



The State of the Columbia River Basin



Northwest **Power** and **Conservation** Council
FISCAL YEAR 2017 ANNUAL REPORT

To Congress and Citizens of the Pacific Northwest
October 1, 2016 - September 30, 2017



Submitted to the
Committee on Energy and Natural Resources
United States Senate

Committee on Energy and Commerce
United States House of Representatives

and

Committee on Natural Resources
United States House of Representatives

The Northwest Power and Conservation Council was established pursuant to the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Public Law 96-501) by the states of Idaho, Montana, Oregon, and Washington. The Act authorized the Council to serve as a comprehensive planning agency for energy policy and fish and wildlife policy in the Columbia River Basin and to inform the public about energy and fish and wildlife issues and involve the public in decision-making.

This annual report has been developed pursuant to Section 4(h)(12)(A) of the Northwest Power Act. The Council's bylaws, which include its organizational structure, practices, and procedures, are available to the public at www.nwcouncil.org/about/policies/bylaws.

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To members of Congress and citizens of the Pacific Northwest:

For the operators of the Northwest's power system, 2017 was another challenging year. While our system continues to be low-cost and hydropower-based, changes in the way electricity is utilized, produced, stored, and delivered are sweeping the entire West.

The most visible change, aside from sustained low natural gas prices, is the rapid ascendancy of renewable energy resources, especially in California where conventional and rooftop solar systems are being built at a breakneck pace to substantially reduce carbon emissions. This threatens to disrupt power markets by flooding the Northwest with electricity when California's supply exceeds its demand for power. Northwest utilities are evaluating how to function efficiently under these new conditions.

Other trends that could transform the power system include more electric vehicles; utility-scale battery systems for storing renewable energy; new and more flexible gas-fired power plants to back-up the wind and solar resources; and innovative alternatives to building new high-voltage transmission lines.

The Council invited a series of utility industry leaders to share their thoughts on the impacts to the region and the steps we should take to leverage them to our advantage. What will the system look like in a decade or two? We don't know yet, but we're willing to bet that it will continue to be low-cost, low-carbon, reliable, and efficient.

The Northwest's second largest energy resource after our clean, renewable hydropower base is energy efficiency. In 2016, the most recent year of available data, the region added another 275 average megawatts of efficiency at a cost of \$475 million, about \$100 million less than the cost to build new generating plants. This brings the region's total savings to about 6,300 average megawatts. The Council's Seventh Northwest Power Plan estimates it will increase by another 4,000 average megawatts by 2035.

The Council also maintained its focus in 2017 on protecting fish and wildlife affected by the Columbia River Basin hydropower system. With our partners, we worked to control invasive northern pike and prevent the spread of invasive quagga and zebra mussels into the basin. And, we are relentlessly working to conserve the natural legacy of the Columbia River Basin, including protecting and rebuilding populations of threatened and endangered species of salmon and steelhead.

The Council greatly appreciates your continued interest and support.

Sincerely,

Steve Crow, Executive Director

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Energy, Fish, Wildlife: The State of the Columbia River Basin

Perhaps no industry has been swept along by change as quickly nor affected as acutely as electricity, here and across the nation

Here in the Pacific Northwest, where we enjoy the largest carbon-free, low-cost power supply in the nation, a hydropower system that provides more than half of our electricity, a future that only a generation ago would have seemed fanciful if not impossible – electric vehicles; smart, Internet-connected devices from phones to refrigerators; massive amounts of low-cost electricity from the wind and sun, particularly from excess California production – not only is upon us, it’s washed over us like a flood. Perhaps no industry has been swept along by change as quickly nor affected as acutely as electricity, here and across the nation. Rapidly evolving new realities of power generation, transmission, cost, and demand present ongoing challenges to providers of an essential service.

A number of factors are driving the change, including:

- Flat load growth — less than 1 percent per year in the Northwest, similar to the rest of the nation
- Government policies mandating renewable resources
- Electrification of transportation
- Low-cost natural gas from fracking
- Distributed resources — from rooftop solar to electric vehicles and smart thermostats — giving

consumers more choices and control over their energy consumption

- Large corporations acquiring their own electricity resources and depending less on utilities

On the West Coast, the rapid advent and declining cost of renewable energy, particularly solar power, challenges the traditional business model of regulated utilities with guaranteed rates of return on long-term investment in power supply and generating plants.

While solar is several times more expensive than existing hydropower, its cost is competitive with the cost of power from a new natural gas-fired power plant. Solar power also is limitless and consistently available, even on cloudy days, if at varying levels of intensity. Importantly, solar power declines as the sun goes down and the power system must be backed up with other resources that can be added quickly, such as hydropower and, increasingly, short-term battery storage.

The explosion of solar and wind power, with their “fuel” supply that varies as the wind blows and as day turns to night, is sending shock waves through the traditionally staid and stable electric power industry. At times, excess low-cost renewable energy forces higher-cost traditional





Libby Dam, photo by Tony Grover

coal and gas-fired energy offline, a new reality for the utility industry.

Increasingly over the last year, renewable power served a larger share of baseload needs in the Northwest, gradually encroaching on the role long played by fossil fuel plants. This change will accelerate as the Northwest loses 1,800 megawatts of generating capacity by 2022 due almost entirely to retirements of coal-fired power plants, which can be expensive to operate – fuel costs, operations, maintenance — compared to renewable energy plants. Utilities have plans to replace the lost power with a combination of new solar, wind, and natural gas-fired power plants, and energy efficiency.

The situation in Fiscal Year 2017 is not unique to the Northwest, but it presents a particularly engaging challenge for the region because our primary source of electricity, hydropower, also depends on a variable fuel supply – rain and snow. As new renewable energy from California, mostly solar power, floods the wholesale power market there is less opportunity to sell surplus energy from the Northwest, mostly hydropower, to the Southwest, and a corresponding loss of potential revenue for sellers such as the Bonneville Power Administration.

Bonneville, the region’s largest electricity provider, faces an increasingly delicate and difficult balancing act, having to integrate increasing amounts of renewable energy into the power grid while being careful not to displace too much hydropower by spilling water over dams. Excessive spill can generate excessive amounts of dissolved gases, which can be stressful for fish, and Bonneville has responsibilities to fish and wildlife under the Northwest Power Act and to threatened and endangered fish species under the Endangered Species Act. This is a particularly sensitive concern in a year like 2017 when steelhead and sockeye salmon returned from the ocean in numbers far below recent 10-year averages.

In an open letter to the region in July, anticipating future fish and wildlife mitigation costs (a portion of Bonneville’s power sales revenue pays for implementation of the Council’s Columbia River Basin Fish and Wildlife Program), Bonneville described upcoming Fiscal Year 2018 as a period of “navigating a volatile and changing energy marketplace, which impacts BPA’s financial situation and available funds.” A 5.4-percent

average increase in the rate Bonneville charges its utility customers, announced the same month, was prompted partly by Bonneville’s projection of reduced surplus power sales to California and the Southwest in the future, thanks to a West Coast power market awash with low-cost renewable energy.

Surplus power sales are an important part of Bonneville’s revenue stream, and a decline in those sales could inject an air of uncertainty into Bonneville’s spending on fish and wildlife mitigation. Sources of that uncertainty include not only the potential for reduced surplus power sales, but also possible increased fish and wildlife mitigation costs associated with Endangered Species Act litigation, development of a court-ordered environmental impact statement on Columbia and Snake river federal dam operations, and the costs associated with the potential renegotiation of the Columbia River Fish Accords.

As inexpensive renewable power pours into the West Coast wholesale market, Bonneville finds itself in an increasingly competitive situation that may lead to difficult budgetary decisions. Thus, sunshine in California could have a chilling effect on Bonneville’s budget, with implications for fish and wildlife recovery if Bonneville has to reduce spending. Nevertheless, the Council is committed to work with Bonneville to ensure that the fish and wildlife program continues to be efficient and data-driven and to produce outcomes that can be measured and assessed.

A Northwest power system or a West Coast power system?

It’s not just Bonneville, but utilities up and down the West Coast that face a serious challenge, one that must be resolved to keep the power flowing at 60 cycles per second 24 hours a day, regardless of the source of generation.

The West Coast power supply began absorbing large amounts of new renewable energy, particularly wind and solar, in 2011, a trend that continued at a moderate pace until 2016 and 2017, when the additions accelerated, particularly in California. By the middle of 2017, California had more than 19,000 megawatts of solar generating capacity installed – 5,000 of it added just in



2016. On one day in March 2017, for the first time, solar power met half of California's demand for electricity.

The huge influx of low-cost solar power that day forced other, more expensive resources off the system and drove wholesale power prices into negative territory for eight hours – power suppliers paid others to take their power so generators could continue to run rather than go through the complex and costly shutdown and restart process. This is a trend that the Council expects will continue, if not accelerate, in the future, and one that emphasizes the need for collaboration and cooperation among power suppliers and operators of the high-voltage transmission system, notably Bonneville, which owns and operates about 80 percent of the high-voltage transmission in the Northwest.

The tide of new renewable energy does not appear to be receding. California plans to add another 4,000 megawatts of solar capacity by 2020, and 10,000-20,000 more by 2030, surpassing the ability of the

existing transmission infrastructure. In the Northwest, the transmission system already is subscribed to near capacity, which will make it difficult, if not impossible, to bring large amounts of solar power from reliably sunny places east of the Cascade Mountains to the dense urban areas west of the mountains like the Seattle and Portland areas – unless new lines are built or operational changes can free some space on existing lines.

The challenge for energy planners and policymakers today is to be prepared to integrate more and more variable-output renewables into the power supply without interruption. As the sun declines toward evening and solar power output drops, or as winds die any time of day, other power supplies need to make up the difference for anywhere from a few minutes to several hours. This imbalance has spurred interest in better coordination of the West Coast power system, and also the creation of a new “imbalance” power market to provide short-term power to keep the system stable.



Libby Dam looking downstream at the Kootenai River, photo by Tony Grover

California's largest power grid, the California Independent System Operator (CAISO), is studying a coordinated dispatch of power with transmission grids in other West Coast states in order to better integrate renewable energy and achieve cost savings through improved operational efficiencies. Some West Coast utilities have expressed interest in the concept including, for example, Portland-based PacifiCorp, which delivers power in parts of six western states including California. Progress has been slow as other states consider the potential impacts of ceding dispatch of electricity to a single operator in another state and address concerns including governance of a West Coast power market and impacts on ratepayers.

Meanwhile, the CAISO is coordinating a multi-state energy imbalance market (EIM) to make power available quickly in response to fluctuations in the output of renewable power. Participation in the EIM increased in the last year, and the Council expects more utilities will join in the near future.

Meeting the challenge

Integrating large amounts of variable-output generation into the power supply is a challenge, but it is not without answers. The Council is researching the development of utility-scale battery storage and its role in the power system to provide short-term power when solar and wind power output subsides. The Council also is looking into the cost, performance, and technology trends of solar power, particularly solar photovoltaic power, in the Northwest, and also ocean wave power and advanced geothermal technologies. Utility-scale solar, geothermal, and ocean wave power plants, possibly paired with large battery systems, could provide important power-balancing services to the Northwest and West Coast power supply.

While there are challenges associated with future power supplies, there also are challenges on the customer side of the meter, notably the proliferation of consumer electronic devices – everything from smart phones to smart thermostats. The Council plans to take a closer look at the implications of the growing digital economy, including concerns about privacy, security, and standards

for integration, as well as environmental concerns over battery materials and the safe disposal of used batteries.

The Council also is taking a close look at the future of electrifying transportation, including cars, trucks, and buses. The Council anticipates a significant increase in regional power demand for charging all-electric and electric hybrid vehicles, from about 8 average megawatts today to 160–650 average megawatts over the next 20 years. One day, electric vehicles could be used to store energy and put it back into the grid as it is needed. Currently that's not possible without violating vehicle warranties, but manufacturers, utilities, and others are working on vehicle-to-grid standards.

Meanwhile the Northwest energy system continues to become more efficient as utilities invest in low-cost, zero-fuel, zero-emission energy efficiency measures. Since 1978 the region has reduced power demand through efficiency improvements by around 6,000 average megawatts, an amount that has been growing by several hundred average megawatts per year. The savings total is roughly the electricity-use equivalent of five cities the size of Seattle.

These savings directly affect the people of the Northwest by reducing electricity bills. Improving efficiency has other benefits, as well. Energy efficiency is a capacity resource by reducing peaks during periods of high demand for power. Efficiency improvements extend the benefits of the region's low-cost hydropower system by making more of it available over time, meaning that less coal and natural gas are burned in power plants and fewer emissions are released into the air. Reduced demand for power also reduces the strain on existing transmission lines.

Clearly, the increasing efficiency of the regional power system has multiple economic, environmental, and infrastructure benefits for the Northwest. An added benefit, one that is becoming increasingly clear, is that improved efficiency acts as a hedge against the uncertainty of the region's energy future.

And the future, while bright with the growing supply of renewable resources, is, at the moment, anything but certain.





Lake Pend Oreille, photo by Tony Grover

Council Energy Overview

Implementing the Seventh Northwest Power Plan

The Council's Seventh Northwest Power Plan, completed in 2016, includes an action plan to implement the program over the six years through 2021 (the Council revises the 20-year Power Plan every five years). In 2017, the first year of implementation of the current plan, the Council and its staff focused on implementing action plan items in collaboration with the Bonneville Power Administration, which implements the plan, Bonneville customers, and others in the regional electric utility industry.

Cost-effective energy efficiency is the most important resource in the Power Plan to meet future demand for electricity. The action plan identifies minimum goals for improving the efficiency of the regional power system of 1,400 average megawatts by 2021, growing to 3,000 by 2026 and reaching 4,300 average megawatts of new efficiency by 2035. The Council staff is working with small and rural utilities to better understand barriers to their participation in efficiency programs, such as reduced revenue from lower power sales as the result of improved efficiency; limited staff and limited access to contractors to install efficiency measures; and the availability of energy-efficient products compared to larger economic markets. The staff also is working with utilities and Bonneville to identify hard-to-

reach markets for energy efficiency, such as low- and moderate-income customers.

Implementing [demand response](#) measures is the second-most important action the region needs to take to meet new demands for power, especially new demands that require additional capacity in the system. Demand response, which is a voluntary and temporary change in consumers' use of electricity when the power system is stressed, is used in the Power Plan to meet fall, winter, and summer peak demands primarily under low-water and extreme weather conditions. The Power Plan has a number of items intended to encourage development of demand-response resources.

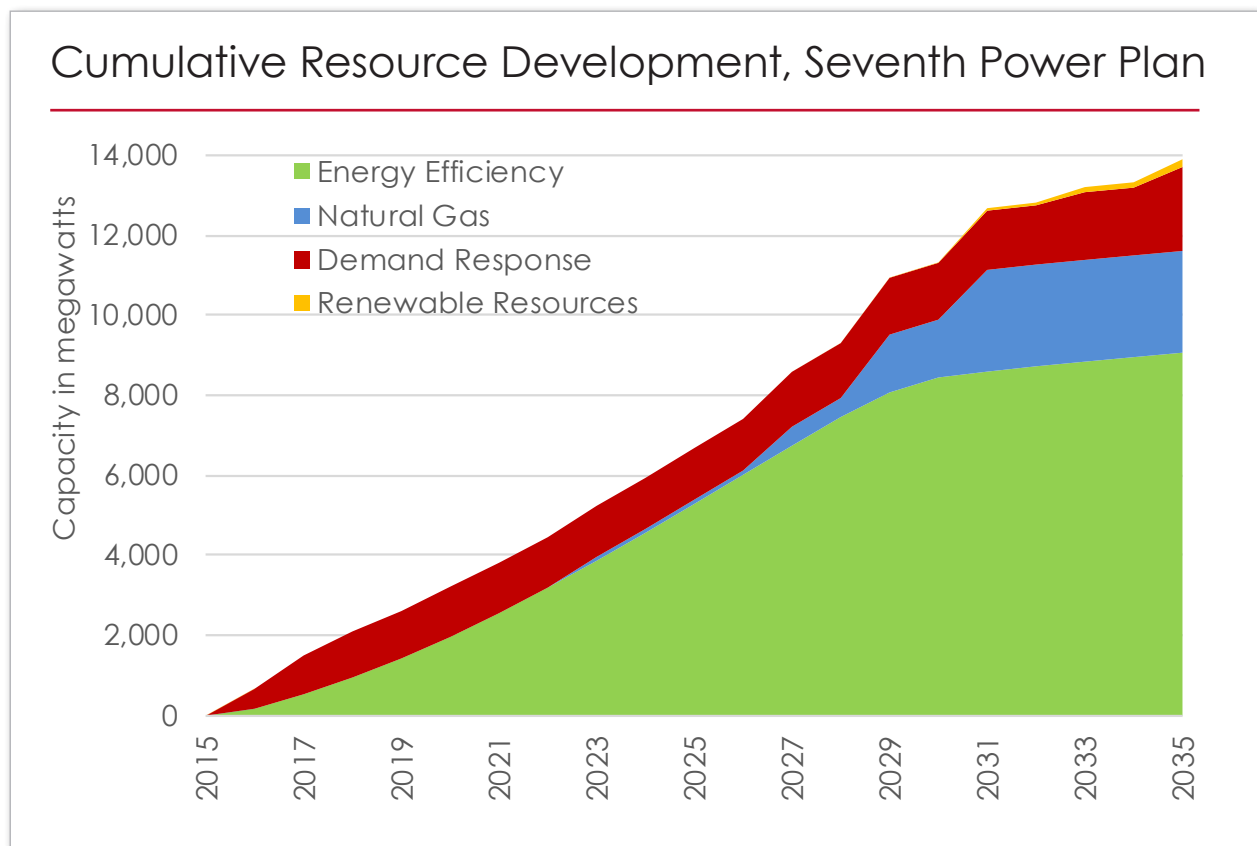
Northwest again leads nation in energy efficiency investments

Based on the results of a new regional survey, the Council [reported](#) in November 2016 that the Pacific Northwest reduced demand for electricity by 1,739 average megawatts over the previous six years — enough saved electricity to meet the annual power demand of 1.25 million homes and equal to the output of four new average-size natural gas-fired power plants. The annual [Regional Conservation Progress](#) survey found that in 2016 alone, 284 average megawatts were saved.



The six-year savings were achieved through a variety of sources, including utility-funded programs, the proliferation of energy-efficient consumer products, and building codes that improve energy efficiency. Most of the savings in 2016 (47 percent) occurred in residential lighting, heating, air conditioning, appliances, and the proliferation of smart technologies and devices such as connected thermostats. Commercial building improvements accounted for 33 percent; improvements in industrial buildings 16 percent; and the remaining 4

also saved Northwest electricity consumers about \$4.06 billion in 2016, the estimated additional cost consumers would have paid if the region had an additional 6,000 average megawatts of load. The efficiency also lowers carbon emissions by an estimated 23.5 million metric tons a year, the carbon output of 5 million passenger vehicles. The Seventh Power Plan recommends that an additional 1,400 average megawatts of efficiency investments can be achieved between now and 2021.



percent was in agricultural, irrigation, and other sectors of the economy.

The region's utilities spent \$440 million on energy efficiency improvements in 2016 at an average cost of \$16.50 per megawatt hour, a bargain compared to the cost of a new power plant fueled by natural gas (\$71 per megawatt-hour) or a solar power plant (\$61-\$91) or wind (\$102), according to the survey.

The savings add to four decades of energy efficiency improvements in the Northwest, now totaling the power equivalent of five cities the size of Seattle. Efficiency

Energy efficiency improvements also have capacity benefits in addition to reducing energy demand. The Council estimated these benefits in the Seventh Power Plan. Using best-available load shapes by measure category, the Council estimated the 5,100 average megawatts of efficiency called for in the plan, to be acquired by 2035, translates to 9,700 megawatts of capacity savings during the regional peak winter hour (6 p.m. on a weekday in December, January, and February) and 6,600 megawatts of capacity savings during the regional peak summer hour (6 p.m. on a weekday in July and August).

State and federal energy codes produce big savings

In 2014, state and federal energy-efficiency codes for appliances, lights, motors, and other devices [reduced electricity consumption](#) by more than 2,500 average megawatts. Federal standards generated more than 20 percent of the cumulative regional energy savings in 2014. Most of the new federal standards – 79 percent – affect energy use in homes, but the standards also affect 46 percent of the average energy use in commercial buildings and 19 percent of the average energy use in industrial buildings.

Federal energy standards are valuable for several reasons:

- They're low-cost since they're not subject to the administrative costs of utility-sponsored energy efficiency programs
- Standards affect the entire market for a product, resulting in greater overall energy savings
- The cost of complying with a standard is paid by the consumer when purchasing a new appliance, for example, rather than by an industry or sector of the economy

Regional savings estimates for 2015 and 2016 haven't been calculated, but they are expected to produce between 1,200 and 1,500 average megawatts of savings by 2035. That is about one-quarter to one-third of the Council's Seventh Power Plan's 20-year energy efficiency goal of 4,300 average megawatts. There is some risk, however, that not all of these standards will be implemented or implemented as scheduled.

Meanwhile, the effect of standards adopted before 2016 have had a nationwide impact. The Appliance Standards Awareness Project and the American Council for an Energy-Efficient Economy [reported in 2017](#) that the average American family saved nearly \$500 on utility bills in 2015 as a direct result of the new standards for appliances and lighting. Total business utility bill savings from standards reached nearly \$23 billion in 2015, according to the report. That amount is equal to 8 percent of total business spending on electricity and natural gas.

Regional Technical Forum continues work to confirm energy savings

The Regional Technical Forum, a committee of energy efficiency experts that advises the Council, continues to work on peer-reviewed analyses of energy efficiency measures and products that help Northwest electric utilities, consumers, and businesses pursue an ever more efficient electric energy system.

In its [annual report for 2016](#), the Forum reported that it had adopted updates to a number of significant efficiency measures including heat pump water heaters, measures for multifamily new construction, electronic thermostats, and non-residential lighting while at the same time taking steps to make its work products more accessible and comprehensible including a complete redesign of its website. The Forum also approved the first calculator approach for quantifying energy savings from construction of an efficient home above minimum code requirements.

In its [work plan and business plan for 2018](#), the Forum anticipates that about 30 percent of existing measures and standard protocols will require updates due to approaching sunset dates. Additionally, the Forum likely will see the development of several new measures and standard protocols.

Forecast for electricity demand is flat, but new generation will be needed

Despite predictions of economic and population growth, the Council expects the long-term growth in [demand for electricity](#) to be flat. This is mainly due to the region's strong focus on improving [energy efficiency](#), but some industrial electricity demand also has declined.

Despite flat load growth, the Council predicts that the Northwest will need to add about 400 megawatts of effective capacity — generating capability that can be counted on during any shortfall hour — in order to maintain an adequate regional power supply. The planned retirements of the Boardman, Centralia 1, and

North Valmy coal plants by 2021 will mean losing 1,457 megawatts of generating capacity, and an additional 352 megawatts is scheduled to retire by 2022. The good news is that predicted energy efficiency savings of 1,570 average megawatts will help replace the coal plant generation.

Each year, the Council assesses the five-year adequacy of the region's power supply. The Council defines an adequate supply to have no more than a 5 percent chance of a shortfall.

Key points in the Council's [2017 adequacy report](#) include:

- The updated load forecasts for 2021 and 2022 project a general trend toward lower winter peaks and higher summer peaks
- This translates into a lower likelihood of winter problems but increased probability of summer shortfalls
- Depending on actual load growth and availability of surplus California generation, the regional need for new capacity ranges from none at all to about 1,000 megawatts

[Demand response](#), which plays a big role in the Council's energy strategy for the region, could help fill the projected 2021 gap. The Council recommended developing 600 megawatts by 2021.

In 2017, the Council issued a report on the [value of the Federal Columbia River Power System](#) citing, among other things, the immense supply of carbon- and emission-free power and the system's flexible dispatch capability, which helps integrate wind and solar power into the regional power supply.

Northwest carbon footprint is low and getting lower

The electricity sector of the economy is the primary source of carbon dioxide emissions in the United States from burning fossil fuels in power plants, followed closely by the transportation sector. Together, they

account for close to 70 percent of the nation's carbon dioxide emissions.

However, that is not the case in the Pacific Northwest. Here, thanks to our primary source of electricity, hydropower, and our region's aggressive acquisition of demand-reducing energy efficiency, we use less fossil fuel to generate power. The Pacific Northwest's annual [carbon dioxide emissions](#) from electricity have been flat over the past 15 years. In 2015, the annual carbon dioxide emissions were around 51 million metric tons—close to what they were in 2000—yet during that time they've ranged from 43 to 60 million metric tons. Nationally, emissions from electricity have declined from around 2,300 million metric tons in 2000 to about 1,900 million metric tons in 2015.

The Pacific Northwest is fortunate to have an abundant hydropower system, providing on average over 50 percent of the region's annual energy. Energy efficiency is the second-largest resource in the region, totaling around 6,000 average megawatts since 1978. These efficiency improvements keep load growth down and provide an alternative to developing new resources.

Coal and natural gas are next, followed by wind, nuclear, biomass, geothermal, and solar. Thermal power plants dominate the United States' resource mix. Coal and natural gas accounted for 66 percent of the nation's energy in 2015, followed by nuclear, hydro, renewables, and petroleum. The difference in the resource mix between the Northwest and the rest of the country is an important distinction. While hydropower drives the dispatch of other resources here, it plays a much smaller role nationwide. For example, in good hydro years, when runoff is above average, thermal plants in the Northwest are dispatched less often and emissions are lower. In poor hydro years, the system relies more on thermal resources and emissions increase.

Electric vehicles could save consumers money while reducing emissions

A [Council analysis](#) suggests significant economic and environmental benefits to Northwest consumers and utilities from electrifying public transit vehicles and school buses. The analysis found that between 2017 and 2035, the savings could total more than \$12 billion in reduced fuel costs and \$4 billion in reduced maintenance costs.

The region would also lower carbon emissions by 42 million metric tons. In the Northwest, the transportation sector of the economy produces about 80 million metric tons of CO₂ per year — 63 million metric tons from gasoline use. But as more electric car options have come on the market, their regional sales have increased. By the end of 2016, there were more than 34,000 all electric and plug-in hybrid cars on the road. They represented about 8 average megawatts of the region's load and reduced CO₂ emissions by 95,000 metric tons.

According to the analysis, if electric public buses and school buses replaced those that use diesel or gasoline, by 2035 urban transit bus fuel costs would be lower by \$1.8 billion and emissions would be lower by 7 million metric tons. Also, operating cost savings would be more than \$1 billion. School bus fuel costs would be lower by \$400 million and operating costs by another \$400 million. Emissions would be lower by 1 million metric tons.

The Council expects demand for electricity to power electric vehicles to grow significantly and that, at the same time, the efficiency of both electric and fossil-fuel vehicles to improve over time.

Wind power development declined, but may be reviving

In the Pacific Northwest, wind power accounts for almost 10 percent of the annual electricity supplied to the grid. However, there has not been much development in recent years, largely due to relatively flat load growth and utilities being well poised to meet their



Wells Dam control booth, photo by Tony Grover



near-term renewable portfolio obligations. The region’s success in [achieving energy efficiency](#) has played a big role in enabling us to meet our demand.

The long-term renewal of federal tax incentives for wind development through 2019 provides some stability to developers. In addition, Oregon passed Senate Bill 1547, which updates its renewable portfolio standard to a new target of 50 percent by 2040 (and raised the intermediate years’ targets as well). Additionally, several closures of baseload coal plants have been announced in the region within the next decade. All of these events will likely mean a second wave of renewable development in the region, the Council believes. This time around however, wind will be competing with the increasingly cost-competitive [generation from solar photovoltaic technologies](#).

Along with smarter controls in wind turbines, allowing for better communication and integration of its power into the grid, wind turbine components have also advanced, with larger and more efficient machines on the horizon. By 2030, experts predicted a 24 percent drop in the cost of wind energy from today’s cost, and a 35 percent drop by 2050.

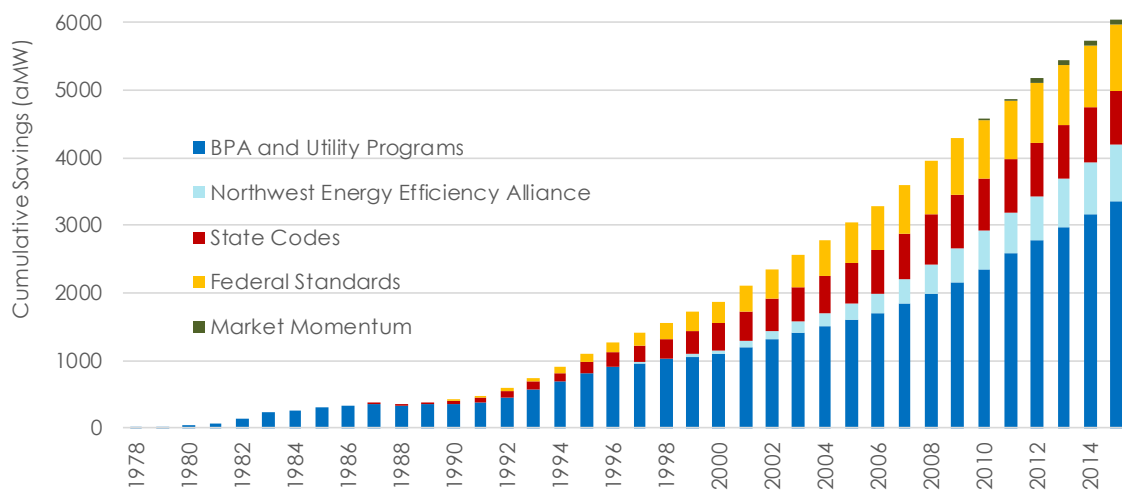
Council tracks growth and implications of emerging smart technologies

The Council is taking a closer look at the implications of the growing digital economy and the explosion of personal electronic devices. This includes concerns about privacy, security, and standards for integration, as well as concern for the environmental impacts of battery disposal.

In the span of a generation, the Internet, and the innovative technologies devised to use it, from the personal computer to smart phones, has transformed virtually every aspect of our lives. The number of connected devices is expected to continue growing.

The Council [reported on this trend](#) and potential effects in the Northwest in October 2016. According to the report, one provocative example is lighting, which is a key pathway to an interconnected smart home. Smart, solid-state lighting that can be controlled through connected devices to turn on or off, adjust brightness, or change color, have other uses, too. They have the potential to provide time of use metering, security

Since 1978 the region has developed around 6,000 aMW of savings



monitoring, and detect radiation levels as well, according to the report.

For office buildings, connected sensors offer the same advantages as in the home: efficiencies in heating and cooling systems, lighting, and security, and also in improving communication systems. In retail businesses, devices will enable seamless shopper discounting, inventory and ordering, and monitoring store traffic and customer behavior. Medical facilities will be able to know when a patient has fallen or is stressed. And in manufacturing and industrial applications, predictive analytics and process monitoring are expected to improve production and reduce downtime.

Council explores value of energy storage to the regional power system

In a [whitepaper](#) issued in the fall of 2017, the Council, in collaboration with a diverse group of stakeholders and subject matter experts, explored current and future expected regional energy-storage policy and development activity.

Energy storage using various types of large batteries and pumped hydropower storage is a topic of keen interest for consumers, utilities, regulators, and decision-makers in the Northwest and across the country. Recent generating plant retirements, regulatory changes, technology innovations, and strong year-over-year growth of variable-output resource generation, like wind and solar, have led policy-makers and system planners to investigate whether and how energy storage may be deployed to increase power system reliability and lower consumers' costs.

According to the paper, one type of energy storage, molten salt thermal storage, accounts for most of the approximately 1,000 megawatts of capacity and 5,400 average megawatts of energy added to the nation's energy-storage system in recent years. For comparison purposes, the sustained two-hour peaking capability of the Federal Columbia River Power System is 15 to 18 times larger. Across the nation, pumped hydropower storage accounted for nearly 96 percent of the total

installed energy storage capacity in 2013 and 93 percent in 2016.

While nationwide the rate of newly commissioned projects increased more than 300 percent in 2015 compared to previous years, only about 200 megawatts of new storage was added to the nation's power supply. However, the cost of storage devices is falling, and this should spur more interest in the technology, according to the paper. Currently there are 17 operating energy storage projects in the Northwest totaling about 324 megawatts of capacity.



Council Fish & Wildlife Overview

Columbia River Basin Fish and Wildlife Program implementation

In Fiscal Year 2017, the Council conducted a review of progress under the latest version of the Program, which is revised every five years. 2017 is roughly the half-way point for the 2014 Program. For the review, Council staff assessed progress in implementing the 22 strategies in the Program and concluded there is progress in implementing many of them, but not all.

Progress was noted in strategies including:

- Improving ecosystem function and fish and wildlife habitat
- Controlling or eradicating non-native and invasive species of fish and freshwater mussels
- Reducing predation of fish by other fish, sea lions and fish-eating birds
- Protecting and improving water quality by 1) better understanding the effect of toxic contaminants in rivers; 2) working to improve water temperatures for fish, and 3) reducing total dissolved gas concentrations at dams
- Assessing the potential impacts of climate change on fish and wildlife

- Evaluating the effectiveness of fish hatcheries (the Program supports 40 artificial fish production projects, 23 of which are directly associated with the 14 Program-funded hatchery facilities; the remaining 17 projects are not associated with Program facilities)

Some strategies have not experienced as much progress.

These include:

- Establishing state-designated habitat “strongholds” to protect wild fish
- Securing federal funding for research into Columbia River pollution and effects on fish
- Enabling dam passage for sturgeon
- Developing assessments of fish and wildlife losses attributable to dam operations as opposed to construction

The staff also noted progress in other areas of the Program that are not tied to specific strategies. For example:

- Developing and refining Program biological objectives
- Revising the program’s research plan
- Forming, with Bonneville, work groups to 1) identify needed maintenance at Program-funded facilities and 2) identify cost savings (about \$650,000 for Fiscal Year 2017 and between \$1 million and \$1.3 million in fiscal years 2018 and 2019)



Sea lions at Astoria, Oregon, photo by Tony Grover

Sea lions feast on spring Chinook in the lower Columbia River, again

Preliminary data compiled by the U.S. Army Corps of Engineers suggests that high numbers of sea lions in the tailrace of Bonneville Dam may have killed a large portion of the below-average spring Chinook salmon run in 2017. The Corps [reported](#) that about 5,000 adult salmon and steelhead were consumed between January and the first week of June – 82 percent of them Spring Chinook, a run that includes threatened and endangered species. Because the Chinook run was only about half of what was predicted, and far below the recent 10-year average, the impact of sea lion predation in 2017 may have been large, the Corps concluded.

Between 2004 and 2016, California and Steller sea lions are estimated to have taken about 68,000 adult salmon and steelhead in the Columbia River near Bonneville Dam, the first dam salmon and steelhead encounter when they return from the ocean to spawn. In addition, between 2006 and 2016, Steller sea lions are believed to have consumed approximately 12,500 white sturgeon below the dam. Sea lion predation on Pacific lamprey has also increased in recent years with 85 observed being taken in 2014, 196 in 2015, and 501 in 2016.

These numbers, however, reflect only the fish observed being consumed within 1/4 mile of Bonneville Dam. State and federal researchers who have studied predation in the entire 146 miles between the ocean and the dam believe that a significant portion of the annual spring Chinook salmon run is lost to marine mammal predation, perhaps as high as 45 percent.

The Council supports the Endangered Salmon and Fisheries Predation Prevention Act, bipartisan legislation introduced in the House by Congresswoman Jaime Herrera Beutler (R-WA) and Congressman Kurt Schrader (D-OR), and in the Senate by Sen. James Risch (R-ID). The Council expressed its support for the legislation in a [letter](#).

Studying salmon reintroduction above Chief Joseph and Grand Coulee dams

The Council's 2014 Fish and Wildlife Program contains a strategy to study the reintroduction of anadromous fish into areas blocked by dams, notably the area upstream of Chief Joseph and Grand Coulee dams. The program measure lays out a phased, scientific approach to investigate the feasibility of reintroduction. Phase 1 includes the task of evaluating the suitability of habitat above the two dams to support anadromous fish. The Council issued a request for proposals and then chose the Spokane Tribe of Indians to conduct the habitat feasibility study, which is expected to be completed in 2017.

Phase 1 also includes a task to identify and evaluate the current methods and emerging technologies of various fish-passage systems used either at high-head dams or those that could be applied to dams of any size and capacity. The Council prepared a paper on the topic. After a public comment period in the fall, the Council [issued the paper](#) in December 2016.

Working to prevent an invasion of Northern Pike

Through the Council's Fish and Wildlife Program, the Spokane and Colville tribes are working to halt the spread of invasive northern pike in Lake Roosevelt, the reservoir behind Grand Coulee Dam. Pike, a voracious predator, have been found in the northern end of the lake near the Canadian border. Popular with anglers but not with fishery managers, northern pike can grow to a meter in length and consume pounds and pounds of game fish like kokanee and westslope cutthroat trout. It isn't clear how northern pike

got into the lake. They may have been introduced illegally or they may have drifted downstream from infested waters upstream.

Regardless how pike got into the lake, they need to go before they take over, ruin fisheries established by the tribe and the state, and, perhaps pass over Grand Coulee and Chief Joseph dams. If they become established downriver, they could wreak havoc on salmon and steelhead. The tribes and other partners including the Washington Department of Fish and Wildlife, launched a public information campaign in 2016 to raise awareness and encourage anglers to keep or destroy the pike they catch rather than releasing them back into the lake. Research by the tribes shows evidence of different age classes of pike, suggesting the Lake Roosevelt population is growing. In 2016, the Council approved an emergency allocation to the Spokane Tribe to purchase more gill nets to broaden the reach of the research and try to remove more pike from the lake.

States, Council work to keep invasive mussels out of the Northwest

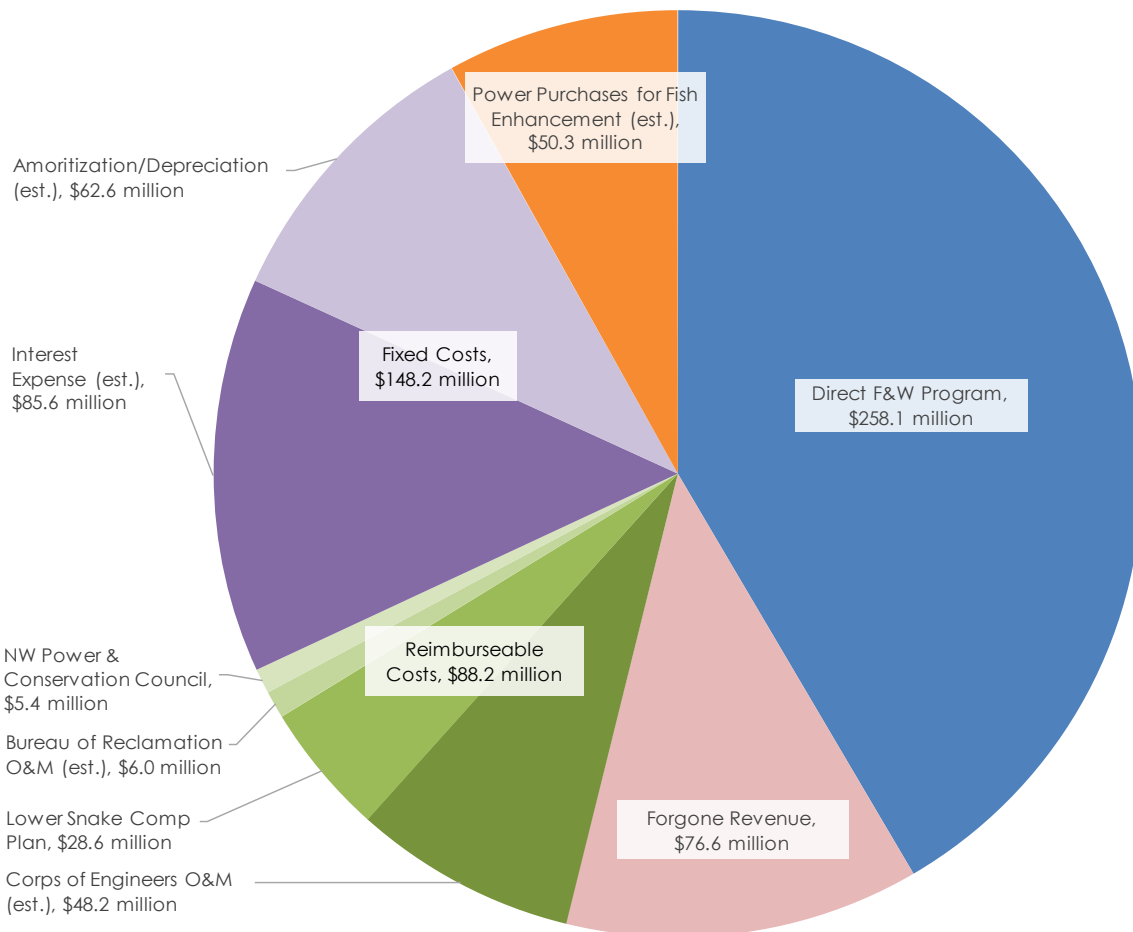
All four Northwest states, their fish and wildlife departments and federal river and power agencies are working together to prevent an invasion of invasive zebra and quagga mussels into Northwest waters, including the Columbia and Snake rivers. Zebra and quagga mussels have become established in lakes and rivers in the Midwest and Southwest, but so far not in the Northwest.

The freshwater pests, which can survive out of water for several weeks, adhere to watercraft and can be transported from infected lakes and rivers. Once they take hold, colonies expand rapidly and form solid masses of shells that can clog water intakes on submerged infrastructure including dock pilings, irrigation intakes, and hydroelectric dams. It has been estimated that the combined economic impact of a Northwest-wide infestation (including British Columbia) could be nearly \$600 million per year.

Watercraft inspection stations, funded by the states and the U.S. Army Corps of Engineers, and operated by the states, are located along roadways leading into the region. These have been effective at catching and cleaning infected

Costs by Major Area, FY2016, as Reported by Bonneville's Fish and Wildlife Division

Total of \$621.5 million does not reflect \$51.4 million in obligations to capital projects for fish and wildlife projects, software development, and structures at dams, or \$72.6 million federal credits Bonneville receives from the U.S. Treasury



These costs, compiled by Bonneville's Fish and Wildlife Division, include forgone hydropower sales revenue (\$76.6 million in 2016). In this calculation, fish and wildlife costs (\$621 million) comprise about 25 percent of Bonneville's total power-related costs in Fiscal Year 2016 of \$2.418 billion.

Fish and wildlife costs are part of Bonneville's power-related costs and do not include costs associated with Bonneville's transmission system.



watercraft, but more money is needed to boost the effort. The Council supports ongoing federal funding for these inspection stations.

Sturgeon research is a priority for the Council

In Fiscal Year 2017, the [Council approved](#) more than a half million dollars to expand three projects over the next two years that are helping to improve knowledge of White Sturgeon in the Columbia and Snake rivers.

One project, sponsored by the Washington Department of Fish and Wildlife, will assess sturgeon populations in the impoundments behind Ice Harbor and Lower Monumental dams on the lower Snake River. The second project, sponsored by the Oregon Department of Fish and Wildlife, will assess sturgeon spawning habitat and use in Lake Umatilla, the reservoir behind John Day Dam. The third project, sponsored by the Columbia River Inter-Tribal Fish Commission and the Yakama Nation, is a research project that aims to discover and develop a genetic marker for sex determination of White Sturgeon. All three are expansions of existing projects. The new funding will allow for additional work to be undertaken. Funding for the projects continues in Fiscal Year 2019, but in different amounts.

The CRITFC/Yakama project will be funded through CRITFC's Columbia River Fish Accord agreement with the Bonneville Power Administration, and the other two projects will be funded through savings identified by the [Cost Savings Workgroup](#), a group of Council and Bonneville employees that began meeting in 2015 to identify cost savings in existing projects to help pay for new projects. The identified cost savings that will be applied to the two projects total \$283,000 for Fiscal Year 2018 and \$233,000 for Fiscal Year 2019, totaling \$516,000.

The Program currently directs about \$13 million to sturgeon research and production in the Columbia River Basin, or about 4.7 percent of the total budget of about \$274 million. Roughly \$10 million goes to research, production, and habitat restoration for Kootenai River White Sturgeon, an endangered species.

Ocean Forum gathers scientists for twice-yearly discussions

Scientists are slowly unraveling mysteries of the inscrutable ocean, such as how the transition from the fresh water environment of the Columbia River to saltwater affects the growth and eventual success of salmon and steelhead in the environment where they will spend most of their lives.

The venue for their periodic discussions, a place to share the results of research in the North Pacific Ocean and learn from their experiences, is the [Ocean and Plume Science Management Forum](#), chaired by Guy Norman, a Washington member of the Council. The forum, which meets twice a year, is a place where ocean researchers and fish managers can discuss critical scientific uncertainties and potential management applications of research results.

An example is research that debunks an old stereotype about the estuary: that it is nothing more than a pipeline to the ocean. Research in the river by the Northwest Fisheries Science Center suggests otherwise. In fact, research shows that the journey through the estuary for juvenile fish more than one year old, notably spring Chinook salmon that were thought to sprint to the ocean, is less a sprint than a series of stops and starts to feed and grow. It was already known that fish less than a year old, notably fall Chinook, stop and rest in the shoreline shallows along the way, but the information about older fish is new. It also appears that fish of different species and age classes overlap as they journey toward saltwater, possibly causing competition for food. Thus, the estuary is not a pipe, but in fact fish of multiple age classes feed, grow and perhaps compete with each other all along the way.

Information like this, shared among scientists at the semiannual Ocean Forum meetings, will help decisions about managing juvenile salmon and steelhead during the freshwater phase of their lives.



Juvenile sturgeon at Kootenai Tribal Hatchery, photo by Tony Grover

Blame 'The Blob' for poor salmon and steelhead returns in 2017

The 2017 Columbia River steelhead run could be the lowest in 50 years. The warm-ocean phenomenon known as The Blob may be the reason why.

Through August, the steelhead return to the Columbia River of about 40,000 fish was roughly eight times lower than the recent 10-year average of 330,000 fish and far below the 2017 forecast of 131,000. In fact, it's one of the lowest steelhead counts in the last 50 years. The sockeye run, about 88,000 fish through August, was about one-third of the 10-year average.

While it's impossible to blame the poor return on any specific factor, the phenomenon known as "Blob," a vast area of unusually warm water in the north Pacific Ocean

that persisted for several years until 2014/2015, may be the chief culprit. Many salmon and steelhead that are returning this year went to the ocean in 2015. One effect of warm ocean water is to reduce the supply and nutritional value of food organisms. Many fish are believed to have starved.

Hot weather and corresponding warm rivers in the summer of 2017 prompted Northwest state fish and wildlife agencies to protect fish by reducing harvest, particularly for steelhead. Meanwhile, the 2017 returns of Columbia River spring and summer Chinook were about equal to the recent 10-year average. Spring Chinook totaled about 110,000 at Bonneville, less than the predicted 160,000, and the number of summer Chinook – 66,000 counted at Bonneville through August – was nearly equal to the 10-year average, 68,000, and above the forecast of 63,000 fish.

2017 ocean sampling shows inhospitable conditions for salmon

The northeastern Pacific Ocean continues to be inhospitable for salmon, NOAA Fisheries reported after conducting its annual fish sampling off the coasts of Washington and Oregon. Poor ocean conditions affect the survival of fish, and thus have an impact on salmon recovery projects under the Council's Fish and Wildlife Program.

Researchers from NOAA's Northwest Fisheries Science Center found "highly anomalous conditions" in the Northern California Current, which runs along the northeastern Pacific coast, including one of the lowest number of juvenile coho and Chinook salmon in 20 years of sampling.

According to NOAA's preliminary report on its spring and summer ocean sampling, data collected during the summer of 2017 suggested very poor ocean conditions for salmon. One measurement, the 2017 "catch per unit effort" of juvenile coho and Chinook, which is correlated with adult return rates, suggests early ocean survival of salmon was

unusually low. As well, researchers observed fewer forage fish, food for adult salmon, than usual.

The researchers noted that the northeastern Pacific has cooled to average or slightly warmer than average after four years of abnormally warm water. While that is good news for cold water species like salmon, the biological effects of the recent warming could be evident for years. For example, the biomass of northern copepods, an important food for juvenile salmon, has been low since mid-2014.

NOAA maintains an [ocean indicators website](#) to track marine salmon survival in the Northern California current.

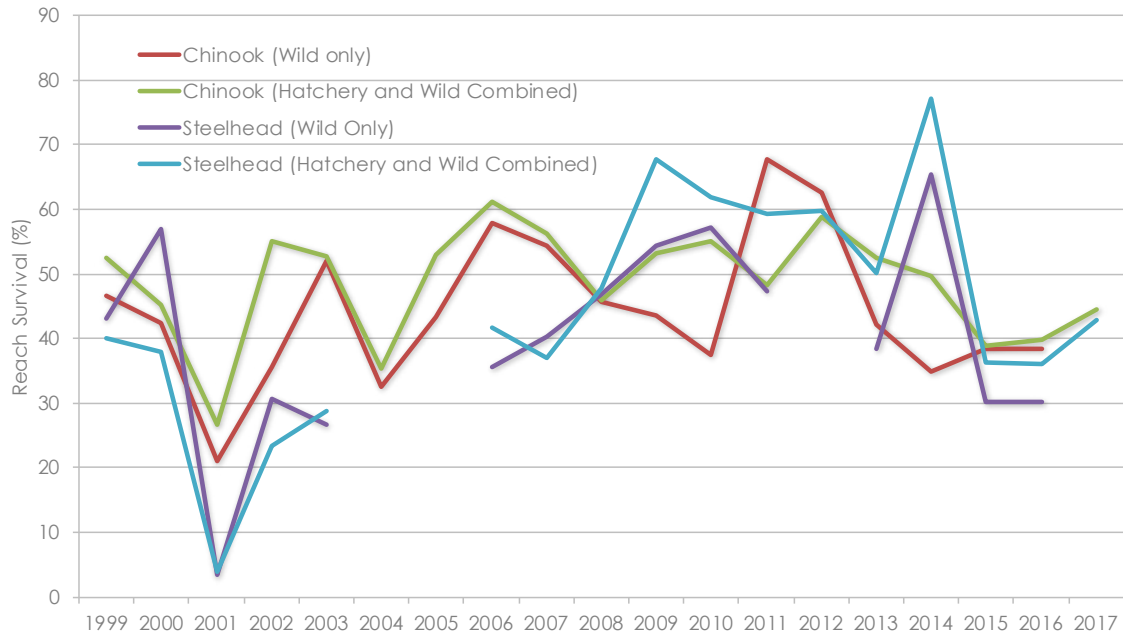
Research plan revision puts focus on 'critical uncertainties'

This year the Council revised the [research plan](#) in the Fish and Wildlife Program in a public process that attracted extensive comments from the public, fish and wildlife agencies, and tribes. The plan identifies "critical uncertainties" that the Council believes must be investigated and better understood in order to define projects that implement the Program, understand how they



Ocean waves near Cannon Beach, photo by Tony Grover

Reach Survival of Juvenile Snake River Chinook and Steelhead, Lower Granite to Bonneville Dams



Survival of Juvenile Upper Columbia Hatchery Chinook and Steelhead, McNary to Bonneville Dams

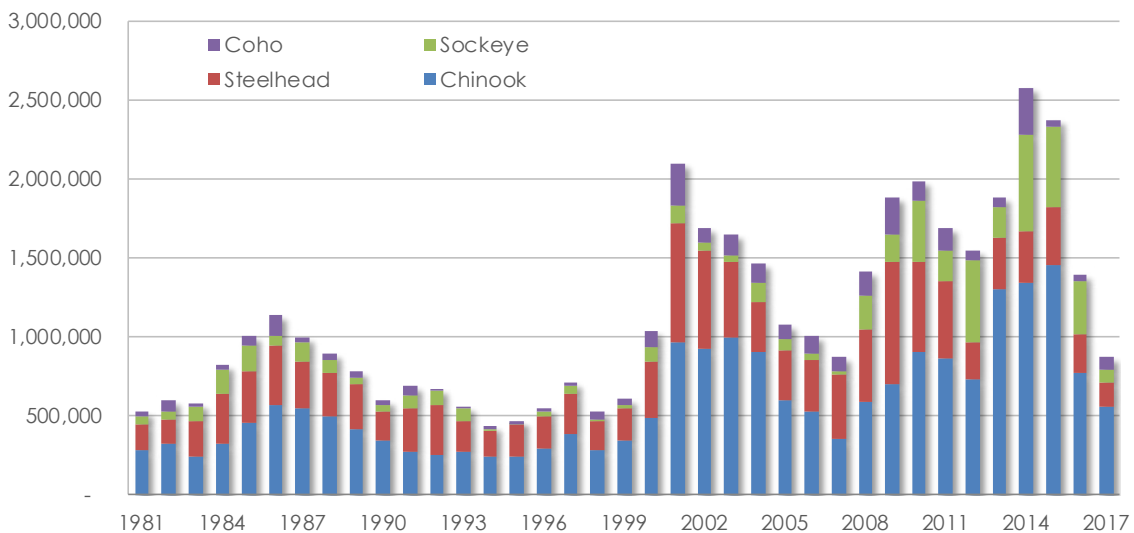


Survival of Juvenile Snake and Upper Columbia Sockeye, Lower Granite and Rock Island Dams to Bonneville Dam



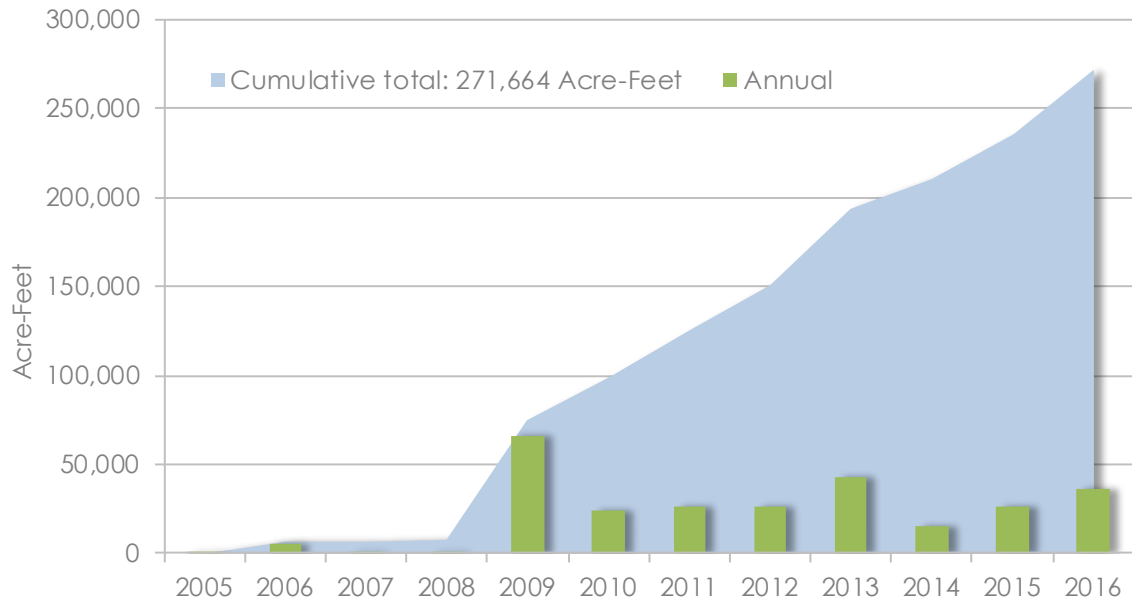
Source for this and previous 2 charts: NOAA Fisheries [Survival Estimates for the Passage of Spring-Migrating Juvenile Salmonids through Snake and Columbia River Dams and Reservoirs, 2016](#)

Salmon and Steelhead Counted at Bonneville Dam

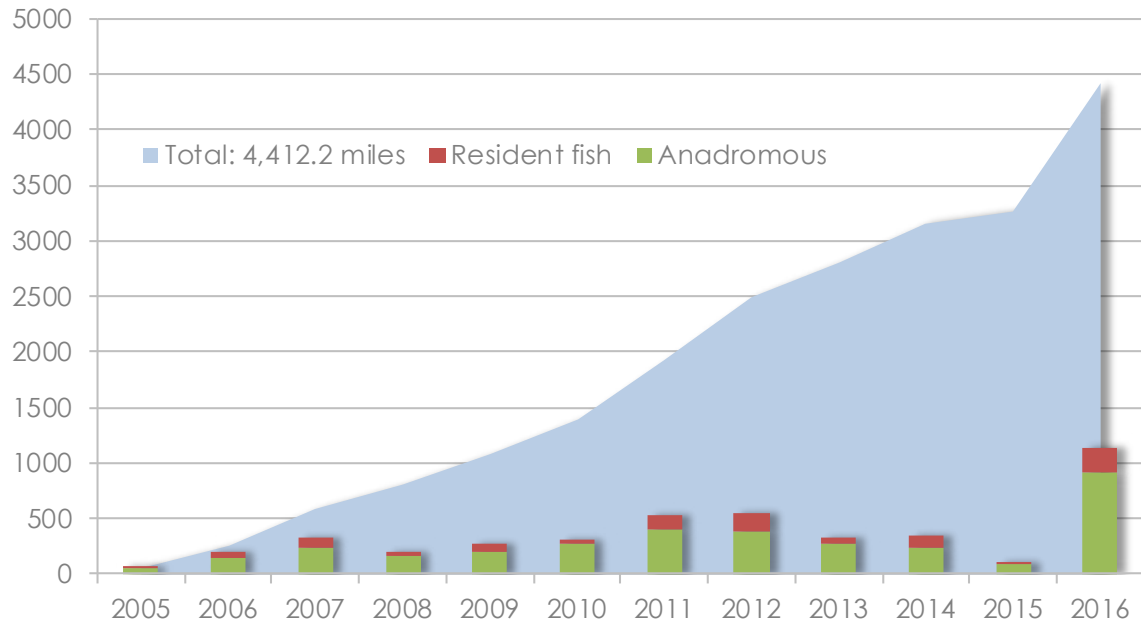


Source: Fish Passage Center, www.fpc.org

Water Protected by Screening



Miles of Habitat Improved



Source for both charts: www.cbfish.org



are performing, and report on the status and trends of focal species – those that define the health of ecosystems — and their habitats.

Among the critical uncertainties identified in the Program are:

- The effects of climate change on fish and wildlife habitat
- The impacts of contaminants on water quality and fish and wildlife
- The effects of hatchery fish on the environment where they are released and on wild fish in the same habitats
- Research about how fish use various habitats, including freshwater and in the estuary
- Impacts of harvest on salmon in the Columbia River Basin
- Impacts of hydropower dam passage on juvenile and adult salmon
- Monitoring and evaluation methods including the use of fish tags
- The abundance of non-native and predator fish and their impacts on other species.

With more than \$250 million spent annually on projects that implement the Council's Program, scientific research is critical to improve knowledge and help guide decision-making. The Council's revision of the research plan, last updated in 2006, was based largely on the advice of its two panels of independent scientists, the Independent Scientific Review Panel (ISRP) and the Independent Scientific Advisory Board (ISAB). The plan identifies 14 areas for future research including (not in priority order) fish habitat in Columbia River tributaries; fish habitat in the mainstem Columbia and Snake rivers; fish hatcheries; river flows and dam passage impacts on fish; and the Columbia River estuary and near-shore ocean.

Analysis: Columbia and Snake reservoirs are not greenhouse gas emitters

In September 2016, the Washington Post [wrote about a study](#) conducted by researchers at Washington State University that concluded methane emissions from reservoirs around the world probably have been under reported due to different measurement techniques. Methane is a greenhouse gas that has a very strong short-term warming effect.

A key characteristic of reservoirs that emit high levels of methane is that they have a lot of plant growth and algae, [WSU News noted](#). Council staff [analyzed the study's findings](#) and relevance to the Pacific Northwest's reservoir system and concluded that, according to the best available information the system of federal dams in the Columbia River Basin doesn't produce that kind of nutrient-rich environment that supports excessive plant growth, and therefore it's unlikely to emit large levels of methane gas.

The Council's analysis confirmed conclusions by various [regional utilities](#) and the [U.S. Army Corps of Engineers](#). According to the Corps, "For the relatively clean reservoirs of the Federal Columbia River Power System, which include the lower Snake River dams, conditions for low dissolved oxygen concentrations are not prevalent; thus methane gas is generally not an issue."

Bonneville Power Administration costs to implement the program

The Council reports annually to the four Northwest governors on costs of the Bonneville Power Administration for fish and wildlife mitigation, including implementation of the Council's Fish and Wildlife Program. In our annual reports to Congress, we include a synopsis of Bonneville's costs in the previous fiscal year — the same information we report to the Governors. The Council issued its Fiscal Year 2016 Columbia River Basin Fish and Wildlife [Costs Report](#) in August 2017.

In Fiscal Year 2016, Bonneville reported total fish and wildlife costs of approximately \$621 million, as follows:

- \$258.1 million in direct (expense) costs
- \$88.2 million in direct costs and reimbursements to the federal Treasury for expenditures by the Corps of Engineers, Bureau of Reclamation, and U.S. Fish and Wildlife Service for investments in fish passage and fish production, including direct funding of operations and maintenance expenses of federal fish hatcheries
- \$148.2 million in fixed costs (interest, amortization, and depreciation) of capital investments for facilities such as hatcheries, fish-passage facilities at dams, and some land purchases for fish and wildlife habitat
- \$76.6 million in forgone hydropower sales revenue that results from dam operations that benefit fish but reduce hydropower generation
- \$50.3 million in power purchases during periods when dam operations to protect migrating fish reduce hydropower generation

The \$621.5 million total does not include the amount Bonneville borrowed from the U.S. Treasury in 2016 totaling \$17.2 million for program-related (capital) projects, or \$34.1 million for associated federal projects as part of the Columbia River Fish Mitigation Program. The total also does not reflect a credit of \$72.6 million from the federal Treasury related to fish and wildlife costs in 2016 that Bonneville is required to take under Section 4(h)(10)(C) of the Power Act. Subtracting the credit reduced the total fish and wildlife costs to \$548.9 million in Fiscal Year 2016.

Effectiveness of actions taken under the Fish and Wildlife Program

Section 4.(h)(12)(A) of the Northwest Power Act directs the Council to include in this annual report to Congress a description of the effectiveness of the Fish and Wildlife Program.

In this report, the Council reports effectiveness in two ways: a “mid-term review” of progress in implementing strategies in the 2014 Program, which the Council adopted in October 2014, and progress in improving the reporting of data collected through projects that implement the Program. Since 2014 progress has been made in implementing many areas of the Program while some areas have shown little or no progress. In 2017, the Council’s fish and wildlife staff reviewed implementation of all strategies in the Program and reported to the Council in [July](#) and [August](#). Overall, the staff noted progress in most of the strategies.

Meanwhile, for the last several years, storage, access, and reporting of project data gathered through monitoring and evaluation has been steadily improving. In response, the Council began tracking progress of fish and wildlife efforts in the Columbia River Basin using three high-level indicators. Posed as questions, they are:

1. Are Columbia River Basin fish species abundant, diverse, productive, spatially distributed, and sustainable?
2. Are operations of the mainstem Columbia and Snake River hydropower dams meeting the fish-passage survival objectives of the Program?
3. What is being accomplished by projects that implement the Council’s Fish and Wildlife Program?

The Council’s high-level indicators are posted on the Council’s website at www.nwcouncil.org/ext/hli.

Council Public Affairs Overview

Outreach, information, and communication

The Northwest Power Act directs the Council to provide for the participation and consultation of the Pacific Northwest states, tribes, local governments, consumers, electricity customers, users of the Columbia River System, and the public at large in developing regional plans and programs related to energy efficiency, renewable energy resources, other energy resources, and protecting, mitigating, and enhancing fish and wildlife resources. The Council's Public Affairs Division has the primary responsibility to implement this portion of the Act.

The Division uses a variety of communication tools to perform its mission, including printed and electronic publications, the Council's website, social media platforms, video, public meetings, and press releases that are posted as news items on the website and then linked to the news media and other interested parties via email and social media.

The Council's website, www.nwcouncil.org, functions as the hub of its outreach efforts and public information strategy. The website contains myriad documents, publications, databases, and other forms of information.

Included on the site are the current versions of the [Northwest Power Plan](#) and the [2014 Columbia River Basin Fish and Wildlife Program](#), as well as press releases, Council white papers, official public comment on Council products, PowerPoint presentations, videos, Council newsletters, and links to the Council's social media platforms.

Social media are used increasingly by the Council to communicate with the public. These include [Facebook](#), [Twitter](#), and [LinkedIn](#), all of which are highlighted on the Council's [News page](#). The Council also maintains [Flickr](#) and [Instagram](#) accounts to showcase and invite photos from around the Columbia River Basin.

The monthly [Council Spotlight](#) newsletter includes news about the monthly Council meetings and links to posts on the website.

The Public Affairs Division also has the responsibility of advancing the Council's mission and accomplishments with members of Congress and their staffs. In August 2017 the Council conducted its annual congressional staff trip, this time to Northern Idaho and Northwestern Montana. The trip involved nearly two dozen Congressional staff members and included visits to the Clark Fork Delta Restoration Project on Lake Pend Oreille, sturgeon and burbot artificial production

at the new Twin Rivers Hatchery of the Kootenai Tribe of Idaho, and Libby Dam.

The purpose of these annual trips is to better acquaint House and Senate staff with the requirements of the Northwest Power Act, the work of the Council, and a sampling of priority issues relating to the Council's work.

Canadian relations

The Columbia River and several of its major tributaries begin in Canada and flow across the international border. Consistent with direction in the Northwest Power Act to treat the entire Columbia River as one system for planning purposes, the Council maintains regular contact with planning entities in British Columbia. This contact primarily is through the Public Affairs and Legal divisions.

The Columbia Basin Trust (CBT), a Crown corporation of the province, is the Council's closest counterpart agency in the Canadian portion of the Columbia River Basin. Since 1996, Council members and staff have met at least once annually with the Trust Board of Directors

to discuss Columbia River issues of mutual interest. In 2000, the two agencies formalized their relationship in a memorandum of understanding and designated official liaisons. The memorandum was revised in 2011.

In 2014 the Council and Trust co-sponsored a major international conference on the Columbia River that attracted more than 300 participants from the United States and Canada. In 2015, following up on commitments made at the conference, the Trust and Council participated in the Lake Roosevelt Forum conference in Spokane to raise awareness about issues including the reintroduction of salmon and steelhead above Chief Joseph and Grand Coulee dams, transboundary ecosystem management, and aquatic invasive species in the transboundary reaches of the Columbia River and its tributaries. Since then, the Trust and Council co-funded a burbot research project in Lake Kocanusa, the transboundary reservoir behind Libby Dam in Montana and, in the fall of 2017, planned to meet with state, provincial, tribal, and First Nation interests to discuss progress on studies regarding salmon reintroduction in the blocked area above Grand Coulee Dam.



Northwest Congressional staff viewing the Clark Fork Delta habitat rehabilitation project, photo by John Harrison



Selected news articles that mention the Council

Washington considers strengthening measures to protect waters from aquatic invasive species

— [The Spokesman-Review](#), January 2017

Harnessing rivers' power gives Northwest Life

— [East Oregonian](#), November 2016

The rivers of Northwestern life

— [Capital Press](#), November 2016

Help for Upper Columbia Sturgeon

— [Council blog](#), September 2017

Battery Power: The technology that powers your flashlight is an increasingly important part of the power system

— [Council blog](#), September 2017

(click any source above for full article)

Council Administrative Overview

Council funding background

The Northwest Power Act of 1980 establishes a funding mechanism to enable the Council to carry out its functions and responsibilities. The Bonneville Power Administration provides this funding through ratepayer revenues. The Act established a formula to determine a funding limitation threshold and authorized the Council to determine its organization and prescribe practices and procedures to carry out its functions and responsibilities under the Act.

The Act further provides that the funding limitation applicable to annual Council budgets will be calculated on a basis of 0.02 mill multiplied by the kilowatt hours of firm power forecast to be sold by the Bonneville administrator during the year to be funded. The limitation may be increased to .10 mill, provided the Council makes an annual showing that such limitation will not permit the Council to carry out its functions and responsibilities under the Act.

The basis of the funding methodology (firm power forecast to be sold) embraces authorities set forth in other sections of the Act that describe the Congressional expectation that Bonneville will serve all anticipated load growth for the region in the future. As such, the Act authorizes Bonneville to supply all of the incremental electricity needed in the future for the region, if so desired by its customers and others.

Fiscal Year 2018

The Council has determined that the 0.02-mill limitation will not allow the Council to carry out its functions and responsibilities under the Power Act in Fiscal Year 2018. The Council determined that an amount equal to .093 mill, which totals \$11,624,000, will be required in Fiscal Year 2018.

Annual Baseline Adjustments

Since 1997, the Council has negotiated 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
- Program improvements individually cost-justified

By applying these budgeting principles on an annual basis, the Council has been able to successfully confine budget growth to an average of less than 3 percent per year over the last 20 years (1998-2018).



Budget Versus Actual Expenditure Considerations

The Council attempts to project workloads and resource requirements two years in advance with some opportunity for budget revisions occurring prior to the beginning of each fiscal year. During each annual budget cycle the Council:

- Manages overall expenditures to the most cost-effective level
- Conserves unanticipated cost savings in a prudent manner
- Re-prioritizes the allocation of funding and staff resources to accommodate new workloads and unanticipated responsibilities

Actual expenditures in one budget year may not necessarily be reliable indicators of funding requirements in future budget cycles because:

- Changes in Council workloads, programs, and responsibilities are difficult to anticipate and are often initiated by external events in the region or by requests from the Congressional delegation or the states' governors
- Programs and activities that are budgeted, but

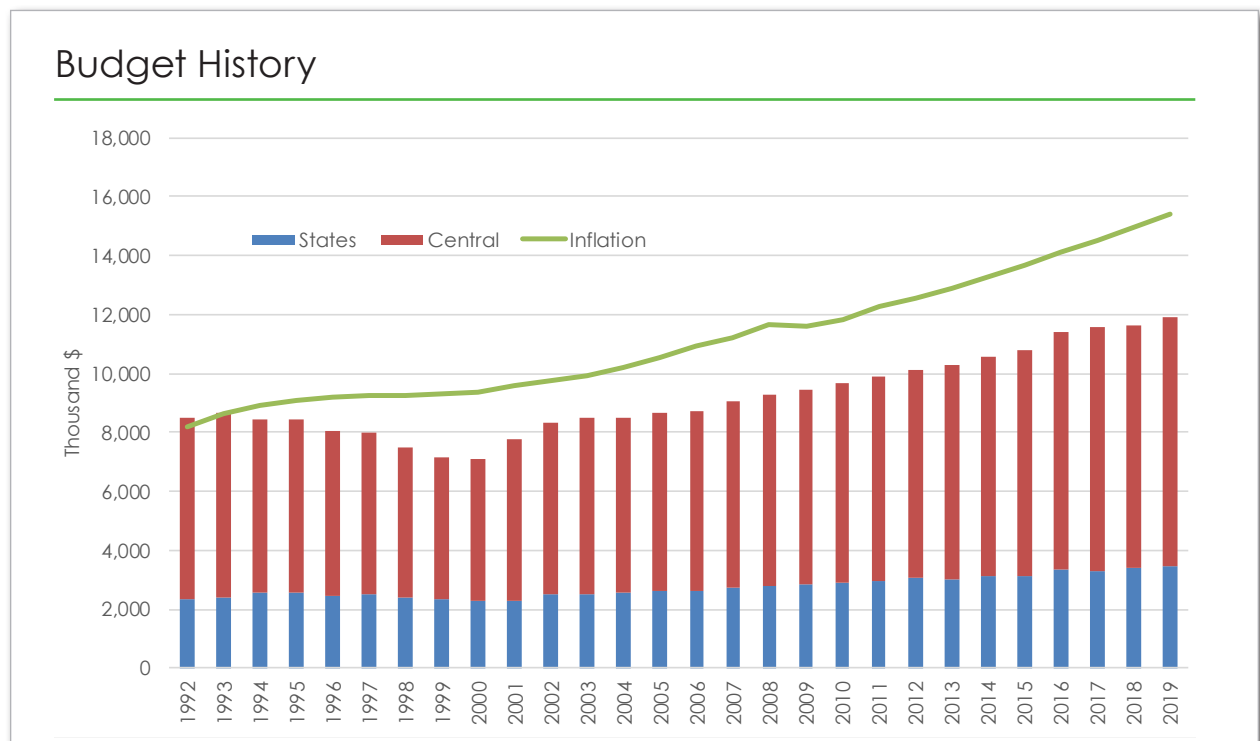
deferred because of new and emerging higher priorities, are often re-budgeted in succeeding years because of their continued need and importance

Fiscal Years 2018 and 2019 Budgets

The Council's Fiscal Year 2019 Budget and 2018 Revisions reflect the proposed budget for Fiscal Year 2019 and the recommended revisions to the Fiscal Year 2018 budget. In addition, the budget contains the out-year budget projection for fiscal years 2020 and 2021. The Council is committed to carrying out its current responsibilities and workloads within these projected funding levels.

A summary of the budgets for the last five budget years follows. These projections show budget growth under 16 percent over the six-year period, 2013 – 2019.

FY 2013	\$10,283,000
FY 2014	\$10,565,000
FY 2015	\$10,784,000
FY 2016	\$11,425,000
FY 2017	\$11,590,000
FY 2018	\$11,624,000
FY 2019	\$11,914,000



The Council showing, required by the Act, for Fiscal Year 2019 is contained in Appendix C of the Fiscal Year 2019 Budget and 2018 revisions.

Fiscal Year 2018 Proposed Budget Revisions

The Council's Fiscal Year 2018 revised budget is \$11,624,000. Increases projected for contracting activities have been offset by decreases in personal services and other operating expenses. The Council's budget for Fiscal Year 2019 and Revised Fiscal Year 2018 is based on current-year expenditure levels plus adjustments for shifting workloads, certain program improvements, and cost-of-living adjustment factors as provided by the U.S. Department of Energy (Bonneville) and the Oregon Economic and Revenue Forecast. A number of cost-containment measures for personal services, travel, contracts, and services and supplies have been incorporated in the budget. (See table and chart on following page.)

More information

For additional information about the Northwest Power and Conservation Council's activities, budget, meetings, comment deadlines, policies, or bylaws, call 1-800-452-5161 or visit www.nwccouncil.org. Copies of Council publications are available at the website or by calling the Council. All Council publications are free.

Council meetings, with links to agendas and notes, Fiscal Year 2017

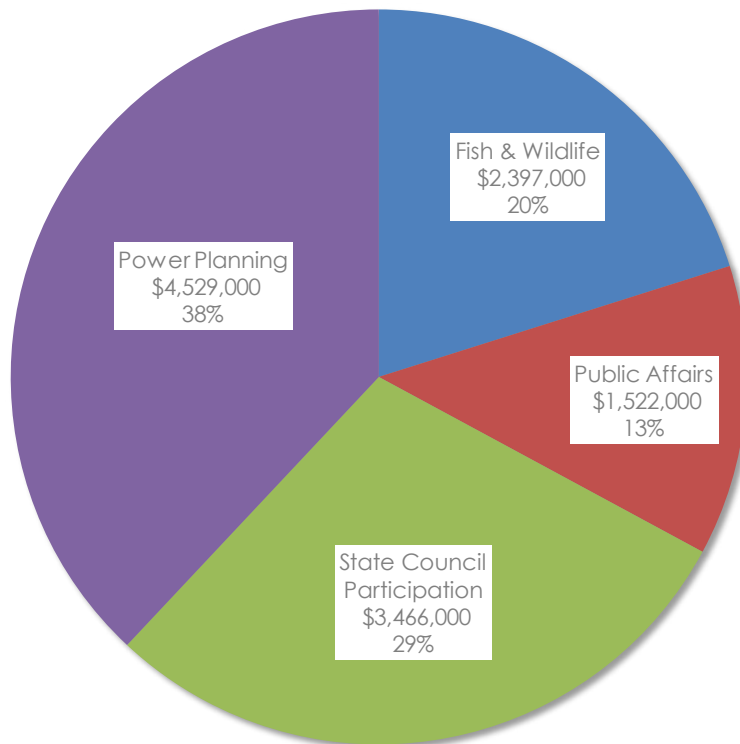
- [October](#) 2016 Portland, Oregon
- [November](#) 2016 Coeur d'Alene, Idaho
- [December](#) 2016 Portland, Oregon
- [January](#) 2017 Portland, Oregon
- [February](#) 2017 Portland, Oregon
- [March](#) 2017 Portland, Oregon
- [April](#) 2017 Missoula, Montana
- [May](#) 2017 Boise, Idaho
- [June](#) 2017 Corvallis, Oregon
- [July](#) 2017 Vancouver, Washington
- [August](#) 2017 Portland, Oregon
- [September](#) 2017 Spokane, Washington



FY 2018 Revised Budget Forecast (000s omitted)

	Power Planning	Fish & Wildlife	Public Affairs	Legal	Admin	Total
Compensation	1,529	874	479	291	900	4,073
Other Payroll Expenses	719	411	225	137	441	1,932
Travel	96	65	60	24	29	274
Contracts	407	135	100	8	40	690
Other Operating Expenses	204	8	113	23	930	1,278
SUBTOTAL	2,955	1,493	977	483	2,340	8,247
State Budgets:						
Idaho	841					
Montana	870					
Oregon	792					
Washington	873					
SUBTOTAL	3,377					3,377
TOTAL						11,624

Budget by Function for FY 2019: \$11,914,000



Background

The Northwest Power Act

The Council was authorized by Congress in 1980 in the Pacific Northwest Electric Power Planning and Conservation Act (the Power Act), giving the states of Idaho, Montana, Oregon, and Washington a greater voice in how we plan our energy future and protect our fish and wildlife resources. The Act gives the four Northwest states a formal role in making decisions about the allocation of new energy resources for the region.

In the late 1960s and early 1970s, the years leading up to the congressional debate over the Act, the Bonneville Power Administration and many of the region's utilities were concerned that the region's expected growth would outstrip the power system's ability to meet electricity demand. As a result, Northwest utilities made decisions to build a number of new energy plants, including five nuclear power plants in the state of Washington. When the Act was passed in late 1980, many in the region had come to realize that those earlier decisions, based in part on inaccurate electricity load forecasts, were a disastrous mistake. Only one of the plants, the currently operating Columbia Generating Station, was completed. Due to exorbitant cost overruns, the other four plants were abandoned or mothballed prior to completion. Two of the unfinished plants were responsible for one of the largest bond defaults in the history of the nation, while the financing for the other three plants was backed by the Bonneville Power Administration. Even today, 36 years after the Northwest Power Act was enacted, Bonneville pays millions of dollars a year on debt service for two of the unfinished nuclear plants, plus the one that was completed. And, from 1978 to 1984, Bonneville was forced to raise its rates by 418 percent (adjusted for inflation) to pay for the cost of the three plants.

Congress concluded that an independent agency, controlled by the states and without a vested interest in selling electricity, should be responsible for forecasting the region's electricity load growth and helping determine which resources should be built. The Council

does that in the Northwest Power Plan. The Act directs the Council to revise the plan at least every five years. The Act also directs the Council to ensure widespread public involvement in formulating regional fish and wildlife and energy policies.

The Northwest Power and Conservation Council

The governors of Idaho, Montana, Oregon, and Washington each appoint two members to the Council. The eight-member Council sets policy and provides overall leadership for Council activities.

The Council's work is performed, depending on the tasks, by the Council's professional staff (including staff in a central office in Portland and in each state), consultants under contract, or by public agencies and Indian tribes under intergovernmental agreements. The Council's executive director is responsible for coordinating with the Council, supervising the central office staff, administering contracts, and overseeing the day-to-day operations of the Council. The Council approves major contracts and the overall work plan. The Council has 61 employees.

The central staff is organized into five divisions: Power Planning; Fish and Wildlife; Public Affairs; Legal; and Administrative. Professional staff in each state provide technical review and assistance to Council members in evaluating matters before the Council. State staff also participate in designing and developing public-involvement programs that focus on the implementation of the Power Plan and Fish and Wildlife Program in their particular states. This support is provided through existing state agencies or by individuals directly under Council member direction.

The Council, known until 2003 as the Northwest Power Planning Council, is an interstate compact agency authorized by Congress in the 1980 Power Act and created by the legislatures of Idaho, Montana, Oregon, and Washington. The Council's first meeting was in April 1981.



The Northwest Power Act gives the Council three distinct responsibilities: 1) to assure the region an adequate, efficient, economical, and reliable electric power supply; 2) to prepare a program to protect, mitigate, and enhance fish and wildlife, and related spawning grounds and habitat, of the Columbia River Basin affected by the development and operation of any hydroelectric project on the Columbia River and its tributaries; and 3) to inform the Pacific Northwest public regarding these issues and involve them in decision-making. This annual report is organized around the Council's three key responsibilities.

The Power Act created a special relationship between the Council and the federal agencies that regulate and operate dams in the Columbia River Basin and sell the electricity that is generated. The administrator of the Bonneville Power Administration, the federal power marketing agency that sells the output of the Federal Columbia River Power System (a system that includes 29 federal dams within the basin and two outside (in southern Oregon), and one non-federal nuclear power plant), is required to make decisions in a manner consistent with the Council's Northwest Power Plan and its Columbia River Basin Fish and Wildlife

Program. Other federal agencies with responsibilities for Columbia River Basin dams (the U.S. Army Corps of Engineers, U.S. Bureau of Reclamation, and Federal Energy Regulatory Commission) are required to 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," in the words of the Act.

Despite its relationship to federal agencies, the Council is not a federal agency and its employees are not federal employees. The eight-member Council consists of two members from each state, appointed by their respective governors. The Council headquarters are in Portland.

The Columbia River Basin Fish and Wildlife Program

A key element of the Northwest Power Plan is a program to protect, mitigate, and enhance fish and wildlife, and related spawning grounds and habitat, of the Columbia River Basin that have been affected by hydropower dams – federal and privately owned. Consistent with direction in the Act, at least every five years the Council revises the Fish and Wildlife Program, followed by the power plan. That sequence is because



Oregon coast, photo by Tony Grover

the Act requires the Council to include measures in the program to improve survival of anadromous fish – those that are born in freshwater, spend most of their lives in the ocean, and then return to freshwater to spawn – at and between dams on the Columbia and Snake rivers. Because these measures can take water away from hydropower generation – by spilling over dams, for example – the Council anticipates that hydropower generation will be reduced in a similar manner to past power plans as the result of implementation of the program. This loss is made up by resources included in the plan, primarily investments in energy efficiency.

The 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, Indian tribes 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 a public comment period on the recommendations and proposed program amendments that includes extensive 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 program is implemented through projects financed by the Bonneville Power Administration and undertaken by federal agencies including the U.S. Army Corps of Engineers, the Bureau of Reclamation, the Federal Energy Regulatory Commission and its licensees, and by state fish and wildlife agencies, Indian tribes, and occasionally private contractors. Every project proposed

to the Council to implement the program is reviewed by the 11-member Independent Scientific Review Panel to be sure it is based on sound scientific principles and is consistent with the Power Act.

The Northwest Power Plan

Following final approval of the Fish and Wildlife Program, the Council revises the Power Plan. Under the Power Act, the Fish and Wildlife Program is part of the Power Plan.

The Plan is a 20-year blueprint to meet future demand for power that includes an electricity demand forecast, electricity and natural gas price forecasts, an assessment of the amount of cost-effective energy efficiency that can be acquired over the life of the plan, and a least-cost generating resources portfolio. The Plan guides Bonneville’s decision-making to meet its customers’ electricity load requirements and also serves as a useful guide for investor-owned utilities in their own least-cost planning.

In the Northwest Power Act, a law that was ahead of its time, Congress concluded that energy efficiency should be the priority energy resource for meeting the region’s future load growth. The Act includes a provision that directs the Council to give priority to cost-effective energy efficiency, followed by cost-effective renewable resources. In effect, for the first time, energy efficiency was deemed to be a legitimate source of energy on par with generating resources.

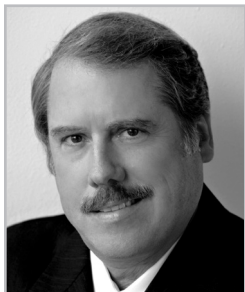
The rest is history. Since the release of the Council’s first Northwest Power Plan in 1983, the region’s utilities have acquired the equivalent of around 6,000 average megawatts of energy efficiency. Expressed as electricity, that is more than enough to power five cities the size of Seattle.

During the roughly two years after the revision of the power plan and the beginning of work on the next Fish and Wildlife Program, the Council and its staff monitor implementation of the two planning documents, meet with energy and fish and wildlife experts to discuss contemporary issues, and assess progress toward goals in the plan and program.

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Comments of the Bonneville Power Administrator



Department of Energy

Bonneville Power Administration
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EXECUTIVE OFFICE

FEB 12 2018

Mr. Jim Yost, Chair
NW Power and Conservation Council
851 SW Sixth Avenue, Suite 1100
Portland, OR 97204

Dear Chair Yost:

On behalf of the Bonneville Power Administration, I want to express my appreciation to the Northwest Power and Conservation Council for another productive, informative and collaborative year. The Council continues to provide an important forum for discussing timely energy and natural resource issues and through its work helps ensure the future economic and environmental prosperity of both Bonneville and the Pacific Northwest.

In 2017, the Council continued to implement important elements of the Seventh Power Plan, including provisions related to energy efficiency and demand response. To expand the scope of the energy conversation, the Council brought in leaders from around the region to provide their perspectives on emerging policies and shifting priorities. Bonneville appreciated the Council's ongoing coordination on updates to Bonneville's Resource Program and the Council's inquiries into energy storage and vehicle electrification. We also appreciated the Council's thoughtful discussion and analysis of the effects of new generation resources in California, particularly solar, on energy markets in the Pacific Northwest. Bonneville recently issued a strategic plan that considers its future competitive position. The Council, through its planning and modeling expertise, will continue to play a vital role in helping the region understand the potential outcomes of regional policy choices under consideration, particularly those specific to reducing carbon emissions.

Related to Fish and Wildlife, we appreciated the particular efforts of Council members and staff to coordinate with Bonneville on different issues. The Council took the time to work with us to identify cost savings in the program, which was challenging at times, but ultimately successful not only because we achieved measurable savings, but because it helped improve understanding between the two organizations. Likewise, we made great progress figuring out how to prioritize operations and maintenance investments at Bonneville-funded projects, benefited from the Council's leadership on taking action to address predation, and appreciated the Council's efforts to identify critical uncertainties across the basin that merit future review. Ultimately, Bonneville and the Council are responsible for overseeing the different elements of the Fish and Wildlife Program in the most cost-effective way possible. Our ability to do so successfully requires maintaining a mutual understanding of future priorities and financial realities, and maintaining an understanding of the effects of on-going regional disagreements and litigation regarding the

operation of the hydrosystem under various federal laws. We made excellent progress in 2017 and I am excited to continue the conversation.

Looking forward to 2018, Bonneville remains committed to working closely with the Council as we implement our updated strategic plan and finalize our Resource Program. We also look forward to beginning the process of updating the Fish and Wildlife Program, and further implementing action items in the Seventh Power Plan, including those related to demand response. Additionally, as referenced above, it will be important for the Council to continue to track and help inform carbon-related legislation along with other policies that have the potential to affect western energy markets.

Thank you for your considerable efforts in 2017.

Sincerely,



Elliot E. Mainzer
Administrator and Chief Executive Officer



Public comments on the draft report

Bonneville Power Administration:

- Report text: “Demand Response is the second-most important resource to meet new demand for Power...” Comment: DR is not actually defined as a ‘resource.’ Action: There is continued debate over whether demand response is a resource under the Power Act, and under what circumstances. To avoid raising the issue without conceding any particular point, I simply changed the sentence to: “Implementing demand response measures is the second-most important action the region needs to take to meet new demands for power, especially new demands that require additional capacity in the system.”
- Report text: “Northwest Again Leads Nation in EE Investments.” Comment: There may be some old figures and references here. The RCP just published the 2016 savings achievements, but the document mentions 2015 multiple times. These should be updated for 2016. Action: The numbers are for 2016; references to 2015 were changed to 2016.
- Report text: “Forecast for electricity demand is flat, but new generation will be needed.” Comment: The first paragraph states that flat and declining loads are due to EE, but during the December Council meeting Massoud Jourabchi stated that it was also due to a decline in sales in the industrial sector. Perhaps this can be restated to something like “This is mainly due to the region’s strong focus on improving EE”. Action: Even though Massoud reported in the new fiscal year, I changed the text to: “This is mainly due to the region’s strong focus on improving energy efficiency, but some industrial electricity demand also has declined.”

Tom Iverson, fisheries consultant (by email):

On page 16, under the heading “Studying salmon reintroduction above Chief Joseph and Grand Coulee dams,” the second paragraph could be updated to state that the Council issued the white paper on passage at high-head dams. Action: The paper was released in December 2016 so I made that clear, consistent with the comment. The sentence now reads: “After a public comment period in the fall, the Council issued the paper in December 2016.”

Snohomish County PUD:

See attachment next 3 pages. The utility had seven specific comments, most of which had to do with the Council’s fish and wildlife program generally and not specifically about the annual report or the Council’s actions in Fiscal Year 2017. Several comments about the value of the hydropower system and energy efficiency did result in minor, clarifying edits in the report on pages 1, 5, 6, 7, and 9.

Snohomish PUD comments



Your Community Energy Partner

December 4, 2017

Chairman Lorenzen
Northwest Power and Conservation Council
851 SW Sixth Avenue, Suite 1100
Portland, Or 97204

Re: Comments of Public Utility District No. 1 of Snohomish County on the Northwest Power & Conservation Council's Draft Fiscal Year 2017 Annual Report to Congress

Dear Chairman Lorenzen and Council Members,

Thank you for the opportunity to review and comment on the Northwest Power and Conservation Council's (Council) draft Fiscal Year 2017 Annual Report to Congress (Draft Report). Snohomish PUD appreciates the effort by both the Council and the Council Staff to develop the information in the Draft Report. We also recognize the importance of the Council's report to Congress because it creates a high-level understanding of the issues and challenges faced by stakeholders in the Pacific Northwest as we attempt to balance the diverse needs of the region. We respectfully offer our comments for the Council's consideration.

Focus Fish and Wildlife comments on measures related to hydro system impacts and emphasize scientific data. The Council's Fish and Wildlife Program (Program) was developed in response to the statutory directive contained in the Pacific Northwest Electric Power Planning and Conservation Act, requiring the Council to develop measures that can be implemented to protect, mitigate, and enhance fish and wildlife. The Northwest Power Act restricts the Program to fish and wildlife "affected by the development, operation and management of [hydroelectric projects] while ensuring the Pacific Northwest has an adequate, efficient, economical, and reliable power supply." 16 U.S.C. §§ 839b(h)(1)(A) and b(h)(5).

Snohomish PUD believes it is important for members of Congress to understand that the Program is restricted to fish and wildlife affected by the development, operation, and management of the relevant hydroelectric projects, and does not extend to unrelated impacts to threatened or endangered species. The Draft Report contains extensive information on fish and wildlife challenges that are important for the region, but which are not clearly or directly attributable to development, operation and management of the hydroelectric projects. For example, sea lion predation of salmon (p. 15), northern pike invasion (p. 16), zebra mussel proliferation (p.17), and ocean temperature impacts (p. 18). To achieve better alignment with the restrictions in the Power Act, the Council should articulate whether each of these challenges is attributable to the hydroelectric projects and which related activities are credited with mitigating hydroelectric project impacts.

Similarly, the Draft Report should increase emphasis on scientific data in the Fish and Wildlife Program. For the Program to be successful, associated projects must be based on sound scientific principles and carried out consistently with those principles. The process described for developing measures and program activity (p. 33) reflects extensive public engagement, but contains only minimal discussion of the importance of

scientific principles and data-driven decision making. Additional discussion would ensure all members of Congress understand the importance of scientific data and scope within the Fish and Wildlife Program.

Remove discussion of Columbia River Treaty issues from this report. The Draft Report contains discussion of the Fish and Wildlife Program strategy to study reintroduction of anadromous fish into areas blocked by dams (p. 16). Snohomish PUD recognizes that this is important to many regional stakeholders. However, the U.S. Entity has developed a Regional Recommendation which acknowledges this issue and indicates that it should be decided and discussed within the treaty negotiation process. The Regional Recommendation states, “The United States should pursue a joint program with Canada, with shared costs, to investigate and, if warranted, implement restored fish passage and reintroduction of anadromous fish on the main stem Columbia River to Canadian spawning grounds...all such federal actions at the Chief Joseph and Grand Coulee projects are subject to congressional authorization and appropriation.” Since this matter is intended to be discussed in the Columbia River Treaty Negotiations and studied jointly with Canada, Snohomish PUD recommends it should not be unilaterally presented to Congress within this report.

Restructure comments concluding that fish and wildlife recovery could be impacted by program funding levels. The Draft Report contains discussion of uncertainty regarding the Bonneville Power Administration’s future funding levels for fish and wildlife mitigation and concludes that the recovery of fish and wildlife could be impacted if the Program budget is decreased (p. 6). This conclusion seems premature because the program management has not completed the research process review, which is expected to fully understand and inventory the broad spectrum of activity within the program, identify duplicative activity, restructure activity that does not achieve outcomes for fish and wildlife impacted by the hydroelectric system, and prioritize efforts based on measurable outcomes and scientific data. Snohomish PUD is confident that these efforts will make the program more efficient, data driven, and improve measurable outcomes for fish and wildlife. The comments concluding that fish and wildlife recovery are impacted by funding levels should be restructured to emphasize the Council’s ongoing effort to better utilize program funding.

Reframe comments to emphasize the value of the low-cost, carbon-free northwest hydropower system and describe how our renewable resources work together:

- **The renewable energy from the Columbia Hydropower system enables more variable renewables by balancing the system.** More emphasis should be placed on the value of the dispatchable Columbia Hydro system and the role it plays in integrating other variable renewables. For example, the Draft Report currently states that solar power is “consistently available, even on cloudy days.” (p. 5). This statement could be misleading to readers. The Council should add context to ensure that readers understand the significant resources needed to balance these variable renewable resources in the Northwest and the high value of our hydropower system to do so.
- **The Columbia Hydropower system is the lowest-cost renewable resource in the region.** The Council should emphasize the great economic value of the hydro system as a low-cost renewable and dispatchable resource. The Draft Report currently states that solar is cost-competitive with a new gas-fired power plant and discusses the “low-cost electricity from the wind and sun . . .” (p. 5). In the Pacific Northwest, wind and solar resources are among the highest cost resources available to the power system. The Council should amend these statements to ensure readers understand the relative costs of wind and solar compared to our renewable hydroelectric energy and the other resources available in the Pacific Northwest.
- **The Columbia hydropower system is Carbon-Free.** The Draft Report states that the electricity sector of the economy is the primary source of Carbon Dioxide emissions in the United States (p. 12). However, in

the Pacific Northwest, the electricity sector is not the primary source of Carbon Dioxide emissions. The Council should reframe this section to emphasize the advantage of the carbon-free hydropower system and how it differentiates the Pacific Northwest from other regions.

- **The Columbia hydropower system enables innovative new renewable resource development.** Snohomish PUD believes that run-of-river hydropower, geothermal, pumped hydropower storage, and other forms of renewable resources can play key roles in the Northwest as we meet the challenges of integrating variable renewable generation. The Council should add discussion of these important technologies to the Draft Report in the section entitled, “Meeting the Challenge” (p. 7).

Amend statement about energy efficiency accomplishments: In the Draft Report discussion of Energy Efficiency (p. 9), the Draft Report implies that the energy efficiency activity within the region has obviated the need for four new gas-fired power plants. This statement should be adjusted because it implies to readers that energy efficiency measures can wholly replace the need for capacity resources in the Pacific Northwest. A reliable power supply requires sufficient amounts of reliable energy and capacity.

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Snohomish PUD appreciates the opportunity to offer our comments and suggestions in the development of this important report to Congress. We look forward to reading the final version and continuing to work with the Council to meet the challenges in the region.

Best Regards,



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GRAYS HARBOR, PHOTO BY TONY GROVER

COVER PHOTO, "SUNSET OVER ROWENA CREST", COURTESY OF [LASTING LIGHT PHOTOGRAPHY](#)



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