually experiences lower growth rates, some of the options would be delayed or even abandoned. This approach reduces the chance of overbuilding resources.

An option contract would permit the region to decide when construction should begin.

And regarding the cost of resources in the plan, led by energy efficiency (AKA conservation), consistent with the requirement in the Power Act, the Council wrote:

> *The Council has been careful to select the cheapest resources possible while giving due consideration to lead times and the ability of a shorter lead-time resource to be cost-effective.*

The resource strategy in the first plan included, in order of cost-effectiveness, energy efficiency, new hydropower, cogeneration, combustion turbines, and coal-fired power plants (if needed). The plan included four electricity-demand growth forecasts and a specific resource strategy for each, with different mixes of resources and schedules for developing them.

Twelve public utility Commissioners meeting with the Council. Photo: Carlotta Collette, 1985.

Conservation was the primary resource in each strategy, capable of meeting nearly all forecasted demand even in the high-growth forecast. Aggressive conservation development has been a key element of the resource strategy in each of the Council's seven power plans.

The first plan called for Bonneville to acquire between 2,120 and 5,300 average megawatts of conservation by 2002, 20 years in the future. In fact, by 2002 Bonneville and its utility customers had acquired 1,431 average megawatts of conservation, but the total including state codes, federal standards, and the accomplishments realized by the Northwest Energy Efficiency Alliance totaled 2,471 average megawatts.

While the Power Act requires the Council to review the plan at least every five years, the Council committed in the first plan to "… modify the plan every two years to keep pace as new and more accurate information about the future becomes available."

The Second Plan, 1986: New challenges in the wake of WPPSS

The Council approved the second power plan in January 1986, following the second revision of the fish and wildlife program (October 1984). In the 1986 Plan, essentially a revision of the First Plan, the Council opted to revise the document every five years but monitor the regional and national economy and power needs, report every six months, and update the power plan if needed before the five-year required review.

The collapse of financing for WPPSS nuclear plants 4 and 5 (these plants were sponsored by utilities, not Bonneville), the suspended animation of two of the three plants (plants 1 and 3) financed by Bonneville ratepayers, and the 500-percent Bonneville rate hike over just five years to pay for the rapidly escalating nuclear plant costs, clearly signaled the end of the era when it was simply assumed that our future electricity needs would be met by building more and more large power plants. The Second Plan noted that while utility planners in the 1960s and 1970s assumed they could predict the most likely future, they were wrong. Their single energy forecast for the region – 6 percent annual growth – was wrong, but it led to the start of construction of 17 coal-fired plants and 10 nuclear plants in the region. The first power plan was written while utilities were still predicting brownouts and severe regional shortages if those plants were not built. Those predictions were wrong.

Between 1981 and 1983, it became apparent the future would not be characterized by power deficits but by expensive power surpluses. By 1985, major shifts were occurring in the Northwest power supply and demand for power. There was an economic recession, and the aluminum industry began to falter as the result of worldwide overproduction, depressed prices, and reduced demand. As a result of the depressed aluminum industry and the recession, Bonneville's industrial customer load dropped substantially. Suddenly, Bonneville and the region's utilities had more power than they could sell.

Thus the Council faced dramatically different circumstances and economic outlook in developing the Second Power Plan than in developing the first plan. Fortunately, the Council accounted for future uncertainty in the first plan – again, a stark departure from traditional utility planning that led the region to begin building power plants in the 1970s that proved to be unneeded by the 1980s. The flexible planning strategy pioneered in the First Plan was designed to inject a risk-management strategy into power planning to deal with uncertainty and prevent overbuilding resources (and sticking consumers with the costs) by matching future generating and efficiency resources to a wide array of potential energy-demand futures.

Like the First Plan, the Second Plan emphasized investments in conservation and called for no near-term development of new resources except those that were cost-effective and could be lost to the region if not secured through, for example, options to build. The Second Plan also identified and addressed five major new challenges for the region:

1. All new sources of power generation are much more expensive than the region's existing hydropower system
2. Traditional, heavy-manufacturing industries in the Northwest, such as aluminum and pulp and paper, employed more than a half million people and used vast amounts of power, but new industries like high-tech companies use less, and as the cheap hydropower is augmented with more expensive power sources the older companies will struggle against their competitors elsewhere in the country and the world
3. While there was a surplus of electricity in the region, it was primarily coal-fired and nuclear and was a lot more expensive than previous surpluses, which were primarily hydropower
4. The surplus was not evenly shared across the region
5. The surplus could disappear quickly if the regional economy improved rapidly.

In response, the Second Plan continued the major emphasis on aggressively developing energy conservation as a hedge against higher prices for all power consumers in the region and as a means of delaying decisions to invest in new power plants. Key elements of the Second Plan were:

- A stronger regional role for Bonneville; in essence, more flexibility in designing conservation programs to achieve the objectives of the action plan in the Second Plan including, for example, developing work plans with descriptions of tasks and activities to achieve the conservation goals in the plan
- Development of conservation on a regional basis
- Strategies to make better use of the hydropower system
- Building conservation capability in all sectors of the economy
- Demonstrating the cost-effectiveness of renewable resources so they are available before the region has to build new thermal generating plants
- Allocating the costs of two unfinished nuclear plants (WPPSS 1 and 3, underwritten by Bonneville) and eliminating barriers to their completion
- Study of electricity sales and purchases between regions

The 1989 Supplement to the Second Plan: The surplus ends

And then, in the economy equivalent of a heartbeat, the energy world changed – again.

It was another reminder of the prescience of the Power Act that initiated the Council's flexible planning strategy. Between 1986 and 1989, the Northwest recovered from a recession and demand for power increased, including from the previously depressed aluminum industry in response to increased demand and rising prices for the metal. The economic improvement coincided with the closure of the Hanford Generating Plant, a World War II-era bomb-fuel production plant that had been converted in the early 1960s to generate power, and with increased firm power sales outside the Northwest. Worldwide oil prices , which influence the cost of some electricity generation, collapsed in 1986 after the Second Plan was completed, and technological improvements in power production and conservation also changed the regional power picture.

The biggest change influencing the Council's power planning was the decline in the region's electricity surplus in the three years after the 1986 Plan – from about 2,500 average megawatts to about 1,400 by early 1988, when the Council began working on the supplement. The surplus was predicted to decline to 400-800 average megawatts by 1990.

The Council responded by updating the technical data base of the 1986 Plan, as opposed to developing an entire new plan, completing the update in March 1989. The supplement had three major conclusions:

- Near-time action was needed to address the declining electricity surplus

- The action plan in the 1986 Plan did not need to be changed, but Bonneville and the region's utilities needed to be more aggressive in implementing the action plan, notably the conservation provisions
- A number of major issues needed to be resolved over the ensuing two years to ensure a reliable power supply in the 1990s

In short, the action plan in the 1989 Supplement reaffirmed the action plan in the 1986 Plan, but with a greater sense of urgency. In the supplement, the Council predicted the power deficit would worsen, and it did. Over the next two years, the Council produced a complete revision of the power plan.

The Third Plan, 1991: New resources needed

The Third Northwest Power Plan, completed in 1991, addressed the fact that for the first time since the Power Act was passed, the Northwest needed new resources. The economy had recovered from the mid-1980s recession, the region's population was increasing, and as a result demand for power was increasing as well. The challenge for the Council was to select resources for the future that offered the most value for the money.

The 1991 Plan had four key objectives:

- Acquire more than 2,300 average megawatts of conservation and other low-cost resources by the year 2000, including 1,500 average megawatts of conservation, 800 average megawatts of low-cost hydropower and 800 average megawatts of cost-effective, natural gas-fired cogeneration power plants
- Shorten the lead times for acquiring new resources to enable quick and flexible responses to energy needs and enhance the ability to acquire resources in small increments to respond quickly to uncertain future power needs
- Confirm the costs, reliability and availability of additional resources, including new technologies and those that were expensive or poorly understood previously so that they could be better understood if needed in the future
- Encourage regulatory and other changes to help implement the plan, such as a mechanism to link utility profits to energy savings as an incentive to invest in conservation programs, which reduce demand for power and thus the amount of power a utility sells.

But then the utility world changed, yet again, in the early 1990s when Congress authorized the deregulation of commodities whose costs had long been regulated by state and federal authorities – natural gas, for example, and later electricity transmission and sales.

Energy industry competition had arrived.

Until the mid-1990s, a key feature of the regional power system was its stability of regulation, whether by state utility commissions or the commissions of publicly owned utilities. But beginning in 1996, the electricity industry in the United States was restructured significantly. This restructuring was the product of many factors, including national policy to promote a competitive electricity generation market and state initiatives in California, New York, the northern New England states, Wisconsin, and elsewhere to open retail electricity markets to competition. This transformation moved the industry away from the regulated monopoly structure of the previous 75 years. As a result, utilities suddenly had a choice of wholesale power providers. Access to high-voltage transmission also was opened to competition.

The implications for Bonneville, the region's largest electricity and high-voltage transmission provider, were ominous. Bonneville supplies, on average, 40 percent of the power sold in the region and controls more than 70 percent of the region's high-voltage transmission.

In the face of a competitive wholesale marketplace for electricity and transmission, Bonneville benefited from the fact that it marketed most of the region's low-cost hydropower, but it was hampered by the fact that at the time it had 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.

The transition to a competitive electricity industry raised many issues for Bonneville and the region. For example, could Bonneville continue to meet its financial and environmental obligations in the face of intense competitive pressure? Also, what is the appropriate role of a federal agency in a competitive electricity market? Should Bonneville even be a competitor? What would happen if market prices remained consistently below Bonneville's cost of power – would utilities leave Bonneville for the lower-cost market?

The Comprehensive Review of the Northwest Energy System, 1996

In response to these questions about Bonneville, but also in order to gauge the potential impacts of competition on utilities throughout the region and consider how to seize opportunities and moderate risks inherent in the transition to competitive electricity markets, the governors of the four Northwest states convened the Comprehensive Review of the Northwest Energy System in December 1995. The governors appointed a broadly representative steering committee of experts in Northwest fish, wildlife, and energy issues to study the system and make recommendations about its transformation. The four governors each appointed a non-voting member to the committee, who included three members of the Council and one former member.

The Fourth Plan, 1996: Confronting competitive energy markets

At the same time, the Council began work on the Fourth Power Plan. For the Council, once again, there was a clear need to plan for future uncertainty – the need to take advantage of low electricity prices that might result from competition among suppliers, but also the need to protect utilities from price volatility that might roil the wholesale markets if demand surpassed supply.

In light of the Comprehensive Review, then, the Council took a different approach in developing the Fourth Plan than with the first three. For example, the draft plan, issued in March 1996 as the Comprehensive Review was under way, contained few recommended actions or policy decisions. Instead, it was written as a reference tool for the review committee and contained background on the regional power industry and its restructuring, as well as analyses of some of the major issues that would have to be addressed as the Northwest advanced toward its new energy future. Because of the potential impacts of competition on Bonneville and the Council's planning, the Fourth Plan also explored issues related to the both agencies' futures.

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 Comprehensive Review "…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 an adequate, efficient, economical and reliable power system," according to the plan.

The Council's analysis of future power demand and the cost and availability of generating and conservation resources led to several broad conclusions in the draft plan, including:

- Low prices for natural gas, resulting from competition in that market, combined with open access to transmission, meant that the West Coast electricity market was likely to have substantial supplies of electricity costing around 2 cents per kilowatt hour for at least ten years
- Taking into account transmission constraints, if the Northwest were to rely on the wholesale market for 3,000 annual average megawatts of power, the future cost of electricity to the region could be reduced by an average of $3 billion, compared to a strategy of building new resources to meet Northwest load
- Natural gas-fired combined-cycle combustion turbines were seen as the most likely choice for new, low-cost generation if needed. The Council identified sites for new gas plants that could supply

6,800 average megawatts of energy at costs of 2.7 to 3.3 cents per kilowatt-hour under the Council's medium gas-price forecast.

- A total of 1,535 average megawatts of new energy efficiency was available over 20 years at an average levelized cost of 1.7 cents per kilowatt-hour
- Renewable resources like wind and solar power, while desirable for their contribution to reducing carbon dioxide emissions from power plants to combat global warming, were not cost-effective in 1996, at least in the near term. The Council saw little economic value in developing renewables in advance of need and cost-effectiveness.

The draft Fourth Plan left to the Comprehensive Review committee the future roles of Bonneville and the Council but noted:

> *Just as the role of the Bonneville Power Administration may be different in the future, the role of the Council in power planning is also in question. The Council's role of establishing a power plan to guide the resource acquisitions of the Bonneville Power Administration is moot if Bonneville is no longer acquiring resources.*

Thus, the recommendations of the Comprehensive Review were seen as having the potential to radically change the power industry in the Northwest, and the work of the review was watched carefully by the industry and the region's elected officials. The Council held the public comment period on the draft Fourth Plan open through the rest of 1996 while the Comprehensive Review was under way. The review participants presented their recommendations to the four Northwest governors in December of that year. The Council then incorporated the recommendations into the draft Fourth Plan and issued an addendum to the plan for public comment in August 1997 and took comments through the end of October. The Council issued a response to comments in July 1998, thus ending the Fourth Plan rulemaking.

The Review included recommendations regarding Bonneville's future, the governance of the Columbia River system (a related topic to Bonneville's federal power marketing); energy conservation, renewable resources and low-income energy services; consumer access to the competitive wholesale power market; transmission; and future power system roles for the Council.

The Council did not adopt the review's recommendations word for word into the Fourth Plan addendum but did examine the relationships between the analysis in the draft plan and the review's recommendations. Where those recommendations were non-specific, the Council added specifics that would have to be addressed by legislatures and state and local regulators before they could be implemented.

After the conclusion of the Comprehensive Review, the governors of Idaho, Montana, Oregon and Washington created the Northwest Energy Review Transition Board to oversee implementation of the steering committee's recommendations. The four governors' representatives on the review committee constituted the Transition Board.

The Transition Board addressed two questions that arose from the review: 1) how can Bonneville survive competition when its power rates are at or above market, and 2) how can the region maintain an efficient and reliable transmission system?

Meanwhile, the Council developed its own recommendations in response to the review, in light of the Power Act requirement to assure the region an adequate, efficient, economical, and reliable power supply. In general, the Council's recommendations in the Fourth Plan were intended to help the region ensure that the benefits of competition would be shared by all electricity consumers, and that public purposes, such as energyefficiency improvements, development of renewable resources, and services to lowincome customers would continue to be provided. The Comprehensive Review, and the Fourth Plan, concluded that while the future was uncertain, the deregulated, competitive wholesale power market would dictate a "perfect" energy-price future. That was the hope, at least.

But the market proved to be sinister, in that low prices encouraged utilities to spend less on conservation – one way to keep their costs low and their rates competitive. While the Fourth Plan's conservation target for the years 1997 through 2000 was more than 350 average megawatts, the actual accomplishment was just over 150.

McNary Dam tour, Umatilla County, Oregon.
Photo: Carlotta Collette, 1987.

The region did not meet the Comprehensive Review's goals for utility investment in conservation, either.

In fact this was not unexpected. The Comprehensive Review recognized that increased market pressures and regulatory uncertainty had – and would continue – to constrain utility investments in conservation. Accordingly, the Review recommended adoption of a "non-bypassable [can't be passed along to consumers], competitively neutral" public benefits charge equivalent to 3 percent of a retail utility's annual revenues. Only Oregon responded, passing the Electric Industry Restructuring Bill, which established a 3-percent public benefits charge to ensure continued investments in conservation, renewable resources, and low-income home weatherization. The Oregon Energy Trust was created to manage the charge and the programs; investor-owned utilities no longer administered conservation and renewable programs.

And then the energy world changed, again:

- A West-wide drought from late 1999 into 2000 reduced the hydropower supply up and down the coast
- Weather extremes pushed regional electricity demand to new highs in the summer and winter of 2000 and 2001
- California suffered a major shortage of electricity caused by illegal manipulations of its wholesale market, largely by the Texas-based company Enron, illegal shutdowns of natural gas pipelines, also by Enron, and capped retail electricity prices, leading to multiple large-scale blackouts in the state and causing one of the state's largest utilities, Pacific Gas & Electric to file for bankruptcy protection
- As a result, West Coast wholesale electricity prices rocketed up 800 percent between April and December 2000

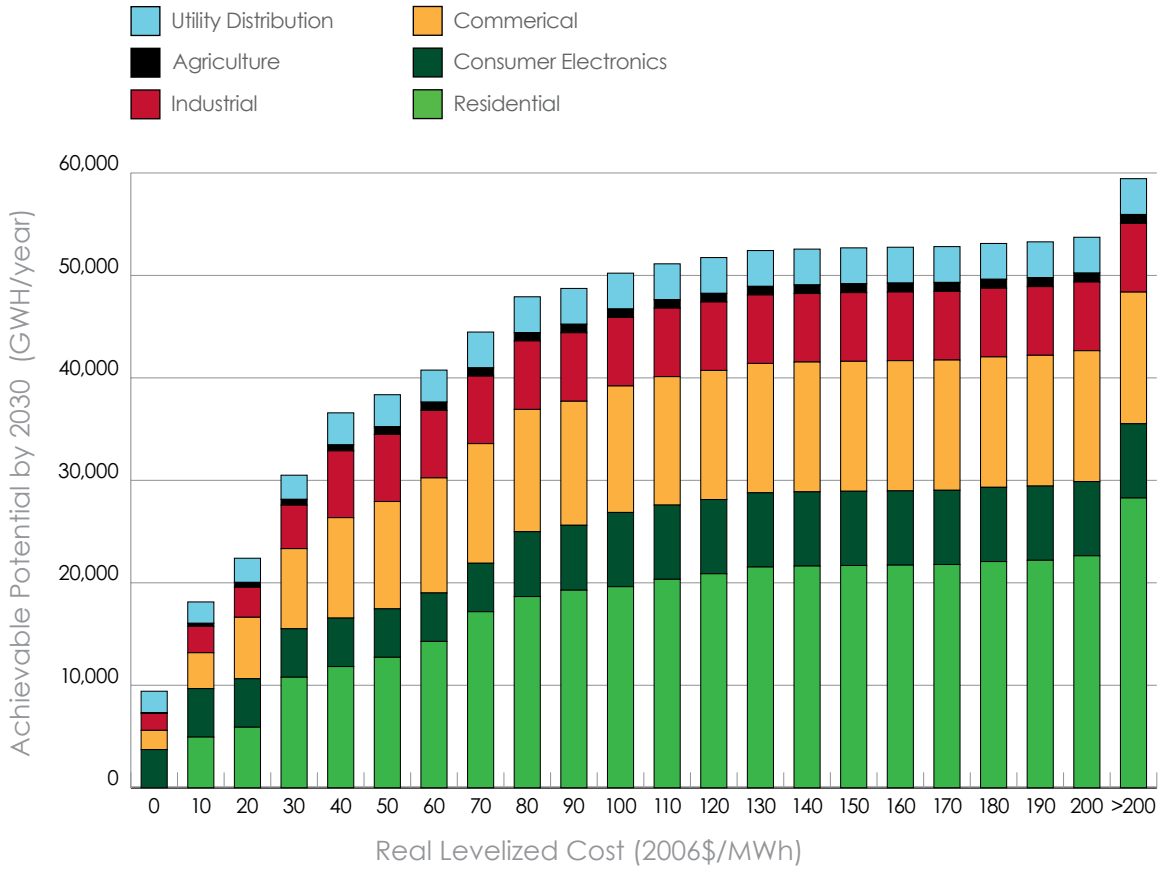
Whereas the Comprehensive Review assumed the market would send appropriate price signals to utilities

and developers when the time was right to build new power plants, in fact the signal was that a disaster was eminent. Low market prices had discouraged investments in new power plants and also, importantly, conservation.

Conservation investments declined steadily from 1993 through 1999, then bumped up slightly in 2000 and rocketed up in 2001, a year when market prices jumped to new highs and stayed there for months. In that year alone, Bonneville spent more than $3 billion on market power to keep our lights on. Other utilities also scrambled for power and found themselves victims of the high-priced market.

The market madness came to be known as the Energy Crisis of 2000/2001. During the crisis, 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 could be built relatively quickly, and many new plants were added to the Northwest and West Coast power supply during the energy crisis, when

Achievable energy efficiency by 2030 by Sector and Levelized Cost



stratospheric prices – well over $200 per megawatt-hour at times – meant that construction debt for the plants could be paid down quickly.

The crisis eased, but consumers continued to pay the price. High wholesale prices caused retail prices to increase by 25 to 50 percent. Many utilities entered into long-term contracts for power supply at high prices at the height of the crisis. As a consequence, although wholesale prices returned to normal levels, retail rates stayed high long after the crisis was over.

The crisis also saw a huge reduction in one of the Northwest's largest industrial sectors, the aluminum industry. Most of these plants, largely known as the direct service industries (DSIs), purchased their electricity directly from Bonneville. During the energy crisis, when Bonneville was scrambling to find enough power to meet its customers' needs, it bought out most of the DSI load. When all of the region's 10 aluminum smelters were operating at capacity they could consume about 3,150 average megawatts of electricity. However, after the crisis and Bonneville's buyout of their load, many of the smelters shut down permanently. This reduced electricity loads in the region by about 2,000 average megawatts, and had a large impact on the region's economy long after the crisis was over.

What did we learn? How did the Council respond?

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 or even days when demand increases and the supply – particularly the hydropower supply – decreases. The whims of weather cannot be controlled, and fuel for the largest percentage of our power literally falls from the sky.

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, not to mention illegal activity such as rocked the California market.

In 2000, concerned about the future impacts of the volatile wholesale market, the Council undertook a study of regional power supply adequacy. The study estimated that the probability of being unable to fully serve Northwest load (the "loss of load" probability) would climb to 24 percent by 2003, even when accounting for the ability to import power in the winter and to draft reservoirs beyond normal limits in emergencies. The analysis also indicated that 3,000 megawatts of new resources would be necessary to bring the loss-of-load probability down to the acceptable industry criterion of 5 percent. While the region responded effectively, if belatedly to the energy crisis with new generation, load reduction through crash investments in conservation, and changes in hydropower operations, more needed to be done to avert future crises.

For example, load reduction did not really begin taking effect in a significant way until more than seven months after the onset of wholesale prices that remained significantly higher than normal. Had there been a more rapid response of loads to wholesale prices, it might have partially mitigated the high wholesale prices that the region was experiencing. Similarly, had investment in conservation continued at cost-effective levels throughout the 1990s there would have been at least a couple hundred megawatts of load not exposed to the high prices.

The Fifth Plan, 2005: Dealing with uncertainty, ensuring adequacy

The Council stepped into these challenging circumstances with the Fifth Northwest Power Plan. In the Fifth Plan, the Council recognized the need to develop more robust planning methods for assessing and managing the risks inherent in the electricity industry structure and to use these methods to develop resource strategies that would meet the region's electricity needs at lowest cost with acceptable risk. The Fifth Plan also provided insights into the resolution of some of the key issues affecting the industry in the Northwest, such as determining what constitutes resource adequacy and identifying the incentives (regulatory or financial) for assuring resource adequacy; how we pay for transmission system expansion; how we ensure transmission is operated reliably, efficiently and equitably; identifying the steps to enable effective demand-side participation in the wholesale market; and identifying the means of sustaining investment in cost-effective conservation and renewable resources, among others.

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 can discourage investments in new generating and energy efficiency resources when the cost of those resources is higher than average market prices. The Fifth Plan responded to the problem of high prices and reduced supply of power that led to 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.

As with all previous Council power plans, a key theme of the Fifth Plan (2005) 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. The Fifth Plan also addressed key policy issues that affect the ability to assure an adequate, efficient, economical, and reliable power system including 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.

Here is a synopsis of the Fifth Plan:

Conservation:

The Council recommended that the Northwest increase and sustain its efforts to secure cost-effective conservation immediately. The targets were 700 average megawatts between 2005 and 2009; and 2,500 average megawatts over the 20-year planning period.

Demand Response:

The Council recommended developing 500 megawatts of demand response (agreements between utilities and customers to reduce demand for electricity during periods of high prices and limited supply) between 2005 and 2009 and larger amounts thereafter.

Wind power:

The plan foresaw more than 1,100 megawatts of new wind power between 2005 and 2014, based on what was known at the time. The Council assumed: 1) federal tax credits for wind power plants would continue; 2) controls on greenhouse gas emissions from power plants would be enacted in the future, encouraging wind power; 3) construction costs for wind plants would continue to decrease; 4) wind power, an intermittent resource, could be integrated into the existing power system at reasonable costs; and 5) large areas of land with access to high-voltage transmission would be available at moderate costs.

Prepare for new power plants:

As a risk-management strategy, the power plan defined a schedule for siting and permitting new power plants in anticipation of construction so that, with siting and permitting completed, actual construction could begin quickly when conditions were best. The schedule included up to 5,000 megawatts of wind power to be

developed through the end of the 20-year planning period, 425 megawatts of high-efficiency coal-fired generation (to begin construction by January 2012) and, late in the planning period, additional natural gas-fired generation.

Improved risk assessment in resource planning:

Risk assessment and management always have been important elements of the power plan. Load uncertainty, fuel price uncertainty, and hydropower generation variability figured prominently in the conclusions of prior plans. Those plans incorporated gas and coal price excursions in forecasts and sensitivity analyses. They also considered capability to export and import various amounts of power to and from outside the region. Since the first power plan, the Council has analyzed the value of shorter lead times and rapid implementation of conservation and renewables. The Council also has valued "optioning" generating resources – carrying out pre-construction activities and then, if necessary, delaying construction until conditions favor going ahead. In the Fifth Plan, the Council further integrated risk assessment and management into its analysis and extended the assessment of risks to such issues as electricity market price uncertainty, aluminum price uncertainty, and emission control cost uncertainty. The analysis includes periods up to a few years when power and fuel prices, as well as other sources of uncertainty, deviate significantly from equilibrium levels. In these model improvements, the Council abandoned the assumption of perfect foresight to better assess the value of risk mitigation.

Policy Issues:

The Fifth Plan identified four policy issues that were considered critical to the future of the region's power supply:

- The future role of the Bonneville Power Administration: The Council recommended that Bonneville sell electricity from the existing Federal Columbia River Power System to eligible customers at cost. Customers that request more power should be required to pay the additional cost. The Council recommended that Bonneville implement this change through new long-term contracts to be offered by 2007. The Council also recommended that Bonneville continue its commitments to support conservation, renewable energy, and fish and wildlife mitigation.
- High-voltage transmission: The Council noted that the move toward deregulation and expansion of wholesale electricity markets, along with changes in technology, altered the character of the traditional transmission system. Questions of how to plan for, build, pay for and effectively manage the region's transmission system were considered critically important (as they had been in the Comprehensive Review).
- Regional power system adequacy standards: The Fifth Plan evaluated alternative regional adequacy standards and their interaction with the western United States power system. The Council committed in the plan to work with regional utilities and regulators to develop a standard that would assure an adequate power supply while being fair and equitable to all parties.
- Integrating fish and wildlife recovery with power planning: The Council committed in the plan to improve coordination of power and fish and wildlife issues with other entities in the region.

Tiered rates, 2008: Bonneville responds to competition

Of the recommendations in the Fourth and Fifth plans, arguably the most important for the long-term cost and stability of the regional power supply was the future of Bonneville in the competitive marketplace.

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, 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. Additional power, which Bonneville supplies if asked, is priced higher – called Tier 2 – because Bonneville purchases it on the wholesale market. Bonneville customers have the option to find their own supplies of Tier 2 power, buy it from Bonneville, or reduce their demand through energy efficiency investments, for example, and possibly avoid Tier 2 altogether.

The proposal, known as the Joint Customer Proposal, 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 beginning 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 standards of the North American Electric Reliability Corporation (NERC) as the host balancing authority for wind-power resources that are meeting load elsewhere, primarily in California.

The size of these obligations was not well understood at the time of the Fifth Plan because it was understood the obligations would 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, was uncertain. There were a number of ongoing regional and West-wide discussions about institutional and business-practice changes to help balancing authorities deal with these issues.

One of these, initiated by the Council and Bonneville, was the Wind Integration Forum. Chartered in 2007, the purpose of the forum was to assess whether the region could reliably accommodate the 6,000 megawatts of wind generation envisioned in the Fifth Plan. In the plan, the Council called for development of a wind confirmation plan to resolve uncertainties surrounding wind power development. The 2007 Northwest Wind Integration Action Plan was the result of that effort, offering 16 recommendations ranging from developing a high-resolution chronological wind resource data set for the Pacific Northwest to improving transmission planning, evaluating ways to deliver wind power from Montana to the other Northwest states, and improving access to Montana's vast wind-power potential. The action plan also recommended that Bonneville and the Council charter the forum as a permanent advisory group.

The Sixth Plan, 2010: Responding to risks

Meanwhile, the Council made risk response an important the theme of the Sixth Power Plan, completed in 2010. Risks included the effects of climate change on the region's hydropower system, the cost risk of future carbon controls, and the risk of wholesale power market volatility, among others.

The plan predicted regional electricity load would increase from about 21,000 average megawatts in 2010 to about 28,000 average megawatts by 2030, an increase of about 7,000 average megawatts overall or about 1.4 percent (about 339 average megawatts) per year.

Once again, the plan recognized that the Northwest electricity system faced huge challenges: uncertainty about future climate-change policy, fuel prices, salmon-recovery actions, economic growth, and integration of variable wind power. And also again, energy efficiency was seen as the most cost-effective and least-risky resource to meet future demand.

According to the Sixth Plan, cost-effective energy efficiency could meet 85 percent of the new load over the 20-year planning horizon (about 5,900 of 7,000 average megawatts). This efficiency, combined with new renewable energy, could delay investments in new fossil-fuel power plants until future environmental legislation is clear and alternative low-carbon energy sources have matured in technology and cost, according to the plan.

In the Sixth Power Plan (2010), developed in 2008 and 2009, climate-change policies were identified as important for 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 in 2007 the Western Climate Initiative adopted carbon-dioxide emissions targets. Several states have adopted similar emissions targets.

The Council's 2007 paper entitled Carbon Dioxide Footprint of the Northwest Power System (www.nwcouncil.org/library/2007/2007-15.pdf), 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 that plan the Council addressed future risks, uncertainties, and growth in demand for electricity with strategies and an action plan that minimized the expected cost of the regional power system over the 20-year planning period, 2010-2029, and sought to ensure that the power supply remains affordable and reliable. The plan forecasted demand growth of about 7,000 average megawatts during that time period, and demonstrated how about 85 percent of that amount – 5,900 average megawatts – could be met with cost-effective energy efficiency.

Importantly, the plan assessed 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 resource strategy in the plan included five specific recommendations:

1. Develop cost-effective energy efficiency aggressively – at least 1,200 average megawatts by 2015, and equal or slightly higher amounts every five years through 2030.
2. Develop cost-effective renewable energy as required by state laws, particularly wind power, accounting for its variable output.
3. Improve power-system operating procedures to integrate wind power and improve the efficiency and flexibility of the power system.
4. Build new natural gas-fired power plants to meet local needs for on-demand energy and back-up power, and reduce reliance on existing coal-fired plants to help meet the power system's share of carbon-reduction goals and policies.
5. Investigate new technologies such as the "smart-grid," new energy-efficiency and renewable energy sources, advanced nuclear power, and carbon sequestration.

The plan also made some specific recommendations to guide Bonneville should it need to acquire resources to meet its future obligations. They were, 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 Seventh Plan, 2016: More efficiency, less carbon

In the Seventh Plan, adopted by the Council in February 2016, the Council again assessed the state of the regional power system, which changed in important ways since the adoption of the Sixth Power Plan six years earlier.

The economy picked up over that time, for example. Employment and job creation in the Pacific Northwest remained sluggish during 2010 and 2011, growing from 6.11 million jobs in 2009 to 6.14 million jobs in 2011, adding just 150,000 jobs each year. But since 2011, employment grew by more than 500,000 jobs per year to 6.3 million in 2014. The regional economy grew at a nominal annual rate of 2.26 percent per year during 2010 to 2014. That said, economic conditions varied in the region. For example, metropolitan areas with diverse economic bases fared better than rural areas, which have traditionally been more dependent on specific industries.

Between 2010 and 2014, regional electricity weather-normalized loads, inclusive of the Direct Service Industries or DSIs (the large industrial customers historically served directly by Bonneville) increased slightly, growing from 20,617 average megawatts to 21,164 average megawatts. This five-year increase of just under 550 average megawatts represents a total growth of just over 3 percent. Without the DSIs, load growth was 343 average megawatts, or just under 2 percent over five years. Regional electric loads finally returned to pre-recession levels in about 2014.

One of the newer segments contributing to demand has been data centers. Custom and mid-tier data centers have been attracted to the Pacific Northwest by financial and tax incentives, low electricity prices, and a skilled professional base. The Seventh Plan forecasts that electricity use by data centers could increase from their current level of 350 to 400 average megawatts to as much as 900 average megawatts by 2035. More recently, as a result of the legalization of cannabis production in Washington and Oregon, indoor agriculture is anticipated to contribute to between 100 and 200 average megawatts of increased electricity demand over the next 20 years. The Seventh Plan also anticipates significant growth in electricity use in the transportation sector, forecasting that plug-in electric vehicles could add 160 to 625 average megawatts to regional electricity use by 2035, a significant increase from 8 average megawatts of load in 2015 created by the region's over 22,000 existing electric vehicles.

Acting in the opposite direction are the anticipated impacts of new federal appliance, lighting, and equipment standards and distributed solar photovoltaic (PV) systems. More than 30 new and revised federal standards have been enacted since 2010. These standards are forecast to reduce future load growth by nearly 1,500 average megawatts over the 20-year period covered by the Seventh Power Plan.

The increasing adoption by homeowners and businesses of distributed solar PV systems is also forecast to dampen regional load growth. As of the end of 2014, over 100 megawatts of distributed solar PV capacity had been installed in the region, lowering system energy requirements by an estimated 18 average megawatts. By 2035, the Council forecasts that 500 to 1,400 megawatts of solar PV systems will be installed in the region. On an annual basis, the energy generated from these distributed PV systems is forecast to reduce regional loads by 80 to 220 average megawatts. In addition, these distributed solar PV systems also reduce winter and summer peak loads. Summer peak impacts from distributed solar PV are forecast to be lower by as much as 600 megawatts by 2035.

Renewable resource development has accelerated in the Northwest, too, since the Council approved the Sixth Plan. This development was prompted by renewable portfolio standards (RPS) adopted in three of the four Northwest states and in California. Idaho has a state policy encouraging renewable resource development but not setting targets.

Wind energy has been the principal focus of renewable resource development in the Pacific Northwest. From 2010 through 2014 about 4,100 megawatts of wind nameplate capacity was added to the region, with nearly 2,000 megawatts of capacity coming online in 2012 alone. By the end of 2014, wind nameplate capacity in the region totaled just over 8,700 megawatts. However, only about two-thirds of that nameplate capacity currently serves Northwest loads. The remaining one-third (about 3,000 megawatts) of wind nameplate capacity is currently contracted to utilities outside the region, primarily California.

As renewable power proliferated, natural gas prices continued to decline. At the time of the Sixth Power Plan, in 2010, market prices for natural gas had just dropped dramatically from $8.24 per million British thermal units (MMBtu) in 2008, to $3.76 per MMBtu in 2009 as the result of the sudden emergence of the huge potential to produce natural gas from shale formations using hydraulic fracturing techniques. Prices continued to fall, reaching $1.98 per MMBtu in April 2012 before rebounding to an average of $2.59 in 2012, significantly below the Sixth Power Plan's forecast of $5.10 per MMBtu. By September 2015, wellhead prices averaged $2.70 per MMBtu (in 2012 dollars).

Increasingly, because of its low prices and apparent adequate supplies, natural gas-fired generation is displacing coal-fired generation. Coal to gas fuel switching is partly the result of environmental concerns, but it also reflects changed economics. In particular, it appears that lower market prices for natural gas are combining with higher market prices for coal to make natural gas-fired generating facilities more cost-effective.

Since 2010, there has been extensive environmental regulatory activity that affects the electricity industry, much of it (but not all) relating to the production of electricity from fossil-fueled and especially coal-fired power plants. The list includes new federal standards for ambient air quality, effluent, haze, and mercury and methane emissions. Since the Fukushima reactor accident in Japan (March 2011), the Nuclear Regulatory Commission required upgrades to existing nuclear plants in the United States. There are also new federal rules to protect migratory birds around solar and wind power plants.

Some fossil fuel-fired power plants in the United States are shutting down. The Seventh Plan accounts for the lost generation from three coal-fired plant shutdowns that will happen before 2025.

The Seventh Plan also notes that developments in California since the Sixth Plan was adopted will have spinoff effects in the Northwest. New federal regulations regarding required equipment for cooling fossil fuel plants will cause about 6,660 megawatts of older California generating plants to retire by 2017. Other expected California resource retirements through 2017 are expected to reduce generation by an additional 1,030 megawatts. Much of the retiring capacity in California is being replaced with modern gas-fired generation, including combined-cycle combustion turbines that are more fuel-efficient than the once-through-cooling plants and also have lower air emissions. Retiring capacity is also being replaced in California with fast-responding, simple-cycle combustion turbines that will provide capacity and help integrate renewables.

Also affecting the California market, both units at the San Onofre Nuclear Generating Station (SONGS), with about 2,200 megawatts of nameplate capacity, were taken out of service in January 2012 due to excessive wear in steam generator tubes. In June of 2013, the decision was made to retire the SONGS units.

Based on this information regarding California resources and considering California's load projections, the Council's Resource Adequacy Advisory Committee recommended limiting available on-peak spot market imports to 2,500 megawatts during winter and none during summer. A review of historical south-to-north intertie transfer capability for winter months led the advisory committee to also recommend limiting the

maximum south-to-north transfer capability to 3,400 megawatts.

Another major California development affecting the Northwest is the state's increasing reliance on renewable resources. In 2011, the California Assembly passed a law requiring the state's utilities to serve 25 percent of their retail customers' loads with qualified renewable resources by 2016. This requirement increases to 33 percent by 2020. The law also established new policies limiting the use of renewable generation from outside California to meet the requirements. In September 2015, the California Assembly increased the minimum requirement to 50 percent by 2030. Many California utilities are already serving 20 percent or more of their customers' needs with renewable energy.

In order to meet these increasing renewable portfolio standards (RPS), California utilities are turning to solar power, as costs for photovoltaic systems have been falling rapidly. In 2014, solar power plants in California produced 10,555 gigawatt-hours (GWh) or 5.35 percent of the state's total electricity production. In August 2015, California recorded its highest solar output to date, 6,341 average megawatts.

The large scale of solar development in California, however, presents significant challenges for power system operations and affects Northwest power markets. Integrating renewable resources into the existing power system requires that generation (hydropower in the Northwest and gas-fired generation in California) must be ready to ramp up or down to offset increases or decreases in wind and solar output. This gas-fired generation cannot be used to provide other types of reserves when it is designated for integration. As well, these low operating cost resources will affect wholesale market prices. The spring and early summer months are when Northwest hydroelectric generation peaks due to spring runoff. This may overlap the time of the year when California's solar generation and low demand for electricity combine to produce its largest energy surplus. The coincidence of the peak output of hydro in the Northwest, surpluses in California, and ample wind generation throughout the Northwest and California, can produce extremely low market prices due to supply far outstripping demand.

Unfortunately, wind resources contribute little to meeting peak demands and solar generation is typically much higher during summer months, which means less capacity would be available during winter, the Northwest's peak energy-demand season. However, combustion turbines provide within-hour balancing needs for renewable resources, and so some of their capacity might be available in winter for Northwest use. California is using summer-only demand response programs to help reduce its summer energy load. This may reduce the amount of thermal generation peaking capacity available to serve Northwest loads in winter.

The Seventh Plan also notes one other California development that will have an impact on the Northwest: the June 2014 decision by the Federal Energy Regulatory Commission (FERC) to allow the California Independent System Operator (CAISO) to expand its real-time energy imbalance market (EIM) beyond state borders. PacifiCorp and NV Energy have joined the CAISO's EIM; Portland General Electric, Puget Sound Energy, Arizona Public Service, and Idaho Power Company all have announced they will join in the future. Among the most significant issues raised by the CAISO's expanded footprint is whether it will grow into something more than a simple energy imbalance market that could lead to improved operational efficiencies for the 38 independently operated balancing authorities in the western interconnection. Such developments were too speculative to consider in the analysis supporting the Seventh Plan, but could be a significant issue for the Eighth Plan.

Wholesale power markets on the West Coast will be affected by these developments, notably low prices for natural gas; potential new regulatory requirements for generating resources that emit greenhouse gases; and development of renewable resources to satisfy requirements of state renewable portfolio standards. In general, the flood of new renewables will depress market prices below the full cost of virtually any new form of generating resource, an issue for utilities that face demand growth.

Partly in response to the advent of large supplies of new, low-cost renewable energy, Bonneville implemented tiered rates, as noted above. In 2016, the average cost of Bonneville's tier 1 power was roughly $32 per megawatt-hour. With the exception of energy efficiency, this is below the typical cost to develop new resources. Ninety of Bonneville's public utility customers were projected to exceed their tier 1 allocations in 2017 and thus would have to acquire additional resources. The prospect of exceeding their tier 1 allocation in the future may already be influencing their behavior. There is anecdotal evidence that some utilities are taking action to avoid spot market purchases. So to a certain extent, tiered rates are achieving the intended purpose of providing more efficient pricing signals to Bonneville's utility customers. However, to the extent that Bonneville or utilities purchase power in the low-cost, short-term wholesale market to meet their incremental resource needs, this mutes the tier 2 price signal.

In the Seventh Plan, the Council acknowledges that utilities across the region have experienced a variety of challenges and successes in the last few years. Some were expected and some are new, reflecting an ever-changing operating environment. As a result, the needs and incentives to acquire new resources also vary among the region's utilities. Continued economic stagnation, particularly in the region's rural areas, has meant low overall load. Poor economic conditions also have triggered the loss of existing industrial loads as certain manufacturing facilities were shut down. For example, Snohomish County Public Utility District lost a big portion of its industrial load when customer Kimberly-Clark closed its paper mill in early 2012.

Some utilities now find themselves with power supply resources that exceed their retail customers' demands. For these utilities, low spot market prices for wholesale power reduce the revenues they generate from sales of surplus power, putting pressure on utility budgets. In turn, this can create upward pressure on the utility's retail electric rates. Meanwhile, those utilities that have not yet exceeded their entitlements to purchase power from Bonneville at tier 1 rates face lower near-term price signals than the cost of new resources. Consequently, their short-term economic incentives to acquire new energy-efficiency resources at costs above the tier 1 rate are reduced.

On the other hand, the region has been a hotbed for new data center loads as companies like Google, Microsoft, and Facebook take advantage of the mild climate and low electricity prices to develop facilities in the Northwest. For example, Amazon has recently built data centers in the Umatilla Electric Co-op service territory, increasing the utility's load substantially. Several of the Mid-Columbia public utility districts have also seen significant growth as new data centers locate in their territory. Certain utilities adding large new retail customers face the prospect of growing enough to become subject to higher state renewable requirements. These utilities may also exceed their entitlement to purchase power from Bonneville at tier 1 rates.

Meanwhile, the region continues to make impressive progress in acquiring energy efficiency. As noted above, the Sixth Power Plan identified a range of likely energy efficiency resource acquisition from 2010 through 2014 of between 1,100 and 1,400 average megawatts. Despite a sluggish economy, which limited new building construction and equipment replacement, the region's overall acquisition exceeded the Council's ramp-up expectations and surpassed the high end of the expected savings range. Over the first five years of the Sixth Power Plan, the region's utilities, Bonneville, the Energy Trust of Oregon, and the Northwest Energy Efficiency Alliance (NEEA) acquired nearly 1,300 average megawatts of efficiency. In addition to the savings acquired by the utilities, Bonneville, the Energy Trust, and NEEA, all four states adopted new building energy codes. NEEA estimates that improvements in state energy codes have produced 18 average megawatts of savings over the last five years.

Another significant contributor to savings in recent years is the adoption of minimum efficiency standards for products that use electricity. Since 2009, the federal Department of Energy has issued final product standards for nearly 40 products ranging from refrigerators to utility transformers. Some of these standards took effect between 2010 and 2014, producing

about 50 average megawatts of additional savings during that period. States also have begun to adopt minimum standards for products not covered by federal standards, such as battery chargers.

In addition, consumer purchases of efficient products, outside of direct utility-funded programs, has been particularly strong for lighting equipment since 2010. In part, this results from prior utility programs pushing efficient products into markets and in part it may be due to consumer preference. Together, minimum product standards and consumer uptake added about 220 average megawatts of documentable savings outside of direct utility-funded programs between 2010 and 2014.

All told, between utility-funded programs, state codes and standards, federal standards, and consumer activities, the region captured just over 1,500 average megawatts of energy efficiency and approximately 2,500 megawatts of peak-period savings during 2010-2014, achieving 125 percent of the Sixth Plan goal and surpassing the high end of the expected energy savings range.

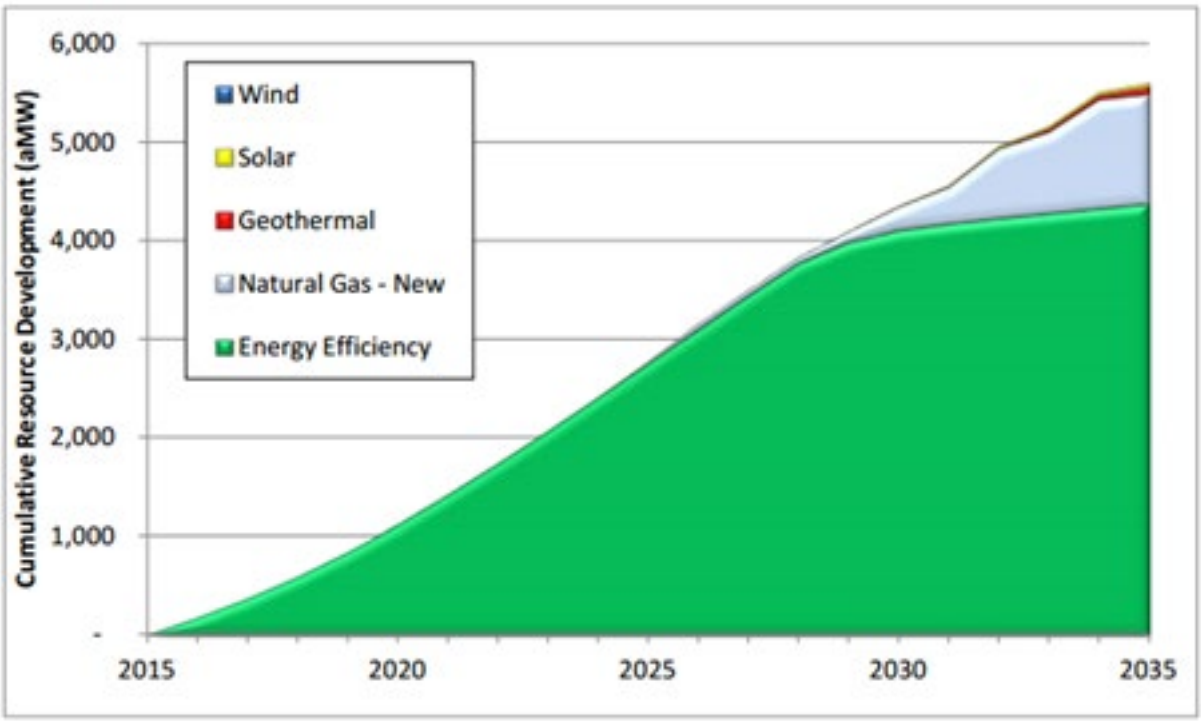
As the amount of energy efficiency increased in the Northwest, so did the amount of natural gas-fired generation. Today, gas is the leading fossil-fuel resource for power generation, both in the Pacific Northwest and nationally. Over 5,900 megawatts of gas-fired generation has been added in the Northwest since 2000. Gas-fired generation is relatively flexible and can be used to supply energy and capacity, as well as help balance variable output from other resources, including wind power.

Fortunately, it is becoming apparent that our region's natural gas infrastructure is relatively robust when compared with other regions. For example, the Northwest has more underground gas storage capacity than some other regions. In addition, deliverability from interstate pipelines has not been significantly impacted by regional shifts in gas production due to rapid growth in shale gas production, as may be occurring elsewhere. Further, the great majority of natural gas-fired generating facilities in the Northwest have firm pipeline capacity rights, fuel-switching capability, or both.

Seventh Plan highlights

Energy efficiency:

- The Council's analysis for the plan found that even with a robustly growing economy (for example, 25 percent more households and commercial buildings, 36 percent more industrial output) energy



Seventh Plan Resource Portfolio

efficiency can meet all of our load growth through 2035. Efficiency savings will come from sources such as solid-state lighting and controls for heating and cooling. The plan recommends acquiring a minimum of 1,400 average megawatts by 2021; then reaching 3,000 by 2026; and totaling 4,300 by 2035.

Demand response

- Demand response–voluntary reductions in customer electricity use when the system is stressed–is a low cost option to meet winter and summer peaks in years with low water and extreme weather. A minimum of 600 average megawatts of demand response would be cost-effective to develop.

Renewable resources:

- The plan encourages development of local, cost effective renewable energy projects and also encourages utilities to consider solar and geothermal, as well as wind, to meet state RPS requirements. Since adoption of the Sixth Power Plan, renewable resource development in the Northwest has increased significantly, particularly wind.
- In 2016, wind constitutes 8 percent of the region's electricity supply – about 2,700 average megawatts per year. The plan also recommends that utilities, especially those with growing summer peaking requirements, consider adding solar photovoltaic resources to their portfolios

Carbon reduction:

- Energy efficiency, demand response, and increasing generation from existing natural gas plants can replace retiring coal plant generation.
- By investing in energy efficiency and demand response, most states in the region will be able to meet the EPA's Clean Power Plan carbon rules.
- By acquiring all the cost-effective energy efficiency identified in the plan and closing the coal plants already scheduled for closure, the region will reduce its carbon emissions by 33 percent from historical levels. By taking other measures identified in the plan, the Northwest could further reduce CO2 emissions by as much as 70 percent from the 2016 level.

Need for new generating resources:

- At the regional level, there is no immediate need to acquire or build new resources, other than energy efficiency and demand response. However, individual utilities may need additional supply for capacity or wind integration if their transmission or power market access is limited.
- Selling long-term capacity contracts in the Northwest rather than selling surplus in short-term energy contracts lowers system cost and delays the need to build new power plants.

Fish and Wildlife Program and the Power Plan

The Columbia River Basin Fish and Wildlife Program is incorporated into the Council's power plan by statute. The fish and wildlife program guides Bonneville's efforts to mitigate the adverse effects of the Columbia River hydroelectric system on fish and wildlife. One of the roles of the power plan is to ensure the implementation of hydrosystem operations to benefit fish and wildlife while maintaining an adequate, efficient, economic, and reliable energy supply.

The hydroelectric operations for fish and wildlife have a sizeable impact on power generation. On average, hydroelectric generation is reduced by about 1,100 average megawatts compared to operation without constraints for fish and wildlife. Since the early 1980s, the Council and Bonneville have addressed this impact through changes in secondary power sales and purchases; by acquiring energy efficiency and some generating resources; by developing resource adequacy standards; and by implementing other strategies to minimize power system emergencies and events that might compromise fish operations.

In addition to operational changes, most of the direct and capital costs of the fish and wildlife program have been recovered through Bonneville revenues, and Bonneville has absorbed the financial effects of lost generation, resulting in higher electricity prices. The power system is less economical as a result of fish and wildlife program costs, but still affordable when compared to the costs of other reliable and available power supplies.

The future presents a host of uncertain changes that are sure to pose challenges to integrating power system and fish and wildlife needs: potential new fish and wildlife requirements; increasing wind generation and other renewables that require more flexibility in power system operations; conflicts between climate-change policies and fish and wildlife operations; possible changes to the water supply from climate change that intensify conflict between fish and power needs; and possible revisions to Columbia River Treaty operations to match 21st Century power, flood control, and fish needs.

Operations to benefit fish and wildlife have a significant biological value, and also a significant effect on the amount and patterns of generation from the hydrosystem. In the Seventh Plan, the Council encourages the federal action agencies to continue to monitor, evaluate, and report on the benefits and impacts to fish from flow augmentation and passage measures, including spill, and to work to revise and improve these evaluation methods as much as possible.

To address hydropower operations and prepare for the challenges ahead, the Council commits in the Seventh Plan to track changes and recommend actions by 1) annually assessing the region's power supply using its regional adequacy standard to ensure that events like the 2000-01 energy crisis, in which fish operations and power costs were affected, do not happen again; 2) working with partners through its Wind Integration Forum to help integrate wind generation into the power system; and 3) completing a mid-term assessment of the power plan to measure progress.

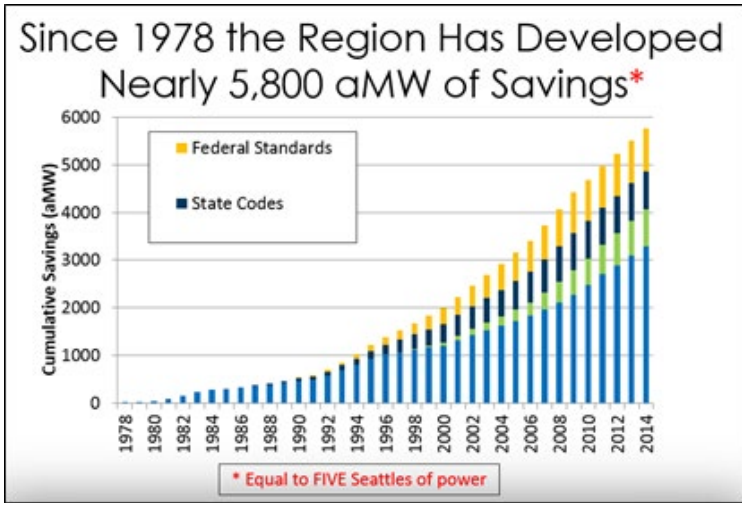
Energy Efficiency

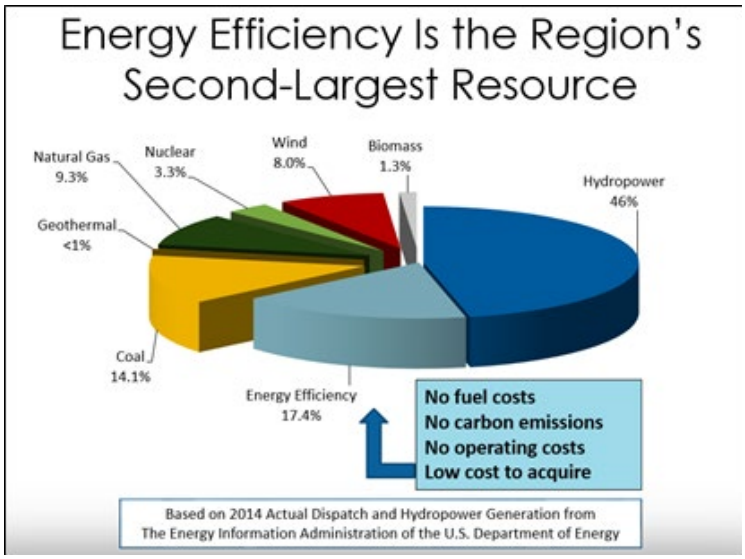
The Northwest Power Act defines conservation (improved energy efficiency) as reduced electric power consumption that results from improved efficiency in energy use. This means that less electricity is needed to provide the same level of services.

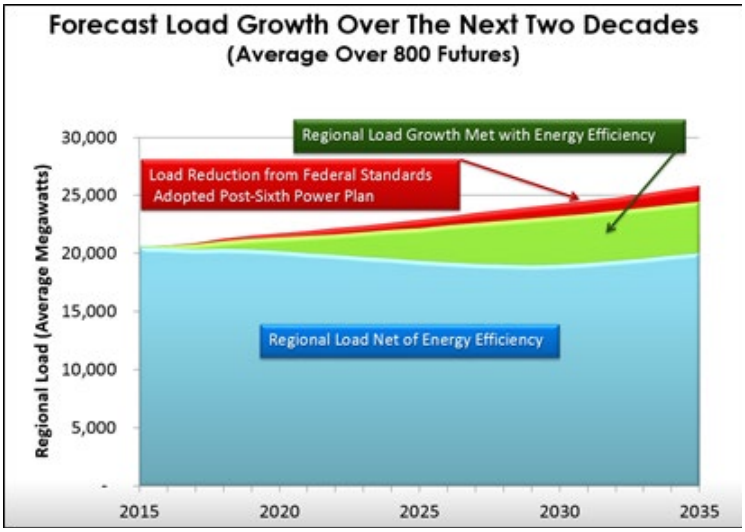
Conservation/energy efficiency resources are measures that ensure that new and existing residential buildings, household appliances, internal and external lighting systems, new and existing commercial buildings, commercial-sector appliances, commercial infrastructure such as street lighting and sewage treatment, and industrial and irrigation processes are energy efficient. These efficiencies, when cost-effective, reduce operating costs by cutting back on the operation of the least-efficient existing power plants, ultimately reducing the need to build new power plants and expand transmission and distribution systems. Conservation also includes measures to reduce electrical losses in the region's generation, transmission, and distribution systems where the measures result in a reduction in electrical power consumption. In addition to the energy benefit of reducing demand for power so consumers use fewer kilowatt hours or megawatt hours of electricity, conservation also provides a capacity benefit by reducing peak demand.

Since 1978, the region has acquired nearly 5,800 average megawatts of improved energy efficiency. Compared to an equivalent amount of generated electricity, that's enough for five cities the size of Seattle. The efficiency saves the region's electricity consumers more than $3 billion annually compared to the cost of power that would have to be consumed in the absence of the improved efficiency, and because the energy is not generated an estimated 22.2 billion tons of carbon dioxide are not emitted into the atmosphere.

As shown in one of the following figures from the Seventh Power Plan, energy efficiency is the second-largest electricity resource in the Northwest after hydropower.


Since 1978 the Region Has Developed Nearly 5,800 aMW of Savings*
Federal Standards
State Codes
Cumulative Savings (aMW)
6000
5000
4000
3000
2000
1000
0
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
* Equal to FIVE Seattles of power


Energy Efficiency Is the Region's Second-Largest Resource
Natural Gas 9.3%
Nuclear 3.3%
Wind 8.0%
Biomass 1.3%
Hydropower 46%
Geothermal <1%
Coal 14.1%
Energy Efficiency 17.4%
No fuel costs
No carbon emissions
No operating costs
Low cost to acquire
Based on 2014 Actual Dispatch and Hydropower Generation from
The Energy Information Administration of the U.S. Department of Energy


Forecast Load Growth Over The Next Two Decades
(Average Over 800 Futures)
Regional Load Growth Met with Energy Efficiency
Load Reduction from Federal Standards
Adopted Post-Sixth Power Plan
Regional Load Net of Energy Efficiency
Regional Load (Average Megawatts)
30,000
25,000
20,000
15,000
10,000
5,000
-
2015
2020
2025
2030
2035

The Regional Technical Forum

The Northwest Power Act defines energy efficiency as a resource and requires the Council to give cost-effective energy efficiency first priority in its regional power plans to meet future demand for power. Over the past three decades efficiency has become a cornerstone resource in the region, helping to mitigate load growth, while simultaneously saving consumers billions of dollars each year and reducing power-sector carbon emissions. The region's success on this front can be attributed to years of cooperation and dedication on the part of utilities, program implementers, and a multitude of other stakeholders.

The Regional Technical Forum (RTF) was created by the Council to further this effort by providing a platform for analysis, discussion, and collaboration aimed at ensuring consistency and reliability of energy savings, while easing the evaluation burden of energy efficiency programs in the region. Since 1999, the RTF has generated increasingly reliable energy savings estimates for program implementers through an analytically stringent and transparent public process, one that is informed by stakeholders across every sector and geographic area of the Pacific Northwest.

In the 2015 annual report of the RTF, the Council's former power planning director, Tom Eckman, who retired in 2016, wrote:

> *Throughout its 16 years of existence, the RTF has been a body that strived to be unbiased, removed from self-interest or politics. It exists with a singular mission: To find the numerical truth and accuracy of each question brought before it, and then present those facts and findings in the most accurate light. For those of you who have observed the RTF in action, you know that its deliberations are both thorough and public. Evolution has kept the RTF relevant since its inception; evolution necessary to meet technological developments, economic realities, and societal pressures head on in order to develop measures that empower the utilities of the region as they work to save energy and create a more efficient power system.*
>
> *In 2015, the RTF continued to evolve and improve every aspect of its operations, from the quality and structure of its work products to expanding regional collaboration and engagement. This past year was the first full year of convening the RTF's Implementers Group. This group brings together energy efficiency program implementers from across the region, and was invaluable in informing RTF analysis and offering a previously under-represented perspective on RTF proceedings. Also, this group gave program implementers a direct line to RTF staff to answer questions on changes to measures, protocols, guidelines, or any other item of concern.*
>
> *2015 was also the first year the RTF began creating research strategies for measures that require additional data before reliable savings estimates can be adopted. These strategies send clear signals to organizations throughout the Northwest about research questions the RTF must answer before it can move forward on a measure, while simultaneously offering them flexibility to mold their research efforts to fit their organizational needs.*

Fish and Wildlife Planning

The Columbia River Basin Fish and Wildlife Program: Background

The Northwest Power Act directs the Council to develop a program to "protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat, on the Columbia River and its tributaries … affected by the development, operation, and management of [hydroelectric projects] while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply." The Act also directs the Council to ensure widespread public involvement in the formulation of regional power and fish and wildlife policies.

As a planning, policy-making and reviewing body, the Council develops the program and then monitors its implementation by the Bonneville Power Administration (Bonneville), the U.S. Army Corps of Engineers (the Corps), the Bureau of Reclamation (the Bureau) and the Federal Energy Regulatory Commission (FERC) and its licensees.

The Northwest Power Act directs the Council to develop its program and make periodic major revisions by first requesting recommendations from the region's federal and state fish and wildlife agencies, appropriate Indian tribes (those within the basin) and other interested parties. The Council also takes comment from designated entities and the public on those recommendations. The Council then issues a draft amended program, initiating an extensive public comment period on the recommendations and proposed program amendments that includes written comments, public hearings in each of the four states, and consultations with interested parties.

After closing the comment period, and following a review and deliberation period, the Council adopts the revised program. The Council develops its final program on the basis of the amendment recommendations, information submitted in support of the recommendations, views and information obtained through public comment and participation, and consultation with the fish and wildlife agencies, tribes, Bonneville customers and others. The program amendments are not concluded until the Council adopts

written findings as part of the program explaining its basis for adopting or not adopting program amendment recommendations.

The Power Act requires the Council to review the power plan at least every five years, and to call for amendments to the fish and wildlife program prior to reviewing the power plan. The Council has opened the fish and wildlife program for comprehensive amendments roughly every five years. The Council has also used the program amendment process at times to amend certain elements or sections of the program. Thus, since the Council adopted the first program in November 1982, the Council has revised the program 18 times (through the 2014 Program).

Program revisions in the 1980s and 1990s focused on dam passage and system water management provisions to improve mainstem habitat and migration conditions and boost the survival of especially juvenile anadromous fish through the system. In those years the Council also established polices regarding resident fish substitution in areas where dams block anadromous fish passage; new hatcheries and fish production including the use of supplementation to plant hatchery-bred fish in rivers and streams to rear naturally; mitigation for wildlife affected by dams; and "protected areas" within and without the Columbia River Basin where new hydropower development should be prohibited – a policy implemented by the Federal Energy Regulatory Commission and the Bonneville Power Administration.

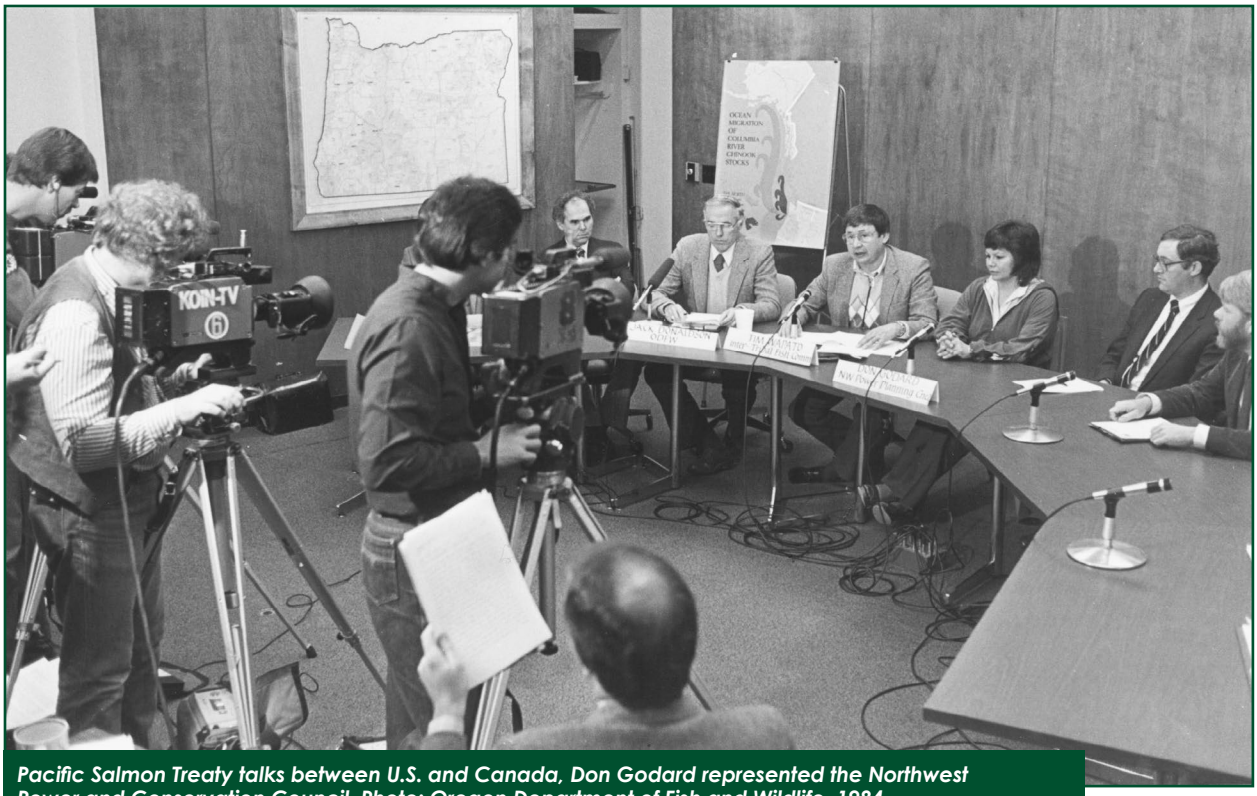
Over time as hydrosystem improvements were implemented through the program, the program began to place a greater emphasis on habitat, including restoration projects throughout the American portion of the Columbia River Basin. Later programs reflected the changing needs and dynamics in the basin, and include expanded restoration and mitigation efforts for losses of resident fish and wildlife and their habitat as a result of the hydropower system. Key stream reaches were protected from hydropower development, and the Council promoted scientific research to guide its decisions, as well as management decisions of the region's fish and wildlife agencies and tribes.

The Council's programs have served as a foundation for federal action agencies (Bonneville Power Administration, the Corps of Engineers, and the Bureau of Reclamation) seeking to recover Endangered Species Act-listed species in the basin. The Council's recommendations for dam operations and its strategies for habitat restoration and hatcheries were incorporated into federal biological opinions and recovery plans, and standards developed by the Council's two panels of independent scientists continue to provide the basis for evaluating the success of salmon and steelhead recovery efforts.

The Council comprehensively revised the program in 2000 with the addition of the current program framework, added specific measures and objectives for the mainstem Snake and Columbia rivers 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 are intended to 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), six Indian tribes (Colville, Yakima, Warm Springs, Shoshone-Bannock, Umatilla and Kalispel), and the Columbia River Inter-Tribal Fish Commission. The federal agencies committed to the following in the Accords:



Pacific Salmon Treaty talks between U.S. and Canada, Don Godard represented the Northwest Power and Conservation Council. Photo: Oregon Department of Fish and Wildlife, 1984.

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 adopts into the program appropriate measures to implement 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 since the first program was adopted in 1982. The program identifies areas of biological potential in the basin and opportunities for improvements. As a consequence of the Columbia Basin Fish Accords and the federal biological opinions, there are significant financial commitments to implement actions 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 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.

In the 2014 Program, the Council established nine priorities for program implementation, identified a set of emerging priorities, articulated 22 objectives for program implementation, and stated a priority list of actions for the program including 1) providing funding for long-term maintenance of the assets that have been created by prior program investments; 2) implementing adaptive

management (including prioritized research on critical uncertainties) throughout the program by assessing the effectiveness of ongoing projects, developing program objectives when appropriate, and taking into account the effects of climate change; 3) supporting expanded management of predators; 4) supporting mapping and determining hotspots of toxic contaminants in the basin; 5) aggressively addressing non-native and invasive species; 6) investigating blocked area mitigation options through reintroduction, passage and habitat improvement, and implementing if warranted (with particular focus on the area from Chief Joseph Dam to the British Columbia border); 7) implementing additional sturgeon and lamprey measures, including research and dam passage; 8) updating subbasin plans most in need of updates; and 9) continuing efforts to improve floodplain habitats. The program also encourages Bonneville to develop settlement agreements for wildlife mitigation. Much of the wildlife mitigation required in the basin has been satisfied through long term settlement agreements.

In all, the program has been amended 17 times through 2014, the latest revision. Every amendment has gone through the same process under Section 4.h. of the Power Act: 1) call for recommendations; 2) an opportunity for comment on the recommendations; 3) a draft program; 4) public comment, consultations and public hearings on the draft; 5) final program; and 6) findings on the recommendations and response to comments. Some were comprehensive, others were tailored to specific portions of the program. Each amendment cycle requires from one year to eighteen months to complete. The next fish and wildlife program amendment process is expected to begin in the summer of 2018.

Here is a more detailed look at each series of program amendments:

The 1982 and 1984 Programs: Getting started

The initial program, which contained more than 220 action items, was developed from more than 400 recommendations that totaled some 2,200 pages. The Council issued its call for recommendations in June 1981, just two months after its first meeting. That same month, April 1981, fish and wildlife agencies and Indian tribes formed the Ad Hoc Executive Committee to organize and manage their recommendations. The Council asked for recommendations by November 15, 1981, conducted public hearings on the recommendations in the spring of 1982 – resulting a record of public testimony 1,728 pages long – accepted written comments through April 1, 1982, conducted additional public meetings and consultations into the fall, conducted public hearings on the draft program – producing another lengthy record of testimony (1,481 pages). There were more than 5,000 pages of written comments from more than 600 agencies, tribes, utilities, and individuals. After reviewing this mountain of information, the Council adopted the final program on November 15, 1982. Remarkably, the program itself is fewer than 100 pages long.

The 1982 Program included provisions for almost immediate revision, so as to be responsive to new information. The Council received amendment recommendations through November 15, 1983 and, after a new round of public comments on 140 amendment recommendations and a new draft program, adopted the 1984 Program on October 10, 1984. The 1984 Program is essentially the same as the 1982 Program, with just a few updates.

The 1982 and 1984 programs at a glance:

- **Water budget**: The Council proposed creation of an innovative river management device called a "water budget," a block of water to be released from storage reservoirs to help juvenile salmon and steelhead travel downstream during the critical migration period, April 15 to June 15. Because much of the water (and fish) would be spilled over mainstem dams, the Council speculated the water budget would reduce hydropower generation by about 550 megawatts, or about 2.9 percent of the region's total power capability.
- **Downstream juvenile fish passage**: The Council proposed immediate implementation of an interim

spill program for the five Mid-Columbia dams, plus study and installation of bypass facilities at four of those dams (all but Priest Rapids, where a transportation system would be tested). The Council made similar recommendations for all of the Corps of Engineers dams except Lower Monumental, where a transportation system also would be tested. The 1984 Program noted that the newest dam on the river, the second powerhouse at Bonneville Dam, which began operation that same year, was a major fish-killer and called on the Corps of Engineers to fix the problem and shut down the powerhouse during the fish-migration period.

- **Upstream adult fish passage**: The Council proposed specific studies to determine improvements in fishway designs, their maintenance and operation, and other hazards at mainstem Columbia and Snake dams. The Council also proposed installing a facility to trap adult fish at Portland General Electric's Willamette Falls project in order to provide information on fish passage problems, and a similar study for Portland General Electric's Clackamas River complex and Chelan County's Tumwater and Dryden hydroelectric projects.
- **Natural production**: The Council proposed a series of measures to enhance fish habitat in the Columbia and Snake drainages with special emphasis on tributary enhancement. The measures Included improved flows, spawning, incubation and rearing habitats, and new or restored access to reproduction habitats. The 1984 program added 27 habitat and passage improvement projects to those in the 1982 program.
- **Artificial production**: The Council adopted the majority of the tribes' and agencies' recommendations, which included new sites for new hatcheries; new release sites for hatchery-reared fish; improved production at existing hatcheries emphasizing better design and testing of low-cost hatcheries and techniques; and devising plans to integrate natural and artificial production of fish.
- **Resident fish**: The Council called on the Bureau of Reclamation and the Corps of Engineers to develop and carry out specific operating procedures for Libby and Hungry Horse reservoirs in northwestern Montana to limit drawdowns for power generation in order to protect fish habitat. The Council also committed to study the level of fishery enhancement necessary on Lake Pend OreilIe in northern Idaho (impacts of Albeni Falls Dam) and then fund a hatchery if warranted.
- **Wildlife**: The Council proposed that the tribes and agencies develop a comprehensive process for their participation in power system planning, management and operation by February 1983. The Council also proposed funding the tribes and agencies to carry out additional research, including a status report detailing the data and conditions of wildlife habitat, systemwide mitigation plans (including land acquisition), and other studies focusing on wildlife habitat issues.
- **Yakima River Basin**: Recognizing the historic abundance of salmon and steelhead in this Columbia tributary in Washington, and the impacts of dams and irrigation withdrawals on fish habitat, the Council proposed enlarging the water storage capacity in the basin, but did not endorse any specific project. The Council also proposed increasing efficiencies in irrigation practices and a reregulating dam to improve flows for fish. The Council also committed to consider a salmon hatchery in the basin once sufficient information could be developed to justify its construction.
- **Future hydropower development**: The program included a study to develop methods to assess cumulative impacts of hydroelectric projects on fish and wildlife. The draft called tor regular Council review of hydroelectric development to ensure that new development would be consistent with the program. The Council also proposed a systemwide study of means to designate critical habitat areas.
- **Action plan**: The 1984 Program added a five-year action plan as a new program section to set priorities and schedule implementation of the program.

The 1987-89 amendments: Habitat, wildlife, and protected areas

The 1987 Program was adopted in February of that year, following an extensive review process that began in 1985. The program noted successes of the first five years, including the water budget; a number of completed projects to improve tributary passage and habitat for salmon and steelhead; more than 80 other projects under way; development of a basinwide salmon and steelhead life cycle model for planning purposes; continued focus on improving dam-passage survival for salmon and steelhead; many new salmon and steelhead research projects; new wildlife restoration projects in Montana where habitat was affected by Hungry Horse and Libby dams; and construction of the Cabinet Gorge Hatchery to raise and release kokanee in the Clark Fork/Pend Oreille system in northern Idaho. The 1987 program amendments followed a two-year technical and public process that attempted to quantify the region's loss of salmon and steelhead.

The 1987 Program at a glance

- **Losses assessment**: The program included a comprehensive assessment of salmon and steelhead losses caused by hydropower dams. That assessment estimated that at one time combined adult salmon and steelhead runs into the Columbia had averaged between 11 and 16 million adult fish per year, and that hydropower development had accounted for nearly 80 percent of the losses to the current average (in 1987) of approximately 2.5 million. Based on the loss assessments, the Council included an interim numerical goal of doubling the current level of salmon and steelhead adult returns. The program did not set a timeline for the doubling goal, and it did not specify where or how fish would be counted to understand progress toward the goal.
- **Dam passage and system water management to increase juvenile passage survival**: These provisions continued to be the major focus of the program.
- **New policies**: The program established seven new polices for selecting new measures to add to the program, including priority to the area above Bonneville Dam; assessment of genetic risks of fish production actions in the program; accelerating actions to increase fish survival in the mainstem Columbia and Snake rivers; increasing fish production; managing harvest to support rebuilding salmon and steelhead runs; ensuring new plans and measures are consistent throughout the Columbia River system; and using adaptive management to increase knowledge and guide future actions.
- **Harvest management**: While the Council has no harvest management responsibilities, the program noted that hatchery production, natural production and harvest management, particularly in the ocean, need to be coordinated so that stocks that contribute to rebuilding in the Columbia River Basin are not overfished.
- **Upstream migration of adult fish**: The program noted that while fishways had been installed at many dams, there still were problems – mechanical and flow-related – and called for studies on ways to increase fish survival at the dams, and also at dams on tributaries.
- **Artificial production**: The program supported the practice of supplementation, which means releasing hatchery fish into natural habitats in an effort to build or enhance a natural run. New production facilities also were included in the Yakima and Umatilla basins, to be managed by tribes.
- **Resident fish**: The program called on dam managers to limit drawdowns that affect fish survival and production in reservoirs behind the dams and established measures for substituting resident fish in areas where dams eliminated access for anadromous fish. The program also included new resident fish hatcheries.
- **Wildlife**: The program included a wildlife mitigation process that called for the development of wildlife status reports at each hydropower project in the Columbia River Basin, losses statements for each dam, and mitigation plans. These were incorporated in the Wildlife Mitigation Rule, adopted by the Council in November 1989. The

first wildlife mitigation plans, those for Hungry Horse and Libby dams, were added to the program in 1988.

- **Future hydroelectric development**: The program noted that many applications had been submitted to the Federal Energy Regulatory Commission FERC) for small dams in the Columbia River Basin and that while the impacts of each dam may be small, "together they could have significant cumulative effects on fish and wildlife in critical parts of the basin." The program urged FERC to account for the cumulative effects of new hydropower projects on fish and wildlife, and also initiated a study to identify areas which, because of their benefits for fish and wildlife, should be protected from future hydropower development. With the study completed, the Council amended the program in 1989 with the Protected Areas Rule, which set aside 44,000 stream miles from future hydropower development, both inside and outside the Columbia River Basin in the service territory of the Bonneville Power Administration. The rule called on FERC, which is one of the agencies required to take the Council's program into account when making decisions, not to approve a petition for a new hydropower dam in a protected area, and also called on Bonneville not to provide to transmission service to any dam that might be built in a protected area, should FERC approve any. The rule also allowed FERC to grant a license if the proposed hydropower facility would have what the rule called "exceptional benefits for fish and wildlife."
- **Five-year action plan**: The action plan, the first for the program, established priorities and schedules for projects to be completed between 1987 and 1991, a period intended to provide sufficient time for planning and budgeting requirements of the implementing agencies.

The 1991-93 amendments: ESA listings, Strategy for Salmon

In April 1990, petitions were filed with the National Marine Fisheries Service NMFS) to list Snake River sockeye for protection under the Endangered Species Act. Two months later similar petitions were filed to protect Snake River spring, summer, and fall Chinook salmon.

In response, there was concern in the region that if the fish were listed, NMFS, a federal agency, would write recovery plans with little consultation with fish and wildlife managers in the region or, notably, the Council. Hoping to create a regional consensus around actions to help the fish, U.S. Senator Mark Hatfield convened the Salmon Summit, which met several times in Portland in late 1990 and early 1991. The Council coordinated the summit with more than two dozen participants representing states of Idaho, Montana, Oregon, and Washington, Indian tribes, federal agencies, and interest groups.

The summit concluded in April 1991 with agreement on specific, short-term actions including:

- Doubling the annual water budget in the spring and early summer to 900,000 acre-feet to speed smolt migration through the hydrosystem
- Testing reservoir drawdowns at the lower Snake federal dams to measure the increase in flow velocity and the effect on smolt travel times
- Expanding Bonneville's program to remove northern pikeminnow, a salmon predator, from mainstem Columbia reservoirs; and
- Encouraging the agencies and tribes to coordinate and accelerate their work to improve salmon spawning and rearing habitat, particularly stepping up the work to install fish-diversion screens on water withdrawal intakes to keep juvenile salmon and steelhead out of farm fields and water systems

The next month, May 1991, the Council entered rulemaking on the next revision of the fish and wildlife

program. In June, the Council conducted a public consultation in Portland with the Salmon Summit participants, and others, on actions to consider for the fish and wildlife program revision and then called for program-amendment recommendations; the Council planned to amend the program in four phases, beginning with high-priority actions intended to bring immediate benefits to the fish

The first phase (high-priority projects) was completed in August 1991. The second and third phases got under way in 1991 and, together with the first phase, comprised the Council's "Strategy for Salmon," completed in 1992. The fourth phase, completed in the summer of 1993, addressed resident fish and wildlife. NMFS listed Snake River sockeye as endangered in November 1991; and Snake River spring/summer and fall Chinook as threatened in April 1992.

The 1991-93 amendments at a glance:

Phase 1 highlights, August 1991 (high-priority projects to immediately help Snake River fish, whose listing was anticipated):

- Identify and screen the highest-priority diversion screens, as determined by the state, federal, and tribal fishery managers
- Undertake water conservation demonstration projects in habitat where salmon and steelhead spawn and rear
- Improve hatchery operations, including further experiments in supplementation – using hatchery fish to jump-start populations that spawn in the wild – including for Snake River sockeye
- Identify 'model watersheds' to bring together relevant groups and agencies to coordinate fish enhancement activities in high-priority watersheds
- Support research to better understand life histories of at-risk fish populations to improve enhancement projects

Phase 2 highlights, December 1991:

- Biological objectives and rebuilding schedules for Snake River fall Chinook
- Complete screens and juvenile bypass systems at all eight federal dams on the mainstem Columbia and Snake rivers by 1998.
- Expedite fish diversion and bypass improvements at the second powerhouse at Bonneville Dam
- Reduce northern pikeminnow population in the tailrace area of Bonneville Dam by 20 percent (a follow-on from Phase One), and also reduce predation on smolts by birds and other fish
- Improve barge transportation of smolts and ladders at the dams for adult fish
- Draw down the reservoirs behind the four federal dams on the lower Snake River to minimum operating level during the spring/summer migration period to speed smolt travel time; test deeper drawdowns and implement by 1995 unless shown to be economically or structurally infeasible or inconsistent with the Northwest Power Act
- Increase the annual water budget to as much as 3 million acre-feet and aim for a velocity of 200,000 cubic feet per second at The Dalles Dam; draft John Day reservoir to minimum irrigation levels during the smolt migration
- Investigate the potential for releasing more water from upriver Snake River dams to boost flows downriver for juvenile fish migration
- Reduce ocean harvest of Columbia River Basin salmon in British Columbia and Alaska fisheries, and commercial fishing pressure in the lower Columbia River
- Request fishery managers to identify high-priority supplementation projects to help boost natural production of salmon

Phase 3 highlights, September 1992:

- Develop a program framework that includes rebuilding schedules and biological objectives for Snake River spring and summer Chinook (goal: 32,000 adult spring Chinook and 8,500 summer Chinook natural spawners passing Lower Granite Dam,), incorporating the objectives approved for Snake River fall Chinook in Phase Two

- Agencies, tribes, and Bonneville develop an annual implementation plan and monitoring report
- Commission an independent scientific review to identify the scientific merits of the program and its implementation
- Achieve the doubling goal established in the 1987 Program by 2015
- Dam-specific recommendations for improving survival of adult and juvenile salmon and steelhead at non-federal dams, including the five mid-Columbia PUD dams and several in the Willamette Basin
- Request National Marine Fisheries Service to prepare an annual unified report on harvest and escapement of various Columbia River Basin salmon and steelhead stocks
- Improve habitat productivity for weak stocks of salmon and steelhead; priority would be accorded to habitat protection and improvements that yield the greatest productivity benefit for the dollars spent
- Identify and protect permanent riparian management areas
- Investigate installation of water temperature control devices at several dams on tributaries of the Willamette River to raise the temperature of water releases and, thus, encourage fish to migrate
- Inspect all underwater diversions in the mainstem Columbia and Snake rivers to determine whether screens that are effective in preventing losses of juvenile and adult salmon and steelhead are installed and operating
- Expand and accelerate the cooperative approach to watershed improvements, including the appointment of individual coordinators for each subbasin of the Columbia
- Collect additional information on naturally spawning salmon populations, such as population status, life history and other data
- Study the juvenile fish carrying capacity of the Columbia River mainstem and estuary in order to ensure that hatchery releases are not exceeding that capacity
- Develop by March 31, 1993 an experimental design for implementing, monitoring and evaluating supplementation of Snake River fall Chinook
- Evaluate the reintroduction of anadromous fish into the upper Cowlitz River Basin above the new Cowlitz Falls Dam

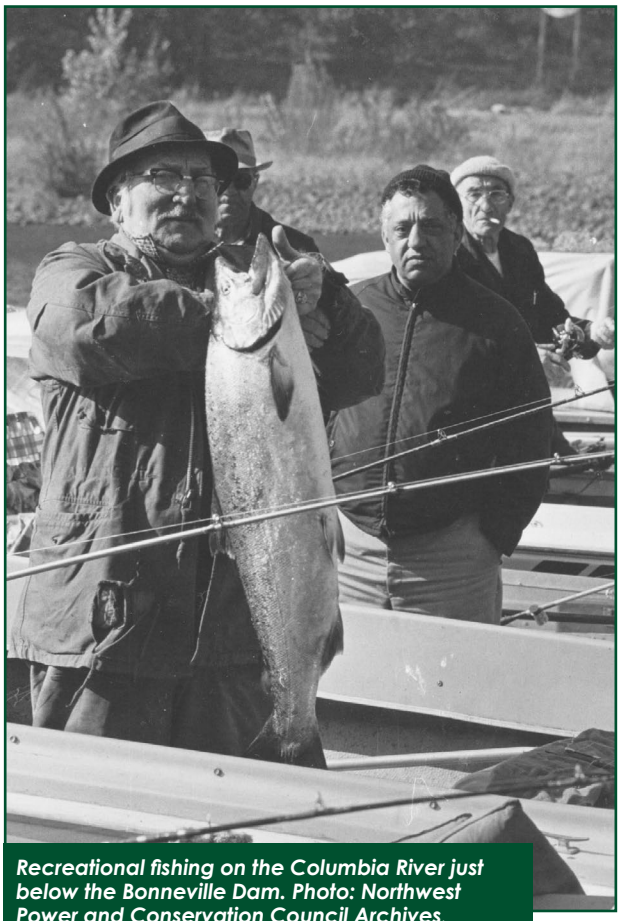
Phase 4, October 1993:

- Bonneville should dedicate 15 percent of its fish and wildlife budget to resident fish projects
- Resident fish goal: fully mitigate all resident fish losses, taking into account the difference between losses and increases related to construction and operation of the dams
- Analyze the declining sturgeon population above Bonneville Dam
- Develop new operating rules at Hungry Horse and Libby dams in Montana to protect trout, kokanee and other resident fish in the reservoirs behind those dams
- Study how much, if any, Bonneville money should be spent to improve populations of fish that migrate back and forth across the border between the United States and Canada, such as in the Kootenai, Columbia, and Okanogan rivers
- Bonneville should determine, in a public process, the share of wildlife mitigation its customers should pay
- Wildlife goal: Improve the productivity of wildlife habitat to fully mitigate wildlife loses from the construction and operation of federal dams; as an interim goal, protect, mitigate and enhance about 35 percent of lost "habitat units," which are amounts of habitat that support one animal of a species
- Mitigation is defined as "achieving and sustaining the levels of habitat productivity for the habitat units lost as a result of the construction and operation" of federal dams

- Bonneville should sign interim agreements with Oregon and Idaho within 90 days of adoption of the amendments, and permanent agreements within three years to mitigate wildlife losses caused by the dams (Washington and Montana already had agreements)
- Initiate loss assessments to determine wildlife losses caused by dam operations
- Incorporate an ecosystem approach in the fish and wildlife program, which means balancing natural resources with the development of those resources
- Monitoring and evaluation costs should not exceed 20 percent of a project's cost unless there are special circumstances

In March 1992, six months before the Council finished the Phase 3 amendments, several environmental groups and the Yakama Nation filed petitions in the Ninth U.S. Circuit Court of Appeals, which is the court of original jurisdiction for legal matters involving the Council, challenging portions of the Phase 2 amendments. In September 1994, the Ninth Circuit issued its opinion in this case, Northwest Resource Information Center, Inc. v Council, remanding the entire Strategy for Salmon to the Council with instructions to make clear findings in the program on recommendations for program measures, while observing that the Council should take bolder actions to protect the fish and give greater deference to the region's fish agencies and Indian tribes when they submit recommendations for program measures. This lawsuit is discussed in more detail in the litigation section of this briefing book.

Earlier in 1994, pursuant to commitments made in the Strategy for Salmon, the Council had begun a process of amending the strategy. Thus, the court's opinion provided valuable assistance in that process, which resulted in the 1994-95 program amendments.



Recreational fishing on the Columbia River just below the Bonneville Dam. Photo: Northwest Power and Conservation Council Archives, date unknown.

The 1994-95 amendments: Strengthening anadromous fish protections

Before the Ninth Circuit opinion, the Council already had invited recommendations to amend the program. The Council had asked for the recommendations by August 1994 and planned to complete a new program in 1995.

But the September 1994 court decision introduced new urgency into the amendment process. After reviewing the court's opinion, which emphasized quick action to benefit fish, and in light of the fact that if the Council accelerated its schedule a new program could be in place in time to benefit the juvenile fish migration in the spring of 1995, the Council considered two

options: 1) continue on the then-current schedule and simultaneously reconsider the Strategy for Salmon recommendations remanded by the court; or 2) abandon the schedule, reconsider the Strategy for Salmon, and issue a new request for recommendations to amend the fish and wildlife program in view of the court's opinion.

After consulting with fish and wildlife agencies, tribes, petitioners who filed the lawsuit against the Council, and others, the Council decided to proceed with the recommendations it received in August, simultaneously review the Strategy for Salmon, and schedule a final decision for the Council's December 1994 meeting. It was a hurry-up rulemaking, but the Council clearly understood the court's admonition that "the emphasis of the entire [Northwest Power Act] is on prompt action." The Council decided that in light of the continuing declines in salmon runs, it was essential to have adequate protections in place in the fish and wildlife program. Waiting for new recommendations would push the process into 1995 and the new program would not be in place before the spring 1995 salmon migration, which NOAA Fisheries advised the Council was critical to the survival of the ESA-listed species in the Snake River.

The final vote on the revised program, on December 14, 1994, was not unanimous. Montana's two members voted no, arguing that the Council was moving too fast and that new Council members who likely would be appointed in January 1995 by the new governors of Idaho and Washington should have the chance to participate in the process.

The 1994 amendments at a glance:

Reservoir drawdowns:

- Operate the Snake River projects at minimum operating pool through the juvenile migration season. Then implement a phased drawdown strategy for the reservoirs behind the four federal dams on the lower Snake River with Council review at each milestone date; mitigate adverse impacts of the drawdowns to irrigation, navigation, and other activities; begin with Lower Granite Reservoir in 1995 for about two months during the spring and early summer; beginning in 1999, draw down Little Goose reservoir to near spillway crest for two months in the spring – after modifications to adult and juvenile passage facilities; continue to evaluate additional drawdowns and make a decision on drawing down Lower Monumental and Ice Harbor dams to near spillway crest prior to 2002
- Operate John Day reservoir at minimum operating pool by the spring of 1996; operate at this level year-round; evaluate deeper drawdowns at John Day and decide by December 1996
- Evaluate other reservoirs for flow or velocity improvements

Dam passage and flows:

- Accelerate tests of surface bypass systems at mainstem dams and schedule rapid decisions on their installation
- Spill water so that up to 80 percent of the juvenile fish that pass each dam do not go through turbines
- Accelerate structural changes to the dams to reduce gas supersaturation and use slotted spillway gates to improve spill efficiency
- Continue juvenile fish screening improvements
- Obtain from willing sellers 500,000 acre-feet in the upper Snake River Basin by the spring of 1996; obtain an additional 500,000 acre-feet from willing sellers by the spring of 1998
- In the Columbia, provide a volume of water up to 4 million acre-feet in low-water years to increase the speed of smolt migration through the mainstem Columbia and Snake rivers
- Improve barge transportation of juvenile salmon and steelhead with additional barges, reduced fish density in barges, and dispersed release of fish

Habitat and fish production:

- Strong habitat objectives and guidelines for improving spawning and rearing habitat
- Accelerate water diversion screening, complete all screening by 1996

- Develop additional habitat improvements in a coordinated way through annual updates of the 1990 Columbia River Basin subbasin plans for some three dozen salmon and steelhead tributaries
- Continue hatchery reforms and improvements.
- As part of updating the 1990 subbasin plans, agencies and tribes should propose supplementation projects to help rebuild naturally spawning salmon populations
- Initiate emergency supplementation of Snake River fall Chinook; prepare for emergency supplementation of spring and summer Chinook if needed
- Intensify efforts to reduce predation on salmon and steelhead

Harvest:

- Intensify efforts to resolve the impasse in U.S.-Canada salmon interception treaty negotiations to bring about significant reductions in Canadian interceptions of Columbia River Basin fall Chinook
- Cap fall Chinook harvest at a 50-percent exploitation rate, and lower in the future; support mitigation assistance to ease economic impact on fishery-dependent communities
- Monitor spring Chinook harvest to ensure that the harvest rate remains low until rebuilding is underway
- Accelerate efforts to develop known-stock fisheries, using terminal locations and selective gear
- Continue restrictions on sockeye harvest

Monitoring and evaluation:

- Develop a comprehensive program to monitor and evaluate the results of program measures and modify actions as needed

The 1995 amendments: Resident fish and wildlife

In September 1995, the Council amended the program with new measures for resident fish and wildlife, and also made some clarifying amendments to other parts of the program. Here are some of the key measures:

- Bonneville should dedicate 15 percent of its fish and wildlife budget to resident fish and 15 percent to wildlife, leaving 70 percent for anadromous fish, which are called out for special attention in the Power Act
- New operating rules for Hungry Horse and Libby dams that limit drawdowns of their reservoirs in order to protect resident fish such as trout and kokanee
- The Council and Bonneville would negotiate annual funding levels for implementation of projects in the program and then communicate those levels to the Columbia Basin Fish and Wildlife Authority, which at the time represented the region's state, tribal, and federal fishery managers and was responsible for prioritizing projects for funding and communicating those priorities to the Council, which would then consider the priorities and made funding recommendations to Bonneville
- Initiate resident fish substitution projects to mitigate for lost anadromous fish in areas blocked by dams
- Rebuild weak but recoverable native fish populations, develop biological objectives to account for approximately 10-13 percent of the total loss of anadromous fish in blocked areas, and develop rebuilding schedules for those species.
- Bonneville should finalize a wildlife mitigation plan, in consultation with the Corps of Engineers, Bureau of Reclamation, agencies, and tribes by March 1996 and submit it to the Council for approval
- Assess the impacts of lake level fluctuations at Lake Pend Oreille on kokanee spawning

- Develop recovery strategies for sturgeon and burbot in the Kootenai River in Idaho
- Develop a mitigation plan for resident fish affected by the construction and operation of Libby Dam
- Monitor fish health in the Flathead River and lake system
- Change operations of Grand Coulee Dam to achieve certain water velocities through Lake Roosevelt to improve fish production; aim for 40-day minimum water particle travel time
- Study bull trout populations in Columbia River tributaries that flow into the reservoir behind Bonneville Dam
- Add 100 acres to the existing Pend Oreille Wetlands Wildlife Mitigation Project along the Pend Oreille River in northern Idaho as partial mitigation for the effects of Albeni Falls Dam

In March 1995, shortly after the Council concluded the 1994 Fish and Wildlife Program, the National Marine Fisheries Service (NMFS, also known as NOAA Fisheries) issued a four-year biological opinion on the operation of the federal hydrosystem to protect listed Snake River salmon. Strongly influenced, as was the Council's 1994 Program, by court decisions faulting NMFS for not being as aggressive as the law called for in protecting listed species, the 1995 Biological Opinion declared for the first time that system operations jeopardized the continued existence of listed salmon, calling for additional measures. NMFS then incorporated into the required measures most of the provisions in the Council's aggressive 1994 Program. NMFS omitted two of the most controversial elements of the program, however – the call for dedication of an additional 1 million acre feet of water from the Snake River to protect salmon migration, and the implementation of the deep spillway-crest drawdowns at the lower Snake projects.

NMFS also began a process to decide, by the end of the 1995 BiOp in 1999 or 2000, whether additional changes to the hydrosystem would be needed to avoid jeopardy and begin recovering listed fish or whether the current hydrosystem improvements plus extensive survival improvements in other stages of the life-cycle – especially in tributary and estuary habitat – would be sufficient. In addition, a few years after the 1994 Program and 1995 BiOp, NMFS listed additional salmon and steelhead population segments throughout the Columbia, Snake, and Willamette rivers.

Another factor affecting the direction of the Council with regard to fish and wildlife occurred in 1996: Congress added a provision to the Northwest Power Act - what became Section 4(h)(10)(D) - to give the Council a formal role in reviewing and recommending projects to be funded by Bonneville to implement the program. The new provision called on the Council to appoint the 11-member Independent Scientific Review Panel, and then the ISRP and the Council together would annually review projects proposed for funding to ensure they were based on sound science and the priorities of the program, and deliver project funding recommendations to Bonneville.

The developments in this period marked a significant transformation in the fish and wildlife work of the Council. Up until the mid 1990s, the Council and its program focused mostly on mainstem hydrosystem passage and water management to increase juvenile survival, even as the Council developed other program elements, as well. After the mid 1990s, the Council's fish and wildlife planning and implementation review work has focused far more intensely on the offsite mitigation elements of the program - tributary and estuary habitat improvements and artificial production programs – and on project review and the monitoring and evaluation elements of the program.

The 2000-2005 amendments: Scientific review, a framework, subbasin plans

The 1994-95 Program called for an independent scientific review of the program; that review was

undertaken by the Independent Scientific Group (ISG), whose 10 members were nominated by the National Academy of Sciences and appointed by the Council. The ISG concluded in its 1996 report called "Return to the River," that the program lacked an explicit statement of its underlying scientific foundation. The ISG was especially critical of the program for being a collection of measures not well tied to a comprehensive framework of goals and objectives (subsequent reviews of project proposals by the Independent Scientific Review Panel, a separate group authorized in a 1996 amendment of the Power Act and formed by the Council in January 1997, also criticized the program for its failure to provide an adequate context for evaluating projects.

In response, in 1998 the Council initiated a public process to develop a program framework. The purpose of the framework was to organize the program and bring together, as closely as possible, Endangered Species Act requirements, the broader requirements of the Northwest Power Act, and the policies of the states and Indian tribes of the Columbia River Basin into a comprehensive program with a solid scientific foundation. While the Council introduced the concept of a framework in the 1994 Program, it was not further pursued at that time.

Beginning in 1998 and lasting until February 2000, the Council worked with federal agencies, Indian tribes, states, industrial and agricultural interests, and environmental interests to develop and expand the framework concept through an effort called the Multi-Species Framework Project. The Council included the framework in the first phase of the 2000 Program revision, completed eight months later. The program framework explicitly states what the Council is trying to accomplish, defines a specific set of objectives, and describes the strategies to be employed to achieve the objectives. The framework also describes the scientific basis for the program and provides guidance for decision-making and a reference point for evaluating program success.

Thus, the 2000 Program marked a significant departure from past versions of the program. Like the 1994-95 program revision, the 2000-2005 revision was accomplished in phases. The first phase, completed in October 2000, addressed the Columbia River Basin as a whole. The Council structured the program around the newly created framework, which included a basinwide vision plus goals and biological objectives for measures to accomplish the vision over time – in short, a structure that allowed for more effective project selection and also improved monitoring, evaluation, and reporting of results. The program framework also included an explicit conceptual foundation for the program in terms of improving habitat conditions that would result in improved survival, productivity, and abundance of fish and wildlife adversely affected by the hydrosystem.

The 2000 Program also initiated other notable departures from past programs. For example, the program included an intensive effort to write mitigation plans for each of the Columbia's 62 subbasins, an effort funded by Bonneville that took several years and culminated in the adoption of subbasin plans into the program in 2004 and 2005, including directing resources away from breaching the four federal dams on the lower Snake River in recognition that the federal government had decided breaching would not occur in the ensuing five years (the Council is required to review the program for revision every five years).

The 2000 program amendments set the stage for subsequent phases of the program revision process, in which the Council adopted specific objectives and action measures for the river's mainstem and tributary subbasins, consistent with the basinwide vision, objectives and strategies in the program and its underlying scientific foundation. The Council intended that subbasin plans would incorporate specific objectives and measures for tributaries into the program consistent with the overall program vision and objectives, and that the mainstem plan would do the same for mainstem Columbia and Snake river dams.

In April 2003, before the development of tributary subbasin plans, the Council adopted a coordinated plan of operations that came to be known as the mainstem amendments. These amendments recommended actions

at the dams that the Council considered biologically sound and economically feasible to benefit the range of species in the river and fit natural fish behavior patterns.

Meanwhile, NMFS/NOAA Fisheries was developing its 2000 Biological Opinion on Operations of the Federal Columbia River Hydropower System (the FCRPS BiOp), with a habitat focus similar to the focus the Council would adopt in the 2000 Program. The mainstem measures in the program comprised recommendations to Bonneville, and therefore to NMFS, for potentially adjusting mainstem dam operations to meet the needs of ESA-listed stocks and also requirements of the Northwest Power Act. The hydrosystem measures also provided necessary guidance to the Council's subbasin planning process, which was under way at the time the mainstem measures were adopted into the program.

In addition to subbasin plans, the 2000-2005 amendments added a number of strategies, presented as principles, to the program to guide choices of more specific strategies at the basin level to implement the program. These included:

- Habitat (restore ecosystems, assign priority to habitat that supports existing populations that are healthy and productive – building from strength – and restore habitats that connect productive areas)
- Hatcheries (implement the Council's 1999 Artificial Production Review to Congress ; use artificial production in concert with habitat improvements; replace lost salmon and steelhead in areas blocked by dams where feasible; limit interactions of hatchery and wild fish)
- Hydropower operations (provide conditions within the Columbia and Snake river hydrosystem for adult and juvenile fish that most closely approximate natural river and fish behavior conditions)
- Harvest (affirm authority of agencies to set harvest rates, recommend that subbasin plans and harvest policies are consistent)
- Wildlife (complete this mitigation using a ratio of two species habitat units acquired for every habitat unit lost)
- Estuary and ocean matters (research to better understand the estuary and its impact on anadromous fish, and to identify the effects of ocean conditions on anadromous fish and use this information to evaluate and adjust freshwater actions)
- Research, monitoring and evaluation (identify and resolve key uncertainties through a research plan the Council committed to establish, monitor and evaluate actions in the program and then apply the results, and make information developed through the program readily available).

NOAA Fisheries' 2000 BiOp also represented a new departure in a number of ways. It was now concerned with listed populations not just from the Snake but from every part of the Columbia River Basin to which anadromous fish have access. NOAA essentially incorporated into the BiOp mainstem hydrosystem passage and water management measures whose foundations were developed in the Council's program. Meanwhile, the 2000 Program incorporated extensive offsite mitigation actions - tributary habitat improvements, estuary habitat improvements, artificial production reforms, predator control actions - whose foundations were and still are in the Council's program.

NOAA and the federal Action Agencies (Bonneville, the Corps of Engineers, and Bureau of Reclamation) were sued in federal court by an environmental and fishing group coalition over the approach taken in the 2000 BiOp, a lawsuit still ongoing 16 years later through a succession of four FCRPS BiOps for salmon and steelhead (and a fifth due in 2018). The big integrated package of mainstem and off-site measures remains in the BiOp and has been increased extensively in terms of implementation and funding. But it has been difficult for NOAA and the Action Agencies to justify to the satisfaction of the courts the extent of the biological benefits to be expected and relied upon from these measures.

The U.S. Fish and Wildlife Service also listed two species of resident fish as threatened - bull trout and Kootenai River white sturgeon - and issued an overall FCRPS BiOp in 2000 and then a Libby Dam-specific BiOp in 2006. Many of the actions in the BiOps to benefit these two species are also integral to the Council's fish and wildlife program, especially with regard to the program's extensive habitat and production efforts in the Kootenai to benefit sturgeon.

The 2009 amendments: Improving performance, program accountability

In the 2009 Program, completed in February of that year, the Council focused on performance – implementing projects and monitoring their success. 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 biological objectives for the program; committed to a periodic and systematic exchange of science and policy information; and expanded the program monitoring and evaluation framework with a commitment to use the information to make better decisions and report frequently on program progress.

Major themes of the 2009 Program:

- Emphasizing implementation of fish and wildlife projects based on needs identified in the locally developed subbasin management plans (these plans were amended into the program in 2004 and 2005) and also on actions described in federal biological opinions on hydropower operations, hatcheries, and harvest, Endangered Species Act recovery plans, and the 2008 Fish Accords signed by federal agencies, Indian tribes, and the states of Idaho and Montana
- 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

Key details of the program

- Increase project performance and fiscal accountability by establishing reporting guidelines and using adaptive management to guide decision-making
- Commit to a periodic and systematic exchange of science and policy information among fish and wildlife agencies, tribes, and the Council
- Emphasize a more focused monitoring and evaluation framework coupled with a commitment to use the information obtained to make better decisions
- Recommend a renewed regional effort to develop quantitative biological objectives for the program
- Retain 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
- Address passage problems for lamprey and sturgeon at the mainstem dams
- Recommend changes in some hatchery practices to create a more balanced, ecological approach to fish production
- Retain a crediting formula for wildlife losses of two new units of habitat for each lost habitat unit, while at the same time encouraging settlement agreements for wildlife mitigation requirements where such agreements could be negotiated

The 2009 Program also included a section on Columbia River Basin-level provisions including basinwide planning assumptions, a scientific foundation, basinwide

biological objectives, and basinwide strategies for habitat restoration, artificial production of fish, harvest of fish, hydrosystem passage, wildlife strategies, and strategies for the use of resident fish (those that don't go to the ocean) to replace fish that were lost because dams blocked their passage to the ocean. This section also included strategies for monitoring, evaluation, research, and reporting of project results.

The program included a section describing the 11 ecological provinces, or groups of related subbasins of the Columbia River Basin, and a section that recommended strategies for improving survival of Columbia River Basin fish in the Pacific Ocean. The program also addressed fish survival and dam passage in the mainstem Columbia and Snake rivers, including strategies for juvenile and adult fish passage, juvenile fish transportation, predator control, climate-change planning considerations, control of non-native species, the operation of the Fish Passage Center, and research in the mainstem rivers. Project implementation was addressed in a separate section that included guidance and strategies for project review (such as the work of the Independent Scientific Review Panel and the Independent Scientific Advisory Board), and strategies for land and water acquisitions to enhance fish survival and improve habitat.

Two subbasin plans for Montana rivers subsequently were added to the program, the Bitterroot plan in 2010 and the Blackfoot plan in 2011.

The 2014 Fish and Wildlife Program: Focus on wild fish

In October 2014 the Council adopted the most recent five-year revision of the fish and wildlife program following more than a year of work and after considering more than 400 recommendations – from tribes, fish and wildlife agencies, and interested members of the public – for measures and policies to include.

Here is a brief review of the major elements of the key strategies in the 2014 Program:

Healthy Ecosystems

The program envisions healthy ecosystems that sustain abundant, productive, and diverse communities of plants and animals. To do this, the program supports protecting and restoring natural ecological systems and biological diversity as much as possible. See Ecosystems in the program.

Wild Fish

Wild fish are critical to preserving the genetic diversity and resiliency of salmon and steelhead. They also provide important opportunities to rebuild and reintroduce populations, with support from hatcheries. See Wild Fish in the program.

Hatcheries

Because habitat restoration alone can't achieve the goals of the program, the Council supports fish hatcheries, managed according to current and evolving scientific principles, to help meet program objectives. See Hatcheries in the program.

Priorities

The program continues the priority mainstem passage and water management elements of the program, as well as the propagation and tributary and estuary habitat efforts the program has developed over 35 years.

Accountability

Ecosystem management should be adaptive and experimental. Nature is a complex, evolving system, and our understanding of it is limited. It's critical then, for resource managers to constantly improve their knowledge and adapt to new information. See Adaptive Management in the program.

Emerging priorities

The program provides guidance to Bonneville, the other federal agencies, and the region in general as to which of new measures are emerging priorities for implementation for the first five years of the program. During that time, the Council anticipates Bonneville will take the necessary steps to integrate these priorities into the program and will report annually to the Council on its progress. The Council may adjust the order of the

emerging priorities, but in the 2014 Program they are listed in the following order:

1. Provide for funding long-term maintenance of the assets that have been created by prior program investments
2. Implement adaptive management (including prioritized research on critical uncertainties) throughout the program by assessing the effectiveness of ongoing projects, developing program objectives when appropriate, and taking into account the effects of climate change
3. Support expanded management of predators
4. Support mapping and determining hotspots for toxic contaminants
5. Support aggressively addressing non-native and invasive species
6. Investigate blocked area mitigation options through reintroduction, passage and habitat improvement, and implement if warranted; the program specifically notes the blocked area above Chief Joseph and Grand Coulee dams and establishes a three-phase approach to investigating the feasibility of reintroduction
7. Implement additional sturgeon and lamprey measures, including research and dam passage
8. Update the subbasin plans most in need of updates
9. Continue efforts to improve floodplain habitats

Other major elements of the program include a focus on water quality, especially the proliferation of toxics in watersheds; a more aggressive approach to avian predators; preventing the spread of invasive species such as quagga and zebra mussels; and operational experiments at the federal dams regarding the effects of spill and reservoir operations on anadromous fish

2014 Program goals

The program's 22 goals are arranged under four themes, as follows:

Theme One: Protect and Enhance Habitat to Provide a Home for Species

1. Provide environmental conditions that support ecosystem functions necessary to restore healthy, self-sustaining and harvestable populations of native resident and anadromous fish and wildlife. This includes areas above and below Hungry Horse and Libby dams, and in and adjacent to Lake Roosevelt above Grand Coulee Dam
2. Enhance conditions in the estuary and near-shore plume to support habitat diversity and productive, abundant, and diverse salmon and steelhead populations
3. Re-establish a more natural hydrological pattern that reflects seasonal fluctuations, rate of fluctuations, peaks, and temperature
4. Provide adequate water quality and quantity to support targeted species
5. Rely on local inflows for drawdown and refill of the mainstem hydropower projects; maintain biological productivity in the reservoirs; and release water or dampen flow fluctuations to benefit fish in reservoirs and downstream
6. Coordinate aquatic and terrestrial actions
7. Improve and expand the habitat function, structure, complexity and range of aquatic habitats in the mainstem rivers and tributaries of the basin, including riparian, wetland, floodplain, alluvial reaches, estuary, and near-shore ocean, to enhance life history and species diversity that are impacted by the hydrosystem
8. Protect, enhance, reconnect, and restore fish populations in mainstem and tributary areas
9. Improve natural populations by connecting stronger populations with weaker populations
10. Reconnect side channels, floodplains, riparian areas, and uplands to improve and maintain aquatic conditions, especially in the Columbia and Snake river mainstems
11. Restore and protect thermal refuge areas for salmonids

12. Mitigate for wildlife losses

Theme Two: Ensure Species Survival by Promoting Abundance, Diversity and Adaptability

13. Achieve full mitigation for anadromous fish, native resident fish, and wildlife losses by restoring healthy, self-sustaining, and harvestable natural-origin anadromous fish, especially salmon, steelhead, eulachon, lamprey species, and resident fish, including sturgeon and bull trout
14. Achieve full mitigation for anadromous fish and native resident fish
15. Encourage biologically diverse species that are resilient to environmental variability
16. Achieve the delisting and recovery criteria for ESA-listed species in the biological opinions, including for listed salmon and steelhead in NOAA Fisheries' 2008 FCRPS, Upper Snake, and Willamette River biological opinions, and those for listed Kootenai River white sturgeon, bull trout, and Oregon chub in the U.S. Fish and Wildlife Service's FCRPS (2000), Libby Dam (2006), and Willamette River (2008) biological opinions
17. Achieve anadromous fish inriver migration and passage survival that approximates natural survival during inriver migration

Theme Three: Compensate for a Wide Range of Impacts Caused by the Hydrosystem

18. Enhance harvest of anadromous fish including salmon, steelhead, and lamprey, and resident fish
19. Reintroduce anadromous fish extirpated from areas blocked by the construction and operation of the Columbia River Basin's hydrosystem; the program establishes a three-phase approach to assessing the feasibility of reintroducing anadromous fish above Chief Joseph and Grand Coulee dams

Theme Four: Public Engagement

20. Inform the public about the program to encourage involvement
21. Encourage considering the program within a social and ecological context
22. Achieve open public access for all program-related data

To bring up-to-date the connected realm of ESA review, NOAA Fisheries issued the 2014 BiOp six months before the Council finalized the 2014 Program. Developed in response to a court order requiring NOAA to make some of the habitat work more certain to occur, the 2014 BiOp continued the big integrated package of mainstem hydrosystem measures with substantial off-site mitigation habitat, predator control, and fish-production reform measures, mirroring and building upon the Council's regional protection and mitigation program.

In May 2016 Judge Simon of the federal district court of Oregon, in the ongoing litigation regarding the ESA review of salmon and steelhead needs, ruled that NOAA violated the ESA largely by developing too-certain estimates of survival on a record of uncertain survival benefits from these actions, especially the off-site mitigation habitat actions. Judge Simon ordered NOAA to produce a new biological opinion by 2018, the same year it would have had to produce a new one, anyway. The judge also faulted the federal agencies for not producing a valid environmental impact statement under the National Environmental Policy Act (NEPA) to accompany the actions to be implemented under the BiOp. In response, the federal agencies embarked on a five-year effort to study the environmental impacts of various alternative approaches to improving conditions for listed species.

Meanwhile, the Council's 2014 Fish and Wildlife Program has been challenged in the 9th Circuit by one entity – the Northwest Resource Information Center – largely on the grounds that the program is too closely tied to the ESA review and an argument that the Council has an independent responsibility to use its power planning authorities to alter the hydrosystem further to the benefit of fish and wildlife. As of August 2016 this has been briefed by the parties and awaits oral argument.

Legal Issues

What kind of legal entity 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 the following year 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 that are responsible for managing, operating, or regulating federal or non-federal hydroelectric facilities located on the Columbia River or its tributaries 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 the 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.

Federal laws applicable to the Council

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.

Certain financial disclosure and ethics laws 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,

Public hearing. Photo: Judith Rafferty, 1982.

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 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 members 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 worker's 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 decided that 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.

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 plants 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.

Is the Council a "sovereign?"

In the context of the Council's planning responsibilities under the Northwest Power Act, the Council is a government entity but not a sovereign entity. The legal definition of a sovereign entity is one that governs a land base and people. Thus, federal, state, and tribal governments, and by extension their agencies, are sovereign entities, and the Council is not.

Yet the Council does have a level of sovereignty, in that the federal and state governments, in adopting the Northwest Power Act (Congress and the President) and in agreeing to form the Council as an interstate compact (the four Northwest states), delegated some of their governing power – their sovereignty – to the Council to do certain tasks specified in the Act. There is precedent for this type of authority designation. For example, the federal government delegates powers and tasks to the Environmental Protection Agency under the Clean Water Act to be implemented through federal law by the EPA, or to the states to be implemented under state law. The only difference is that the Council is independent of state and federal governments.

Precisely how sovereigns interact with sovereigns is specified – or not – in their governing statutes. Federal, tribal, and state agencies consult on fisheries issues, for example, under the Endangered Species Act. Or, similar to the Clean Water Act example above, a decision by the U.S. Army Corps of Engineers on spill at the federal dams involves NOAA Fisheries and the state of Oregon in granting a water quality waiver. What's important is that the statutory requirements are followed, not how the agencies interact to reach those decisions.

Similarly, the Power Act – and not some general notion of "sovereignty" – largely determines how federal agencies work with the Council. For example, the Bonneville Power Administration administrator must make decisions that are consistent with the Council's fish and wildlife program or power plan; Bonneville, the Corps and the Federal Energy Regulatory Commission must account for the Council's fish and wildlife program "at every relevant stage of decision-making to the fullest extent practicable."

There is no requirement in the Power Act or other statutes that personnel of the sovereign entities – federal, state, or tribal – meet with Council personnel. That's a matter of policy, politics and practicality. For example, the System Configuration Team used to include the Council in its deliberations and recommendations, and today it does not. The sovereign entity partners simply decided they prefer to do their work without inviting non-sovereigns like the Council to participate. While we may not like that decision, it is not a violation of the Federal Advisory Committee Act or any other statute.

Thus, the test for the Council should always be whether decisions by the Corps, Bonneville or FERC respect their legal obligations toward the Council under the Power Act, or not.

Amending the Power Plan and Fish and Wildlife Program

In developing, reviewing and amending 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 and additional public involvement procedures the Council may adopt. The overarching goal is to broadly and actively involve the public as well as specified entities - such as Bonneville, the other federal water management agencies, the tribes, the states, and the Bonneville customers - in the planning decisions by the Council.

The Council must hold public hearings in each of the member states before adopting the plan and program or substantial, non-technical amendments to either. The Council must review the plan at least every five years, and always call for recommended amendments to the

fish and wildlife program before reviewing the power plan.

The Northwest Power Act does not require, at least not explicitly, that the Council follow the notice-and-comment rulemaking procedures of the federal Administrative Procedures Act. But the Power Act applies certain provisions of the APA to the Council such as the judicial review standards; plus, the APA's notice and comment rulemaking procedures are useful guidelines to flesh out the specific procedures and purposes in the Act. For that reason, the Council follows the APA notice and comment rulemaking procedures as guidelines when it revises the fish and wildlife program and then the power plan.

Power plan amendments

Essentially the only specific procedural requirement in the Northwest Power Act for reviewing the power plan is to hold a public hearing in each state before adopting the plan. The Act also requires the Council generally to engage the public and specified entities in the development of the plan.

Adding the federal Administrative Procedures Act notice and comment rulemaking procedures, the Council provides broad public notice of the fact the Council is starting a process to review and revise the power plan and then broad public notice of the draft power plan, including a description of the subjects and issues involved, and a statement of how the public may participate in the process. The public is given an opportunity to submit written and oral comments. The Council also engages the public and the various entities constantly through the power plan process, including through the use of a set of advisory committees.

At a certain point toward the end of the process, opportunities for people outside the Council to contact Council members and staff about the developing power plan is cut off. From that point on, the Council deliberates and makes its final power plan decision based on the administrative record developed to that point.

Again following the APA procedures as a guidelines, the Council also approves, along with the final power plan, what is known as a concise general statement of the basis and purpose of the plan it has just adopted. The major portion of this statement is a response to comments, which briefly summarizes the major comments received and explains how the Council has dealt with them.

The Council then completes the process by publishing notice of the new power plan in the Federal Register. At that point, anyone intending to challenge the revised power plan has 60 days to file a petition for judicial review in the U.S. Ninth Circuit Court of Appeals. An unusual provision of the Power Act provides that any challenge to decisions by the Council (including adoption of the plan or program) or Bonneville under the Act must go directly to the Ninth Circuit, and not to federal district court.

Fish and wildlife program amendments

The fish and wildlife program must be amended before the Council reviews and revises the power plan. The program is also published separately from the power plan, although it also is legally an element of the power plan.

Unlike the power plan amendment process, the Power Act sets out quite 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 Power 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. Following the APA rulemaking procedures, the Council then issues draft fish and wildlife program 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 program 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 as part of the program.

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.

The end of the program amendment process is similar to the end of the power plan process. The statement of basis and purpose includes not just the response to comments but also more importantly the findings explaining what the Council did with each of the program amendment recommendations, including the required findings for any rejected recommendations.

Petitions for rulemaking

The Administrative Procedures Act 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. Again, the Council follows this approach as a guideline. 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.

Litigation history

Seattle Master Builders Association v. Northwest Power Planning Council

A number of organizations in the building industry challenged the Council's first power plan in the Ninth Circuit. They were particularly aggrieved by the model conservation standards (MCS) the Council included in the plan as required by the Power Act. The petitioners 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 itself. Focusing on the fact that a federal agency, Bonneville, had obligations to make decisions

consistent with the power plan created by a non-federal agency, the Council, the petitioners argued that this arrangement violated the appointments clause of the U.S. Constitution. This clause requires officers of the United States to be appointed by the president and confirmed by the Senate. Council members are officers of an interstate compact agency appointed by the governors of the four Northwest states and not by the president. And so, the argument went, a federal agency could not be obligated to the follow decisions made by non-federal officers.

An interesting aspect of the litigation involved the position taken by Bonneville Power Administration, which intervened in the case. Focusing narrowly on the MCS themselves that were challenged, Bonneville argued that the Council's adoption of the MCS did not violate the constitution. Bonneville noted that the Council's model conservation standards themselves did not impose a legal obligation on Bonneville or anyone else, 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 with regard to the power plan as a whole, the Department of Energy had taken a more aggressive position against the Council. The Secretary of Energy, Don Hodel, wrote to the Justice Department 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 in 1986, 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 and its power plan and fish and wildlife program: "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.

Cascade Natural Gas Corp. v. Evans

In a separate challenge to the Council's First Power Plan, in 1983 six regional natural gas companies brought suit challenging the 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.

NW 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 the Second Power Plan in 1986. The petitioners began the litigation as part of 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.

CASE, et al, v. Northwest Power Planning Council

In a separate challenge to the Second Power Plan, 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, specifically asking for model conservation standards for industries that buy power directly from Bonneville (direct service industries) and for Bonneville's federal agency customers. The Natural Resources Defense Council and the Northwest Conservation Act Coalition also petitioned to revise the model conservation standards for commercial buildings, residential weatherization and space heat conversion. 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 and 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

This case was the first, and until just recently only, challenge to a Council decision to adopt a fish and wildlife program. The petitioners challenged the Council's "Strategy for Salmon," a three-phase amendment of the fish and wildlife program that responded to the 1991 ESA listings of several species of Snake River salmon and steelhead. The amendments began with actions intended to bring immediate benefit to the listed species, and others, and proceeded through two more phases culminating in a notice in the Federal Register in January 1992 regarding program amendment recommendations for increased flows in the lower Snake River and drawdowns of four federal dams on the Snake. Three petitions subsequently were 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 Nation; 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, in what has often been called the "Tang" opinion after the lead author of the Ninth Circuit panel, 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 actual rulings were limited to what were essentially procedural matters, the opinion offered extensive interpretations of the provisions of the Northwest Power Act about how the Council is to develop a fish and wildlife program underlying the procedural rulings. In direct contrast to the view the court took of the Council in its power plan decisions, in which the Council is seen as the expert agency entitled to deference in its judgments, the Court noted that the provisions of the Act heavily circumscribe the process and substance of the fish and wildlife program. The Council is to build the program out of the recommendations of others and not out of its independent policy judgments, and in particular is to give a "high degree of deference" to the fish and wildlife agencies' and Indian tribes' recommendations and expertise for both program measures and objectives. The Council's discretion to reject these recommendations is narrow.

The Court remanded the Strategy for Salmon for the Council to develop new findings. In an agreement with the petitioners, the fish and wildlife agencies and tribes, and Bonneville, rather than revisit the Strategy for Salmon decision, the Council agreed to implement the Court's ruling in the subsequent program amendment process already initiated, which resulted in the 1994 Fish and Wildlife Program.

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 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 1996 Congress amended the Power Act, adding the Council's project review process and the Independent Scientific Review Panel as Section 4(h)(10)(D). Following the Council's first set of project review and funding recommendations to Bonneville under the new statute, in 1997, the four lower Columbia River Indian tribes of the Columbia River Inter-Tribal Fish Commission challenged the Council's recommendations at the Ninth Circuit. Focusing in particular on the recommendations to hold up some of the fish-production programs, the tribes were particularly concerned that the Council would use the project review process and the ISRP during program implementation to undo the deference to the tribes' recommendations required in the program development process. The tribes also were prepared to challenge the constitutionality of the newly added provision, arguing that the states had not taken action to modify the original compact to accept the new provisions.

Following the filing of the petition, tribal and Council representatives agreed to put the litigation on hold and monitor the Council's implementation of Section 4(h)(10)(D) for a couple of years. After this period, the tribal representatives decided that while some concerns remained, the Council was not implementing the project review process in a way that fundamentally challenged the arrangements set forth for program development.

The petitioners and the Council agreed to allow the Ninth Circuit to dismiss the petition in 2000.

Northwest Environmental Defense Center v. Bonneville Power Administration (fish and wildlife program implementation)

In 2005 Congressional committee report language accompanying that year's energy and water appropriations legislation told Bonneville to "deobligate" funding for the Fish Passage Center. The Fish Passage Center (FPC) is an entity providing technical assistance in river operations to the state and tribal salmon managers. The FPC is a long-term provision in the Council's fish and wildlife program based on the recommendations of these agencies and tribes.

In response to the committee report language, Bonneville decided not to renew the funding for the Fish Passage Center and put out an request for proposals to implement some of the functions the FPC had provided. The Northwest Environmental Defense Center and the Yakama Nation challenged Bonneville's decision in the Ninth Circuit, arguing that Bonneville was violating the provision in the Power Act that required it to use its funds "in a manner consistent with" the Council's program. The Council intervened in the case, given that this challenge would be the first time the Ninth Circuit would review an issue about implementation of the Council's program and Bonneville's legal obligations to the program.

In 2007 the Ninth Circuit ruled that Bonneville did indeed violate the provision of the Power Act requiring Bonneville to use its fund in a manner consistent with the Council's program in deciding not to fund the Fish Passage Center. The court ruled that Bonneville's consistency obligation to the Council's program is a substantive obligation - not just procedural and not just guidance or advisory - and essentially a default or baseline obligation on the part of Bonneville. Bonneville can make a funding decision inconsistent with the program, but it needs to explain the reasons for that deviation in writing that the court can review and the reason given must be reasoned and rational and not arbitrary. And Bonneville's decision to "deobligate" the FPC as if ordered to in the committee report language was arbitrary and not reasonable as committee report language is not legislation and did not change the law requiring Bonneville to act consistent with the program. As part of its discussion of the Power Act and the program, the court essentially equated Bonneville's obligation to the Council's program in project implementation with the Council's deference obligation to the recommendations of the fish and wildlife agencies and tribes in program development.

NRIC v. Northwest Power and Conservation Council (2010 (Sixth) Power Plan)

In 2010, the Northwest Resource Information Center (NRIC) challenged the Council's Sixth Northwest Power Plan. NRIC - essentially a non-profit advocacy entity of one Idaho salmon activist, Ed Chaney, raised issues – according to the petition – of whether the Council gave "due consideration" for fish and wildlife in the power plan as required by the Act; whether the Council developed an appropriate "methodology for quantifying environmental costs and benefits" of power resources as that term might relate to the existing hydrosystem and its effects on fish and wildlife; and whether there was anything legally inappropriate in the inclusion in the power plan of Bonneville's reported costs for the fish and wildlife program.

On September 18, 2013, a three-judge panel of the Ninth Circuit issued a decision affirming the Council's consideration of fish and wildlife interests in developing the power plan. The court rejected NRIC's argument that the Council was obligated to reconsider, during the development of the regional power plan, measures benefitting fish and wildlife that the Council had adopted previously in its fish and wildlife program. The court also agreed with the Council that its statutory obligation to consider fish and wildlife interests when developing the regional power plan is related to the

Council's evaluation of new (future), as opposed to existing, power resources.

The court did find, however, that the public must have an opportunity to comment on the methodology for determining environmental costs and benefits and that the Council had not provided that opportunity before adopting the Sixth Plan. The Court therefore remanded the plan to the Council for the limited purpose of adopting a methodology following an opportunity for public comment on the methodology, which the Council did on remand. The Court did not make any finding with respect to the specific methodology used in the Sixth Plan recognizing that "[t]he choice of methodology is a highly technical question which falls within the unique expertise of the Council."

Finally, the court remanded the Sixth Plan to the Council to reconsider the estimated cost of the 2009 Fish and Wildlife Program that was reported in the Sixth Plan. The Court did not find that inclusion of any particular method of estimating program costs was required by the Power Act, only that the Council did not provide a reasoned basis for including the estimate. The court thus remanded the plan to the Council to reconsider inclusion of the cost estimate in the Sixth Plan. On remand the Council simply removed that information from the power plan as it played no role in the resource analysis or resource strategy.

NRIC v. Northwest Power and Conservation Council (2014 F&W Program)

After the Council adopted the 2014 Fish and Wildlife Program, the Northwest Resource Information Center, Inc. (NRIC) filed another petition with the Ninth Circuit to challenge the program. The brief filed by NRIC in January 2016 alleges the Council failed to adopt sufficient flow and passage measures and objectives to benefit anadromous fish, including an argument that the Council allowed improper factors (i.e., the ESA/FCRPS Biological Opinions and the Columbia Basin Fish Accords) to dictate the Council's decisions on what flow and passage measures and objectives to include in the program for anadromous fish. The Council filed its answering brief in April 2016, responding that the Council, following requirements of the Northwest Power Act, based its decisions on the program's measures and objectives, including for flow and passage, on the recommendations submitted to the Council to begin the program amendment process, with particular reliance on the recommendations, views, activities and expertise of the federal and state fish and wildlife agencies and tribes. A number of entities intervened in the litigation to support the program (Spokane Tribe, Kootenai Tribe of Idaho, the states of Montana and Idaho, Bonneville Power Administration, Public Power Council, Northwest RiverPartners, along with the state of Washington as an amicus participant). A decision from the Court is not likely until sometime in 2017.

NRIC v. Northwest Power and Conservation Council (Seventh Power Plan)

NRIC (Ed Chaney) also challenged the Seventh Power Plan in the Ninth Circuit, in mid 2016, part of the ongoing argument by Mr. Chaney that the Council is not using its fish and wildlife program and power plan to do more to change the hydrosystem to the benefit of Snake River salmon and steelhead. Whether and what issues might be worth litigating with regard to the Seventh Power Plan depends heavily on the outcome of the challenge to the 2014 Fish and Wildlife Program. So the Council and the EarthJustice attorneys representing NRIC agreed in July 2016 to stay the challenge to the Seventh Power Plan until there is a resolution to the challenge to the 2014 Fish and Wildlife Program.

Administrative Issues

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. 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 the late 1990s, as wholesale electricity markets were deregulated, the electricity industry entered a period of restructuring, and prices fluctuated with supply and demand, it appeared for a time that the Council's

Bonneville-focused power planning and fish and wildlife planning might be less important in the future as Bonneville competed with other power suppliers. Accordingly, the Council reduced its budget. Instead, however, the Council's role and workload increased substantially.

Today, 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 2014 and the power plan in 2016 – 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.

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 since 1982.

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.

The Northwest Power Act (Section 4(c)(10)(A)) directs the administrator of the Bonneville Power Administration to pay the expenses the Council determines are necessary or appropriate for the performance of its functions and responsibilities, including reimbursement to those states with members on the Council. This section also establishes a funding limitation equal to 0.02 mills multiplied by the kilowatt-hours of firm power forecast to be sold by Bonneville during the year to be funded. Upon 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 literal interpretation of the word "showing" requires that the Council provide evidence that: 1) substantiates that annual funding in the amount provided by the 0.02 mills of firm forecast power sales will not be adequate to carry out its functions under the Act; and 2) explains the basis on which additional funding is required. The Council's budget document is intended to provide sufficient information to meet these criteria.

In Fiscal Year 2017, based on Bonneville's forecast of firm power sales, the 0.02-mill funding level is $2,485,605. The 0.10-mill funding limit is $12,428,026. The funding requirement as determined by the Council for Fiscal Year 2017 is $11,648,000, which is equal to 0.094 mills of forecast firm power sales.

The Council's annual budget documents are posted on its website. The organization of the budget documents and the level of detail provided shows how the Council intends to use the funding provided to carry out its major responsibilities under the Act.

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 GAO 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 "About Us" webpage, www.nwcouncil.org/about.

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.

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 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.

Federal laws that apply to the Council

The Council is an interstate compact agency and, explicitly in the Power Act, not a federal agency. However, in Section 4(a)(4) of the Act Congress applied a set of federal laws to the Council "[f]or the purpose of providing a uniform system of laws." The federal laws that apply to the Council are described as those relating to "the making of contracts, conflicts-of-interest [federal ethics in government laws], financial disclosure, open meetings of the Council [Sunshine in Government Act], advisory committees [Federal Advisory Committee Act], disclosure of information [Freedom of Information Act], judicial review of Council functions and actions under the Northwest Power Act [Administrative Procedures Act], and related matters." The Act further says that these laws shall apply to the Council "to the extent appropriate," without any guidance as to what precisely that means. The Council acts to comply with these federal laws in general and has described certain narrow circumstances where compliance by the Council might be different than by federal agencies.

Council name change

In the Northwest Power Act, the official legal name of the agency is "Pacific Northwest Electric Power Planning and Conservation Council." Up until 2003, the Council used "Northwest Power Planning Council" as a shortened working version of its official title.

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

Staff Directory

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	Judi Hertz	Executive and Legal Assistant
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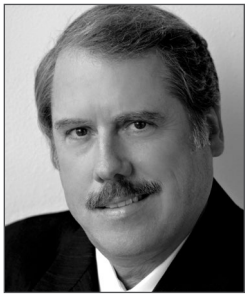
	Sharon Ossmann	Administrative Division Director
	Bud Decker	Information Systems Manager
	Tamara Fleming	Payroll/Accounting Assistant
	Michael Osborne	Business Manager
	Barry Richardson	Information Systems Assistant
	Trina Gerlack	Travel Coordinator/Accounting Assistant
	Bethany Slyter	Production and Facilities Support
	Deb Woolf	Receptionist
Fish and Wildlife Division		
	Tony Grover	Fish and Wildlife Division Director
	Leslie Bach	Senior Program Manager
	Mark Fritsch	Manager, Project Implementation
	Nancy Leonard	Fish, Wildlife and Ecosystem M&E Report Manager
	Erik Merrill	Manager, Independent Scientific Review Program
	Patty O'Toole	Program Implementation Manager
	Lynn Palensky	Program Development Manager
	Laura Robinson	Program Implementation and Liaison Specialist
	Kendra Coles	Administrative Assistant

Power Division		
	Ben Kujala	Acting Power Planning Director
	Gillian Charles	Energy Policy Analyst
	John Fazio	Senior Power Systems Analyst
	Charlie Grist	Manager, Conservation Resources
	Dan Hua	Power System Analyst
	Tina Jayaweera	Senior Energy Efficiency Analyst
	Massoud Jourabchi	Manager, Economic Analysis
	Jennifer Light	Regional Technical Forum Manager
	Chad Madron	Project Analyst
	John Ollis	Power System Analyst
	Steve Simmons	Senior Economic Analyst
	Kevin Smit	Senior Energy Analyst
	Mike Starrett	Energy Policy Analyst
	Garrett Herndon	Regional Technical Forum Assistant
Public Affairs Division		
	Mark Walker	Public Affairs Division Director
	John Harrison	Information Officer
	Eric Schrepel	Technical and Web Data Specialist
	Carol Winkel	Senior Writer and Editor
Legal Division		
	John Shurts	General Counsel
	Sandra Hirotsu	Senior Counsel
	Judi Hertz	Executive and Legal Assistant

State Offices

Idaho



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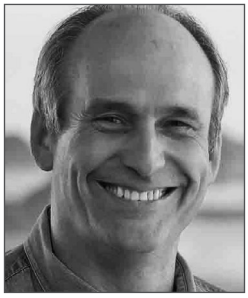

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Council By-laws

The Council's By-laws, last revised in 2003, are posted at www.nwcouncil.org/about/policies/bylaws, and copied below:

Chapter 1 - Authority

The Pacific Northwest Electric Power and Conservation Planning Council, also known as the Northwest Power and Conservation Council, was authorized on December 5, 1980 by Congress in the Pacific Northwest Electric Power Planning and Conservation Act, Public Law 96-501. The Council was established as an interstate agency on April 28, 1981, by agreement among the states of Idaho, Montana, Oregon and Washington.

Chapter 2 - Purpose

The Northwest Power and Conservation Council was created by Congress and the states of Idaho, Montana, Oregon and Washington to provide planning and policy leadership on regional electric power and fish and wildlife issues. The Council develops a plan, which, if implemented, will assure the region of a safe, reliable, and economical power system with due regard for the environment. The Council also prepares a program to protect, enhance, and mitigate fish and wildlife affected by the Columbia River hydroelectric system.

In the development of its Plan and Program, the Council provides a forum for public involvement, makes certain the public interest is represented, and balances competing interests.

The Council monitors and promotes the implementation of the Plan and Program.

Chapter 3 - Council Membership

1. Membership: The Council consists of eight members, two each from the states of Idaho, Montana, Oregon and Washington, who have been certified as members by the Governors of their respective states.
2. State Officers: The Council members are officers employed by their respective states and are not officers or employees of the United States.

Chapter 4 - Election and Appointment of Officers

1. Elections: At the first meeting of each calendar year, the members of the Council shall elect a Chair and Vice Chair. The meeting shall not adjourn until the elections have been completed.
2. Committee chairs: The chairs of all Council committees are appointed by the Chair of the Council. The Chair, at its sole discretion, shall give high priority to balancing the leadership of the Council among the four states, recognizing that the Chair and Vice-Chair are elected by the full Council.
3. Service until successors chosen: So long as they remain members of the Council, all officers of the Council shall serve until their successors are elected or appointed.

Chapter 5 - Chair

1. Presiding officer: The Chair presides over all meetings of the Council, unless the Chair designates another member to preside.
2. Meeting: The Chair sets the date, time, place, and agenda of all Council meetings, subject to the provisions of Chapter 12 of the By-Laws.
3. Authorized signatory: The Chair may execute all documents, pleadings, or the like that must be executed in the name of the Council.
4. Emergencies: The Chair may take action on behalf of the Council in emergencies that arise between meetings of the Council, provided that, where practicable, the Chair shall advise all members by telephone of the action proposed to be taken.
5. Central staff: The Chair and the Executive Committee represent the Council in providing oversight and overall direction of the central staff.
6. Delegation of duties: The Chair may delegate to other Council members duties and responsibilities that are assigned to the Chair.

Chapter 6 - Vice Chair

1. Acting Chair: The Vice Chair acts as Chair whenever the Chair is absent or unavailable.
2. Completion of unexpired term: If a vacancy occurs in the office of Chair, the Vice Chair succeeds to the office of Chair, and serves as Chair for the remainder of the term.
3. Filling Vacancies: If a vacancy occurs in the Vice Chair before the completion of a full term, the office may be filled by special election at a regular Council meeting. The Council may fill such vacancy for the remainder of the unexpired term plus a full year's term.
4. Maintenance of records: The Vice Chair is responsible for recording all votes of the Council, preparing and certifying minutes of all Council meetings, and for maintaining the records of the Council. The Vice Chair may certify any official Council document. The Vice Chair may designate one member of the staff as Secretary of the Council and may delegate to that Secretary any duties described in this paragraph.

Chapter 7 - Censure of Officers

A member may move that the Council consider censure of the Chair or Vice-Chair or the Chair of any standing committee. Censure may include a statement of no confidence. Once the motion is seconded, the maker of the motion shall state the grounds for censure before Council discussion. The motion must be voted on at the meeting at which it is offered and requires a simple majority for adoption. A subsequent motion to censure may be made at the Council's next regularly scheduled meeting and requires a majority of six members, including at least one member from each state for adoption.

Chapter 8 - Offices and Staff

1. Central office: The Council's central office is located in Portland, Oregon.
2. State offices: Council members may establish offices in their respective states for the conduct of Council business within their states.
3. State staff: Subject to the funding established for such purposes in the Council's annual budget, Council members may appoint staff in their state offices, fix compensation for them, and assign and delegate duties to them. State staff will be considered employees of their respective state offices and are subject to the supervision and direction of the appointing Council member or members.
4. Central staff: The staff located in the Council's central office are employees of the Council as a whole and are subject to the guidance and direction of the Council through the Chair and Executive Director.

Chapter 9 - Executive Director

1. Chief executive officer: The Executive Director is the chief executive officer for the Council and conducts the day-to-day business of the Council under the direction of and in consultation with the Chair.
2. Responsibility for central staff: Subject to oversight by the Executive Committee and the Chair, the Executive Director directs the Council's central staff. The Executive Director approves personnel actions, including reassignments, promotions, transfers and suspensions. Subject to approval by the Executive Committee, the Executive Director may adopt rules and procedures governing the central staff. Before any major personnel action becomes effective, the Executive Director shall confer with the Chair and receive approval from the Chair and the Executive Committee. Major personnel actions include appointments, dismissals, creation or deletion of staff positions and the like. The Chair shall report all such major personnel actions to the Council.
3. Staff performance reviews: The Executive Director shall conduct annual performance evaluations of the central staff and recommend salary adjustments and bonuses consistent with Council policy. However, before such evaluations and recommendations become effective, the Executive Director shall confer with the Chair and receive approval from the Chair or the Council of the evaluations and recommendations. It is intended that evaluations and recommendations relating to Division Directors be reviewed in some detail and approved by the Chair in consultation with the Executive Committee. The Executive Director shall provide the Chair with a more general overview of the evaluations and recommendations relating to other staff members.
4. Severance agreements: The Executive Director or his designee shall negotiate all employee severance agreements, consistent with the Council's severance policies. No severance agreement shall become effective, however, until approved by the Executive Committee and two business days have elapsed after the full Council has been given actual notice and no Council member has requested reconsideration of the agreement.
5. Contracts: The Executive Director is the contracting officer for the Council. He may approve and enter into contracts on behalf of the Council, or take similar action committing the Council to the expenditure of funds, for the acquisition of any property or service having a value that does not exceed $25,000 individually.
6. Financial authority: On behalf of the Council, the Executive Director may sign or endorse all checks, drafts and other orders for payment or collection of money, notes or other evidences of indebtedness, with the countersignature of a

division director or other staff member designated by the Council.

7. Service of process: The Executive Director may accept service of process on behalf of the Council.
8. Signatory: At the direction of the Chair, the Executive Director may execute documents, pleadings, or the like in the name of the Council.
9. Other responsibilities and actions: The Executive Director shall undertake such other responsibilities as may from time to time be delegated to him by the Council and may take such other actions as are necessary or appropriate to ensure the efficient and effective operation of the Council staff.
10. Delegation of duties: The Executive Director may delegate any of the authorities or responsibilities assigned to him.
11. Executive Director performance reviews: Consistent with the Council Compensation Plan (IV-6, adopted October 15, 1987, as amended) the Council Chair shall annually conduct a performance achievement evaluation of the Executive Director. The Chair will, in writing, prepare and submit to the Council a preliminary performance achievement evaluation. The Council will then proceed to adopt or amend, by majority vote of the members present and voting. The majority evaluation shall be distributed and recorded as provided in the Compensation Plan, Council By-Laws, or common Council practice. Minority evaluations may be submitted by Council members, but without the usual publication, distribution, or recording. Minority evaluations may be given to the Executive Director and Council members only. Executive Director merit awards shall follow the above procedure and Compensation Plan guidelines and shall be determined separately from performance achievement evaluations. Executive Director evaluations and merit awards shall be conducted in executive session.

Chapter 10 - Executive Committee

1. Membership: The Executive Committee shall have one member from each of the states. The Chair of the Council shall serve as Chair of the Executive Committee.
2. Authority: The Executive Committee, in consultation with the Executive Director, shall develop and provide oversight over the implementation of all administrative, operational and personnel policies. Such policies may include, but are not limited to: major personnel actions; budget development; annual audit recommendations; financial oversight; contract matters; facilities, such as office space and major equipment leases and purchases; and travel.

Chapter 11 - Meetings

1. Council meetings: All meetings of the Council are open to the public and all persons are permitted to attend except when the Council meets in executive session.
2. Executive sessions: Executive sessions of the Council may be held only for the consideration of the following matters:
   a. internal personnel matters;
   b. real estate leases and acquisitions;
   c. Council participation in civil litigation, or in mediation or negotiation undertaken in lieu of likely civil litigation, or the potential for civil litigation associated with alternative courses of Council action;
   d. trade secrets or other confidential commercial or financial information;
   e. information the premature disclosure of which would be likely to frustrate significantly implementation of a Council action; or
   f. Council retreats to discuss Council organization, structure, procedure, or personnel issues.

3. Movement of executive session matters to open meeting: During the course of an executive session, any member may request that the matter under discussion be moved into an open meeting. Upon receiving such request, the Chair will poll the members present in the executive session. If a majority agree to move the matter into an open meeting, the Chair will conclude the discussion and schedule the matter for consideration at the next open meeting of the Council.
4. Executive session under premature disclosure exception: Notwithstanding the above, a unanimous vote of the members present is required to approve holding an executive session under the premature disclosure exception. During an executive session under the exception, upon the request of any member to move the discussion into an open meeting, the Chair will conclude the discussion and schedule the matter for consideration at the next open meeting.
5. Definition of Council meeting: A meeting of Council members occurs whenever five or more Council members are present and the members are deliberating together on matters within the authority of the Council or receiving information upon which such deliberations may be based. Notwithstanding the foregoing, a Council meeting does not occur when the Governors ask the members to attend a meeting called by the Governors to discuss policy issues pursuant to an agenda established by the Governors. Nor does a Council meeting occur even though a quorum of members participates in a meeting convened by an entity other than the Council, provided: (1) the agenda is set by the other entity, (2) any resultant action is not a Council action, (3) no more than four Council members join with one another in discussions of Council-related matters, (4) the meeting is open to the public, and (5) the Council gives public notice of member attendance at such meeting.
6. Site visits by a quorum of Council members are not considered to be meetings of the Council so long as no more than four Council members join with one another in discussions of Council-related matters. However, whenever feasible, interested members of the press will be invited to accompany the Council on site visits.

Council meeting in session, left to right: Dale Horton, Energy Architect, Montana Local Government Energy Office; Lynn Carmichael, Council Member, Yakima City Council, Tom Townscend, Moscow City Commissioner and Larry Tuttle.
Photo: Steve Engels, date unknown.

7. Attendance of five or more Council members at a conference or convention that is open to the press or the public is not considered to be a meeting of the Council, so long as no more than four Council members join with one another in discussions of Council-related matters. Similarly, the presence of five or more Council members at a social occasion does not make the social occasion into a meeting of the Council so long as there are no discussions of Council-related matters in groups where more than four Council members are present.

8. Committee meetings: It is the intention of the Council that committee meetings should generally be open, and that such meetings should be closed only when, in the judgment of the committee members, the reasons for closing the committee meeting clearly exceed the merits of public disclosure. Unanimous consent of the members is required to close a committee meeting. Council committees are primarily for the purpose of giving guidance to staff, for staff briefings, for identifying ideas for issue papers, and for other preliminary discussions. Except as provided in these By-Laws in the case of the Executive Committee, Council committees are not authorized to make decisions on behalf of the Council.

9. Movement of matters from closed committee meetings to open meeting: During the course of a closed committee meeting, any member may request that the matter under discussion be moved into an open meeting. Upon receiving such request, the committee Chair will conclude the discussion, and either move the matter into the next open meeting of the committee or request the Council Chair to schedule the matter for consideration at the next open meeting of the Council.

10. Definition of committee: A committee is a regularly organized group of four or fewer Council members. Council committees include the Power Planning Committee, the Fish and Wildlife Committee, the Public Affairs Committee and the Executive Committee. Council committees also include any other committee or subcommittee that conducts hearings, takes public testimony, or otherwise acts to implement the Plan, Program or other Council decisions. An "ad hoc" working group is not a committee, and two Council members from one state are not, by themselves, a committee.

11. Notification by Chair: Whenever a matter is proposed for consideration in an executive session of the Council, the Chair shall notify each Council member in advance of the matter proposed for consideration and of the ground or grounds for closing the meeting.

12. Application of federal open meetings law: The Council finds that sections 1-9 above represent an appropriate adaptation of the federal open meetings law, as permitted under Section 4(a)(4) of the Northwest Power Act. For matters not specifically described in sections 1-9, the intent of the Council is that the provisions of the federal open meetings law, 5 U.S.C. §552b, shall generally govern the conduct of the Council's meetings. However, when notice is required, notice of meetings shall be given on the Council's website, or by such other means as are reasonable in the circumstances.

13. Call of Council meetings: The Council meets at the call of the Chair or upon the request of any three members.

14. Location of meetings: The regular meetings of the Council will be rotated among the states of Idaho, Montana, Oregon and Washington unless special circumstances dictate to the contrary. The Council may hold other meetings at any appropriate location, inside or outside of the Northwest.

15. Conference calls: Council members may participate in a Council meeting through the use of conference telephone or similar communications equipment after notifying the Chair, provided that all members so participating, and members of the public in attendance, can

hear each other. A public meeting space shall be provided so the public may participate by speaker-phone or similar equipment.

Chapter 12 - Voting and Procedure

1. Quorum: Five members of the Council constitute a quorum.
2. Majority vote: Unless otherwise specified in these By-Laws, all actions and decisions of the Council shall be by majority vote of the members present and voting.
3. Super-majority vote: Adoption or amendment of the Power Plan, the Fish and Wildlife Program, and these By-Laws shall be by rollcall vote and requires a majority of the members, including at least one member from each state or the affirmative vote of at least six members.
4. Special majority for 6(c): A Council determination of the consistency or inconsistency of a proposal related to a major resource with the Power Plan under Section 6(c) of the Act shall be by majority vote of all members of the Council.
5. A motion to suspend the By-Laws requires a three-fourths majority, including at least one member from each state.
6. Proxy: Voting by proxy is not permitted.
7. Statements: Any member of the Council may submit a statement for the Council record or to accompany any matter transmitted by the Council setting forth such member's disagreement with the Council decision or additional views and the reasons for such disagreement or views.
8. Procedure: Any proposed Council action must be moved by a Council member and seconded by another Council member before a vote may be taken by the Council. Other questions of procedure will be decided by reference to generally accepted principles of parliamentary procedure, as determined by the Chair or his designee.
9. Record of voting: All votes and major actions of the Council shall be set out in the minutes of the meeting.

Chapter 13 - Agendas

1. Council meeting agendas: The agenda for each Council meeting will be prepared by the Chair, and shall set out all matters expected to come before the Council at the meeting.
2. Public comment: Each Council meeting agenda shall include an opportunity for public comment by interested parties who wish to address the Council. The Chair may limit the time members of the public may address the Council in order to accommodate as many who wish to address the Council as feasible.
3. Agenda items from committee meeting: If the Chair of a committee of Council members requests the opportunity for discussion by the Council of an item that was discussed within the past 30 days during a committee meeting, the Chair shall place the item on the agenda of the next Council meeting.
4. Council member request: If any two Council members request that an item (other than an item described above in paragraph 3) be placed on the agenda of a Council meeting, the Chair shall place it on the agenda.
5. Public request: If any person other than a Council member wishes to have an item placed on the agenda of a Council meeting or wishes the Council to take action on a particular matter, the person must submit the request in writing to the Executive Director at least 20 days prior to the meeting. The Chair may place the item on the agenda in his discretion. Any item placed on the agenda upon such request shall be identified on the agenda and shall state the name of the person making the request.

Chapter 14 - Books and Records

1. Audit: The Council shall keep correct and complete books and records of account and shall establish an adequate accounting system so that its finances can be audited. The Council shall provide annually for an independent audit of its finances by a certified public accountant.
2. Minutes: The Council shall keep minutes of its proceedings at its principal office and shall provide those minutes to each Council member.
3. Council member right of inspection: All documents and physical properties of the Council may be inspected by any Council member or his agent at any reasonable time. The right of inspection includes the right to copy and make extracts. Former Council members may inspect all books, records, and documents that were produced during the term of their service on the Council.
4. Public right of inspection: Any Council document that would be available to the public under the federal Freedom of Information Act if held by a federal agency is available for public inspection upon request.
5. Fiscal year: The fiscal year of the Council commences on the first day of October of each calendar year, and closes on the 30th day of September of the following calendar year.

Chapter 15 - By-Laws

The Council shall adopt By-Laws that set forth the Council's organization, practices and procedures for carrying out its functions and responsibilities under the Northwest Power Act.

The Council shall adopt and amend its By-Laws, after opportunity for public comment, as part of Council business during any regularly scheduled and noticed Council meeting.

Council By-Laws shall be published as an Appendix to the Council's Annual Report and made available to any person, upon request.

Chapter 16 - Business Practices and Procedures

The Council shall develop business practices and procedures necessary for conducting its administrative and financial operations. These practices and procedures shall include, but not be limited to the following:

1. Financial management, such as budget and audit;
2. Accounting systems, such as travel reimbursement and expenses;
3. Procurement, such as contracting, purchasing, or leasing;
4. Personnel management, such as separation and severance; and
5. Administration, such as the Privacy Act, the Freedom of Information Act (FOIA), and petitions for rulemaking.

Consistent with other provisions of the By-Laws, revisions to such business practices and procedures shall be developed by the Executive Director, subject to approval of the Executive Committee after opportunity for public comment. The Executive Committee may, at its discretion, require these policies to be reviewed and adopted by the full Council during regularly scheduled Council meetings. Consistent with FOIA and Privacy Act guidelines, the Council shall make available, upon request, its business practices and procedures.

Chapter 17 - Council Communications

1. Chair and Executive Director: The Chair, or the Executive Director at the request of the Chair, may write letters or make other communications in the name of the Council without prior authorization from the Council, provided such letters do not materially affect the policies and procedures of the Council. The Council shall approve in advance any letters or

other communications that materially affect the Council's policies and procedures. However, when a delay in sending a letter or other communication would render it ineffective, the Chair may take immediate action, which shall be reviewed at the next meeting of the Council.

2. Council members: Council members, other than the Chair, may send letters or other communications in the name of the Council provided that they receive prior review by all Council members and approval by a majority of Council members.

Chapter 18 - Advisory Committees

The Council may establish such advisory committees as a majority of its members deem appropriate to assist it in carrying out its functional and responsibilities. The Chair may appoint such committees of Council members, as he deems necessary.

Chapter 19 - Bonding

All members and employees of the Council handling the funds of the Council shall be bonded at Council expense in an amount designated by the Council.

Chapter 20 - Indemnification

To the extent permitted by law and as described herein, the Council agrees to indemnify its members and employees, whether presently or formerly occupying such positions, and their personal representatives, heirs, and devisees, against judgments fines, forfeitures, settlements and litigation expenses and attorney fees actually and reasonably incurred or required in defense of any action, suit, or proceeding in which the member or employee, including, without limitation, any action by or in the right of the Council for any breach of duty relating to assets. Such indemnity shall not extend to liability resulting from intentional wrongdoing, actions taken in bad faith, actions taken with willful and wanton disregard for the rights of other, or conduct outside the scope of employment.

The Council reserves the right to seek indemnity from any present or former member or employee in the amount of any judgment, plus litigation expenses and attorney fees, when such judgment, expenses, and fees are incurred by the Council as a result of intentional wrongdoing, actions taken in bad faith or with willful and wanton disregard of the rights of others, or conduct outside the scope of employment.

The Council reserves the right to defend and control all litigation in which it is a party, and nothing in the Chapter shall require the Council to waive such right or to provide separate and independent counsel to any present or former member or employee.

As a condition of indemnification by the Council, a present or former member or employee shall cooperate fully with the Council in defense of the action and shall, if requested by the Council, make demand for and resort to any available indemnity or defense rights made available or provided by the law of any state.

The obligation to indemnify created by the article shall be solely the obligation of the Council and shall not be an obligation or liability of Council members personally. Nothing contained in this article shall detract in anyway whatsoever from the obligations of the several states to indemnify their officers and employees except in cases of conflict of interest between the Council as a body and the individual defendant.

Electricity Futures Symposium, hosted by Bonneville Power Administration, League of Women Voters, and the Northwest Power Planning Council. Photo: Northwest Power and Conservation Council Archives, 1988

Glossary of terms

1. Terms in the 2014 Fish and Wildlife Program

Accuracy	The accuracy of a measurement is the degree of closeness of measurements of a quantity to that quantity's actual (true) value, i.e., how close a measurement is to the "true value."
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 steelhead salmon.
Anadromous fish substitution	The protection, mitigation, or enhancement of resident fish and wildlife to address losses of salmon and steelhead in those areas currently blocked to anadromous fish as a result of hydroelectric dams.

Baseline	Historical or current conditions against which change can be measured. When referring to a baseline passage or flow measure in the mainstem, the baseline indicates the starting point as described in the Federal Columbia River Power System Biological Opinion.
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, hatcheries, predation, harvest, and wildlife habitat.
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 non-regulatory 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 River Basin	The Columbia River and its tributaries.

Columbia Basin Fish Accords	The accords are agreements between the action agencies, several tribes, and some states that 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 U.S. Army Corps of Engineers and 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.
Construction and Inundation Losses	The wildlife losses that occurred as a direct result of construction of a dam and the flooding of the area upriver of the dam.
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 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.

Critical uncertainties	Critical research uncertainties are questions concerning the validity of key assumptions implied or stated in the program.
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, which 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).
Distinct population segment	A vertebrate population or group of populations that is discrete from other populations of the species and significant in relation to the entire species. The smallest division of a taxonomic species permitted to be protected under the U.S. Endangered Species Act.
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.
Ecosystem Function	The ability of a river to sustain healthy populations of fish, wildlife, and plants, that is enhanced by environmental conditions that support healthy populations.
Effectiveness monitoring	Assessing whether certain actions and projects are having the intended affect and contribute to overall mitigation, protection, enhancement, and recovery efforts in the basin. This may require establishing a causal relationship or a correlation between the action and the change observed; i.e. statistical cause-and effect and correlation relationships. This can be at one of two scales: to detect a localized effect (project or stream reach level effect), and to detect a watershed level effect (intensively monitored effect).
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	Federal legislation, as amended in 1973, 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 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 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.
Extirpated	The loss of a discrete subpopulation within a species.
Extinction	The loss of an entire species.
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 the Hungry Horse Project 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 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 and wildlife agencies and tribes	The federal and region's state fish and wildlife agencies and Indian tribes.
Floodplain	Land adjacent to a 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.
Focal species	A species that has ecological, cultural or local significance or protected legal status, and is used to evaluate the health of the ecosystem and the effectiveness of management actions. A set of focal species is established for each subbasin plan [see Appendix N].
Forebay	The part of a dam's reservoir that is immediately upstream of the powerhouse.
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.
Habitat	The locality or external environment in which a plant or animal normally lives and grows. As used in this program, habitat includes the ecological functions of the habitat structure.
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 and wildlife agencies and tribes.
Hatchery	Generally refers to 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 natural-origin populations. In this program, "hatcheries" may also refer to any of a suite of activities that includes 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.

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 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.
Invasive species	A species that establishes and reproduces rapidly outside its native range. It may threaten the diversity or abundance of native species through predation, competition, parasitism, hybridization with native populations, introduction of pathogens, or the physical or chemical alteration of the invaded habitats.
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 salmon	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 the 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	The multitude of physical stages and behaviors exhibited by a species in the completion of 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	Refers to the main channels of the Columbia and Snake rivers. The program includes a mainstem plan with specific objectives and actions 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 dams.
Mainstem passage	The movement of salmon and steelhead around or through the dams and reservoirs in the Columbia and Snake rivers.
Mid-Columbia Public Utility Districts	PUD No. 1 of Grant County, PUD No. 2 of Chelan County, and PUD No. 1 of Douglas County.
MPG (Major population group)	A set of populations that shares genetic, geographic (hydrographic), and habitat characteristics within an evolutionarily significant unit.
Native species	A species whose presence in a region or ecosystem is due to natural processes and not to human activities.
Natural-origin fish	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
Natural production	Spawning, incubating, hatching, and rearing fish in rivers, lakes, and streams without human intervention.
Non-native species	An introduced species living outside its native distributional range, which has arrived there by human activity, either deliberate or accidental. These species 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 is native to the Columbia River and its tributaries and a known predator of young salmon.

Northwest Power Act	The Pacific Northwest Electric Power Planning and Conservation Act (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 this program that are proposed for funding by the Bonneville Power Administration, and to make final recommendations to Bonneville on implementation of projects.
Nutrient cycling	Process by which nutrients are continuously transferred between organisms within an ecosystem.
Objectives	The biological and non-biological changes needed to achieve the program vision in a quantifiable fashion. This is a broader term that includes biological objectives, defined above. Objectives serve as a benchmark to evaluate progress toward the vision and should be, as feasible, specific, measurable, achievable, relevant, and time-bound.
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 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.
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.
Passage 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.
Performance measures	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.
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.
Precision	The degree to which repeated measurements show the same results. It is also called reproducibility or repeatability.
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.
Rearing	The juvenile life stage of anadromous fish spent in freshwater rivers, lakes, and streams or hatcheries before they migrate to the ocean.
Recovery	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 are no longer 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 of the relevant federal agency, 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-of-year fish entering a population in a given year.
Reference stream	Reference streams are similar in physical and biological character to streams in which an integrated production effort will take place. No new supplementation should occur in reference streams.
Removable Spillway Weir	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 program purposes, resident fish include landlocked anadromous fish (for example, sturgeon, kokanee, and coho), as well as traditionally defined resident fish species. For example, freshwater mussels, threatened bull trout, burbot, Westslope cutthroat trout, mountain whitefish, endangered Kootenai white sturgeon, green sturgeon, and resident life histories of the native anadromous species, e.g. kokanee [see Appendix N].

Riparian	Riparian areas and wetlands are habitats along the banks of streams, lakes, or rivers 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.
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 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.
Smolt to Adult Return (SAR) rate	A measure of survival from smolt outmigration to adult return. Depending upon the species, tag type, and research/management question, smolt outmigration and adult returns may be enumerated at various locations (e.g., Bonneville to Bonneville, Dworshak Hatchery to Lower Granite, or tributary to tributary). Therefore, SARs must be explicitly defined based on the enumeration points. The SAR indicator incorporates all sources of mortality between the smolt and adult life stages.
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 which 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 conspecific population units, 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.
Stacking	A procedural step used to calculate the relationship between wildlife species and their habitat in the course of calculating Habitat Units (HUs) for the purposes of mitigating for wildlife losses. Stacking can produce varied results if inconsistent species or habitat types are used in the calculation.
Status and trend monitoring	Used to assess status over time of fish, wildlife, and habitat that informs program evaluation and reporting needs. This type of monitoring is intended to span a time-period adequate to understand the trend and be able to detect a negative change that would require a change in program implementation to rectify.
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.
Strongholds	Generally characterized as large and relatively intact areas that support abundant, diverse, genetically strong populations of native salmonids that can serve as "anchor recovery areas" to help re-establish and re-build core populations in the basin. The concept of native fish strongholds is further defined as conservation reserves to protect remaining areas of high-quality habitat supporting abundant populations and a diverse number of native fish species.
Subbasin	A set of adjoining watersheds with similar ecological conditions and tributaries that ultimately connects, 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 management plans	Management plans set 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 outlines biological objectives describing the desired environmental conditions, and then identifies 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	A fish that is less than 1 year old.
Supplementation	The use of hatcheries 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 a dam.
Tailwater	The water surface immediately downstream from a dam.
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.
Terminal fishery	A fishery created to provide a significant degree of spatial separation from stocks bound for other streams. The terminal fishery targets a hatchery stock of fish to avoid harvest of listed and weak stocks.
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/species	Stocks or species whose range or migratory routes cross the United States/Canada border.
Transportation	Collecting migrating juvenile fish and transporting them around 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 right of "taking fish at all usual and accustomed grounds and stations" as well as the "privilege of hunting, gathering roots and berries and pasturing horses on open and unclaimed lands." Certain of these rights have been well defined by judicial decisions, such as those pertaining to treaty 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 Community of Oregon; 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; the Spokane Tribe of Indians; the Confederated Tribes of the Siletz Indians of Oregon; and the Cowlitz Indian Tribe.
Turbidity	A measure of light penetration in a body of water. Higher turbidity indicates murkier water conditions.
United States 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.
Uplands	Land at higher elevations than the alluvial plain or low stream terrace; all lands outside the riparian-wetland and aquatic zones.
VARQ	Variable outflows for flood control 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 is typically 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 would not yet qualify for ESA listing.
Wild fish	Fish that have maintained successful natural reproduction with little or no hatchery influence.
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.
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 2016 Northwest Power Plan

Adequacy	To be considered adequate under the NERC definition, "the electric system [must be able to] supply the aggregate electrical demand and energy requirements of the customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements."
Adequacy reserve margins	A multiplier to peak or average load in the Regional Portfolio Model that reflects if more or less resources are required, in comparison to load resource balance, to meet the Council's adequacy standard.
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.
Associated system capacity contribution	The percent of a new resource's capacity that contributes toward meeting the Council's adequacy standard.
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 (aMW) 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.
Balancing reserve	Balancing reserves are provided by resources with sufficiently fast ramp rates to meet the second-to-second and minute-to-minute variations between load and generation left over after providing regulation and scheduled operations.

Baseline efficiency	The energy use of the baseline equipment, process, or practice that is being replaced by a more efficient approach to providing the same energy service. It is used to determine the energy savings obtained by the more efficient approach.
Base-loaded resources	Base-loaded electricity generating resources are those that generally are operated continually except for maintenance and unscheduled outages. For example, hydroelectric, natural gas combined cycle combustion turbines, and coal plants.
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).
Busbar	The physical electrical connection between the generator and transmission system. Typically load on the system is measured at busbar.
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.
Capacity factor	An estimate of the ratio of the actual annual output to the potential annual output of a generating plant if operating at full capacity.
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 7,500 heating degree days (the somewhat harsher eastern parts of the region); and Zone 3: more than 7,500 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 combustion turbine	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.
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.
Conservation program	An activity, strategy, or course of action undertaken by an implementer or program administrator. Each program is defined by a unique combination of the program strategy, market segment, marketing approach, and energy-efficiency measure(s) included.
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 historical 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 to meet the Northwest's loads. Under the Pacific Northwest Coordination Agreement, the critical period is based on the lowest multi-month streamflow observed since 1928. The current critical period begins in October of 1936 and ends in September of 1937. A repeat of this historical water condition would generate about 11,600 average megawatts of hydroelectric energy.
Current practice baseline	The baseline is defined by the typical choices of eligible end users in purchasing new equipment and services.

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.
Demand response	A voluntary and temporary change in consumers' use of electricity when the power system is stressed.
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 (DSI)	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, such as loans, grants, or other incentives, made available pursuant to other provisions of the Act.

End-use	A term referring to the final use of energy; it often refers to the specific energy services (for example, space heating), or the type of energy-consuming equipment (for example, motors).
Energy	Energy is defined as a quantity of work, commonly measured in units of kilowatt-hours or megawatt-hours. In the Northwest, energy is also measured in units of average megawatts, where one average megawatt is equal to 8,760 megawatt-hours.
Energy efficiency	See conservation
Energy-efficiency measure	Refers to either an individual project conducted or technology implemented to reduce the consumption of energy at the same or an improved level of service. Often referred to as simply a "measure".
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.
First year cost of saved energy	The initial cost of implementing an energy-efficiency measure divided by the annual savings
Fixed O&M cost	An estimate of the fixed operation and maintenance cost for the reference plant, including operating and maintenance, labor and materials, and administrative overhead. Both routine maintenance, and major maintenance and capital replacement are assumed to be included.
Fexibility	Flexibility often refers to the ability of a power system to provide balancing reserves.
Forecast of demand or load	Estimating future demand for electricity (measured at the customer meter site) or load (measured at busbar at the interconnection point of generation and transmission). The difference between demand and load forecasts are mainly transmission and distribution losses.
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.
Futures	Circumstances over which the decision maker has no control that will affect the outcome of decisions. For example, futures consists of unique combinations of natural gas and electricity prices, population and economic growth, none of which are within the control of resource planners.
Gas 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.
Generation	The act or process of producing electricity from other forms of energy.
Geothermal energy	Thermal energy stored in the Earth's crust. Geothermal heat is caused by the convection and conduction of heat from the Earth's mantle and core, and from the decay of radioactive elements in the crust.
Head	The vertical height of water in a reservoir above the turbine.
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.
Higher heating value (HHV) / lower heating value (LHV)	Gas turbine heat rates and efficiency ratings may be based on the HHV or LHV value of natural gas fuels. The HHV value of natural gas fuel may be thought of as the Btu content which was paid for, and includes content that is not convertible into power. Depending on the hydrogen content of the fuel, a rule of thumb is that 11 percent of natural gas HHV Btu-content is not useful for power generation. The LHV is the HHV minus the heat of vaporization of the water vapor combustion product.
Hydroelectric power (hydropower)	The generation of electricity using falling water to turn turbo-electric generators.
Incremental annual savings	The difference between the amount of energy savings acquired or planned to be acquired as a result of energy efficiency activities in one year, and the amount of energy savings acquired or planned to be acquired as a result of the energy efficiency activities in the prior year.
Incremental cost	The difference between the cost of baseline equipment or service and the cost of alternative energy-efficient equipment or service.
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 and wind generating plants.
Infiltration control	Conservation measures, such as caulking and weatherstripping, generally referred to as air sealing measures, 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 (IOU)	A utility that is organized under state law as a corporation to provide electric power service and earn a profit for its stockholders.
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 cost of energy (LCOE)	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	Estimate of all direct costs of a measure or resource over its effective life. See system cost.
Load	The amount of electric power required at a given point on a system. Load is typically measured at the busbar.
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, can only be captured during a limited window of opportunity and are no longer available for development after that window at that given cost. For example, when a building is built or when a replacement refrigerator is purchased.
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.
Maximum achievable potential	The amount of energy or demand savings within a defined geographical area or population that can be achieved over the planning period assuming no financial barriers for the end-use customer.
Measure	See energy-efficiency measure.
Megawatt (MW)	The electrical unit of power that equals one million watts or one thousand kilowatts.
Megawatt-hour (MWh)	A basic unit of electrical energy that equals one megawatt of power applied for one hour.
MicroFin	A financial revenue requirements model that calculates the levelized fixed cost and the full levelized cost of energy (LCOE) for each resource reference plant. MicroFin calculates the annual cash flows which will satisfy revenue requirements over the plant lifetime. The annual cash flows are compressed and discounted into a dollar value – net present value (NPV).
Mid-C price/market price	The price of electricity traded on the wholesale spot market at the Mid-Columbia trading hub.
Mill	A tenth of a cent. The cost of electricity is often given in mills per kilowatt-hour.
Model conservation standards (MCS)	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.

Natural replacement	Equipment or systems that are replaced at the end of their life are considered a natural replacement opportunities. At this time, there is an opportunity to replace the equipment or system with a more efficient alternative, and are considered lost opportunities resources.
Net billing and net-billed plants	Net billing was 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 those plants. Bonneville, in turn, credited and continues to credit the wholesale power bills of the utilities to cover the costs of their shares in the thermal plants. Bonneville sells the output of the thermal plants, melding the higher costs of the thermal power with lower-cost hydropower. The term "net-billed plants" refers to the 30-percent share of the Trojan Nuclear Plant, all of the Washington Public Power Supply System's nuclear Plant 1 (WNP-1) and Plant 2 (today the Columbia Generating Station), and 70 percent of Plant 3. Of these, only the Columbia Generating Station remains in operation; plants 1 and 3 never were completed, yet their debt remains, and Trojan closed in the early 1990s).
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-energy impacts (NEI)	The quantifiable non-energy impacts associated with program implementation or participation; also referred to as non-energy benefits (NEBs) or co-benefits. Examples of NEIs include water savings, non-energy consumables and other quantifiable effects. The value is most often positive, but may also be negative (e.g., the cost of additional maintenance associated with a sophisticated, energy-efficient control system).
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 plan owners and operators. Non-utility generators include qualifying facilities, small power producers, and independent power producers.

Northwest Power Act	Passed by Congress on December 5, 1980, the Pacific Northwest Electric Power Planning and Conservation Act authorized the four states of Idaho, Montana, Oregon and Washington to form the Northwest Power and Conservation Council. The Act directs the Council to assure the Pacific Northwest region an adequate, efficient, economical and reliable power supply while also protecting, mitigating and enhancing fish and wildlife affected by the construction and operation of hydroelectric dams in the Columbia River Basin. The Act requires the Council develop a 20-year Pacific Northwest conservation and electric power plan which the Council reviews at least every five years. The Act also requires the Council develop a fish and wildlife program to protect, mitigate and enhance fish and wildlife affected by the region's hydrosystem and to include that program in the Council's subsequently developed power plan.
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 capital 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.
Peak (on, off, winter, summer)	WECC defines peak-load hours to be the 16 hours beginning at 6am and ending at 10pm. Off-peak hours are the remaining eight hours in the day. For Council analysis, the winter period is roughly defined as the months of October through March. The summer period runs from April through September. However, the most important months with respect to resource planning are December, January and February. Similarly, the most critical summer months for resource planning are July and August.
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 (PV)	Direct conversion of sunlight to electric energy through the effects of solar radiation on semi-conductor materials.
Potential assessments	Studies conducted to assess market baselines, future savings and costs that may be expected for different technologies and customer markets over a specified time horizon.
Power	Power is the rate of performing work, usually measured in units of kilowatts or megawatts.
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.
ProCost	A Council model used to estimate conservation costs and benefits; the hourly, daily, and seasonal savings; and capacity impact of efficiency measures.
Program administration cost	The cost incurred by the program administrator (often the utility) to deliver a conservation program. These costs include personnel, marketing, tracking systems, and any other non-incentive costs.
Public utility commissions (PUC)	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.
Ramp rate (energy efficiency)	The annual rate of acquisition for energy-efficiency resources over a period of time.
Real dollars	Dollars that do not include the effects of inflation. They represent constant purchasing power.
Reference plant	A collection of characteristics that describe a resource technology and its theoretical application in the region.
Region	See "Pacific Northwest."
Regional act credit	Used in the Northwest Power Act to give economic preference to conservation resources. When estimating incremental cost of an energy-efficiency measure, this cost is reduced by 10 percent of the value of the energy system benefits.
Regional Portfolio Model (RPM)	An agent based planning model that develops least cost or least risk resource strategies for the regional power system. The model uses embedded Monte Carlo simulations to generate load, peak demand, natural gas price, carbon tax, electricity price, and REC value distributions allow resource strategies to be tested over many potential futures.
Resource strategies	Actions and policies over which the decision maker has control that will affect the outcome of decisions. For example, the resource type, amount and potential timing of resource development.
Reliability	Under the NERC definition, a power system is reliable if it is adequate and secure.
	adequate: the electric system can supply the aggregate electrical demand and energy requirements of the customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements
	secure: the electric system can withstand sudden disturbances, such as electric short circuits or unanticipated loss of system elements.
Renewable energy credit (REC)	Represent the "green" attribute of energy produced by a qualifying renewable resource. One REC is equal to one megawatt hour of generation. Also known as renewable energy certificate, or a tradeable renewable energy credit (TREC).

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.
Renewable portfolio standards	Regulatory mandates enacted by individual states to increase the development and generation of eligible renewable resources. An RPS requires a certain percentage of electricity sales be met with renewable energy resources. In the Pacific Northwest, Montana, Washington, and Oregon all enacted RPS in the mid-2000's.
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.
Scenario	Combinations of resource strategies and futures that are used to "stress test" how well what resource strategies (what the region controls) performs in a futures that the region doesn't.
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 agriculture (e.g. dairy farms, irrigation) sectors.
Sensitivity study	A subset of scenario where a single input assumption is modified to assess the direction and magnitude of the impact of that parameter on the outcome. For example, fixing the range of natural gas prices to a lower or higher bound.
Simple payback	The time required before savings from a particular investment offset costs, calculated by investment cost divided by value of savings (in dollars). 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.
Stock	The quantity and characteristics of existing equipment or buildings in the region.
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 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.
Technical potential (energy efficiency)	An estimate of energy savings based on the assumption that all existing equipment or measures will be replaced with the most efficient equipment or measure that is both available and technically feasible over a defined time horizon, without regard to cost or market acceptance.
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.
Total resource cost (TRC) test	A cost-effectiveness test that assesses the impacts of a portfolio of energy-efficiency initiatives regardless of who pays the costs or who receives the benefits. The test compares the present value of costs of efficiency for all members of society (including all costs to participants and program administrators) compared to the present value of all quantifiable benefits, including avoided energy supply and demand costs and non-energy impacts.
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.
Turnover rate	The portion of existing units that will be naturally replaced each year due to failure, remodeling, or renovation. It is usually calculated as one divided by the equipment average service life. Under the assumption that if equipment lasts for 10 years, one-tenth of the units in existence will be replaced each year. This factor is not used in the retrofit market, where inefficient equipment is replaced before its natural life is over. Nor is it used for new construction analyses, where all new equipment is eligible for efficiency upgrade at the time of purchase.
U-value	The measure of a material's ability to conduct heat, numerically equal to 1 divided by the R-value of the material.
Variable energy resource	A generating resource that is non-dispatchable due to the fluctuating nature of its energy production. For example, wind power and solar.
Variable O&M cost	An estimate of the variable operation and maintenance cost for the reference plant, including all costs that are a function of the amount of power produced. This includes consumables such as water, chemicals, lubricants, and catalysts, and waste disposal.
Watt	The electrical unit of power or rate of energy transfer. One horsepower is equivalent to approximately 746 watts.

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