

# Northwest Regional Forecast of Power Loads and Resources

2020 through 2029

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**PNWCC**

April 2019

Special thanks to PNUCC System Planning Committee members and utility staff that provided us with this information.

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# 2019 Northwest Regional Forecast

## Executive Summary

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### The One Certainty is Change

This annual analysis of Northwest utilities' data predicts the region's electric power need based on a look at supply and demand over the next 10 years, recognizing the unpredictability of weather and water conditions. This *Northwest Regional Forecast* has been a valuable tool to help inform utilities, decision-makers and others facing important decisions about the resource investments needed to ensure that the region has adequate supplies of electricity to meet the requirements of a growing region with a changing power supply picture.

This year's report, published on the heels of a recent record-setting wholesale energy price event in March, underscores the region's need for generating and demand-side resources that match up with characteristics of consumers' demand for electricity. It may also be a sign that traditional resource planning cannot fully capture the abilities and inabilities of our more dynamic, diverse power system.

This report largely shows a continuation of several compounding trends impacting the electric power industry's planning and operations. With the hydropower system as a backbone and a heavy reliance on future energy efficiency savings, utilities continue to operate – and make decisions about future power supply and demand – within a changing and sometimes chaotic economic, political, technological and social environment. The one certain thing is that the utility landscape continues to change and evolve.

Most notably, these are the key trends worth watching:

- Northwest utilities are achieving carbon-reduction goals and many are seeking opportunities to do more, while policymakers seem eager to enact more aggressive decarbonization legislation.
- Although the winter period shows improvement, serving winter peak demand remains a concern. And summertime peak demand continues to increase, focusing planners on peak capacity needs.
- The loss of several coal-fired power plants over the next decade will contribute to the challenges of maintaining an adequate, reliable power supply. In the Northwest, nearly 2,100 MW will be retired by 2022 with another 1,500 MW by 2029. Similarly, many more retirements are anticipated across the west, adding to regional adequacy concerns.
- Current planned construction of new wind and other renewable resources cannot be expected to fully offset the anticipated loss of generation from coal-fired power plant retirements.
- The use of new technologies, such as large-scale batteries, is being explored to confirm a greater role in utilities' resource plans.
- Growth in demand for electricity is not consistent across the region. On average, load growth is forecast under one percent annually. Some utilities are experiencing declining or flat loads, while a few expect well over three percent annual growth in demand through time.

These and other data-based perspectives are outlined in more detail on the following pages.

## Decarbonization is Happening

Decarbonization of electric power supply is the conversion of fossil fuel-based energy to lower-carbon electricity sources. Utilities are taking action to transition their power supply, and states' legislatures are considering additional action aimed at reducing carbon emissions more aggressively, including both Oregon and Washington. California already has very aggressive carbon-reduction goals in place that will also impact the Northwest.

Utilities have taken the decarbonization goal to heart. To meet policy directives and consumers' desires, they are setting corporate carbon reduction goals to reduce greenhouse gasses that contribute to climate change. Customers are expecting that their utility will invest more in wind, solar and other renewables.

Programs to accommodate electric-powered vehicles with charging stations and incentives are also top-of-mind among electric utilities across the region as they move to decarbonize. In addition, utilities continue to encourage more homes and businesses to pursue efficient heat pumps while pursuing more non-carbon generation. The success of these electrification efforts will influence future power supply and demand forecasts, but just how much is yet to be determined.

## Coal Retirements Underscore Reliability Challenges

Plans to retire eight coal-fired power units that serve the region will reduce the almost 6,800 megawatts of coal-fired generation available today to below 3,200 megawatts by 2028. This loss of more than 3,600 megawatts of dispatchable generation (both utility and non-utility owned) will be most notable during peak-demand periods in the winter and summer.

The committed and planned new generation facilities on the drawing board for the next five years are renewables projects. Then almost 950 MW of natural gas-fired generation are penciled in between 2025 and 2028. Utilities also continue to pursue aggressive energy-efficiency along with demand side-management programs designed to reduce energy use during peak periods. They are looking to capacity contracts and seeking to prove new technologies such as batteries, to also help fill the void created by the closure of the coal units.

Taken together, this is presenting the region with new challenges for reliably meeting demand under certain conditions. There is plenty of work ahead to identify and develop resources that meet the desire of customers and provide the supply attributes to ensure an adequate power system in the years ahead.

Figure 1: Northwest Planned Coal Unit Retirements

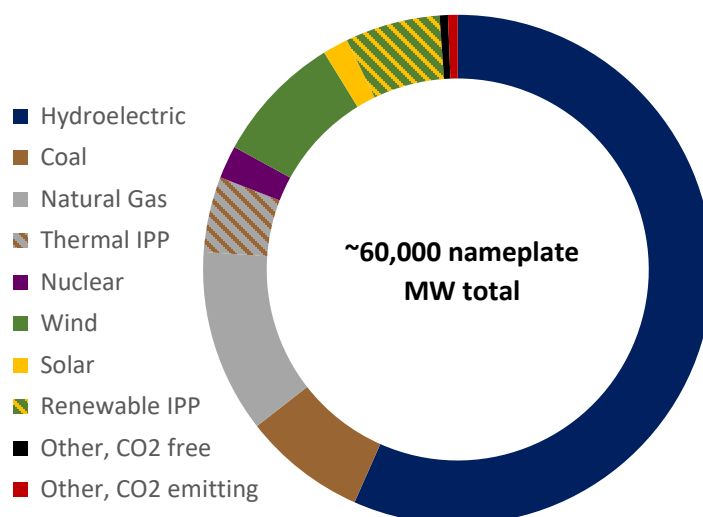
Project	Nameplate MW	Schedule
Valmy Unit 1	254	End of 2019
Centralia Unit 1	670	End of 2020
Boardman	585	End of 2020
Colstrip Unit 1 & 2	660	July 2022
Centralia Unit 2	670	End of 2025
Valmy Unit 2	267	End of 2025
Jim Bridger 2	540	End of 2028
<b>Total</b>	<b>3,646 MW</b>	

## Hydropower Still Dominates

Utilities in the Northwest depend on a reliable, low-carbon fleet of resources to ensure that we meet the energy needs of customers. Since the 1930s, hydroelectric power has been the centerpiece of the Northwest’s low-carbon energy portfolio, making up nearly 60 percent of the total electricity supply built in the region today. Even in low water conditions, hydropower makes up more than 60 percent of the region’s winter peak capacity supply. Of course, the more abundant the water supply in a year, the greater the share of the Northwest’s electric generation hydro provides.

Our reliance on hydropower means the average carbon footprint of the Northwest’s generating resources is less than half of the rest of the nation. It also means that the Northwest, in aggregate, has a head start in meeting national, regional, statewide and local goals that may be established for decarbonization.

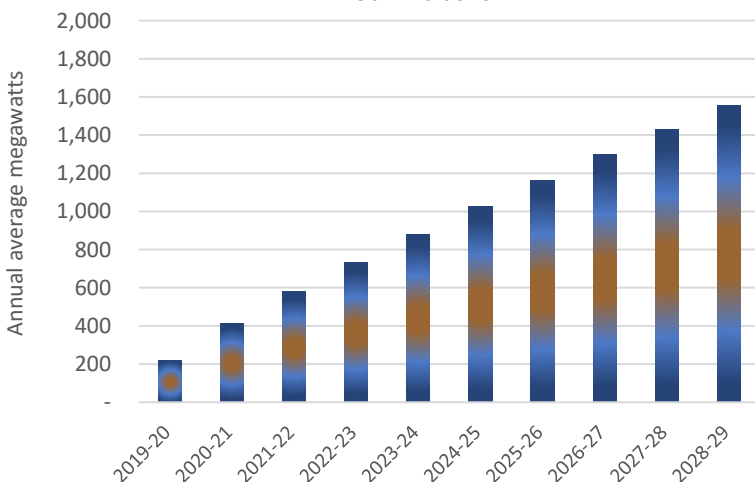
Figure 2: Northwest Generating Resources  
2021 Nameplate MW



## One Constant: Energy Efficiency

Northwest utilities’ steady and long-term commitment to offering energy-efficiency programs and incentives to customers has saved thousands of average megawatts, reducing the need to invest in new and expensive power plants. According to the Northwest Power & Conservation Council, a multi-state planning agency, the Northwest has saved more than 6,600 average annual megawatts since 1978 thanks to energy efficiency.

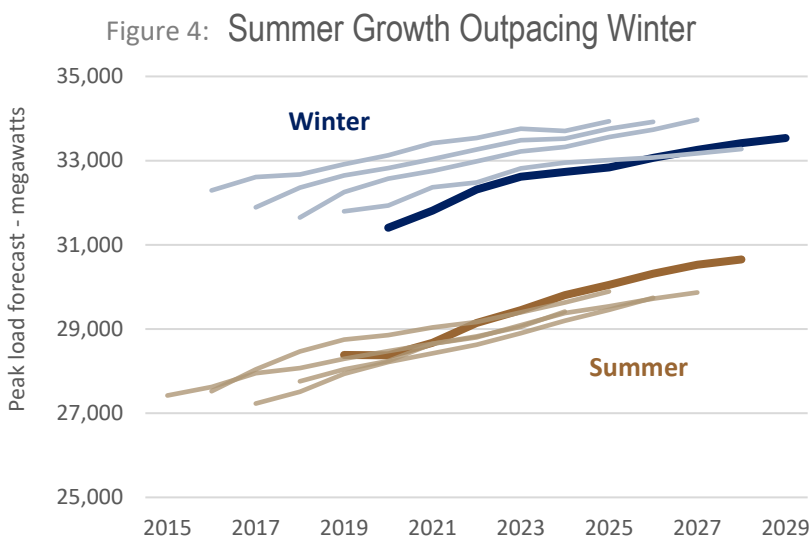
Figure 3: Energy Efficiency Savings  
Cumulative



Based on utility data the Northwest has consistently exceeded its goals. The story remains constant. Utilities continue to invest heavily into energy efficiency, forecasting savings of almost 160 average megawatts per year. These numbers don’t include the added savings from federal building and construction codes and standards, nor any market transformation efforts. The *Forecast* continues to predict significant energy efficiency acquisitions over the next decade.

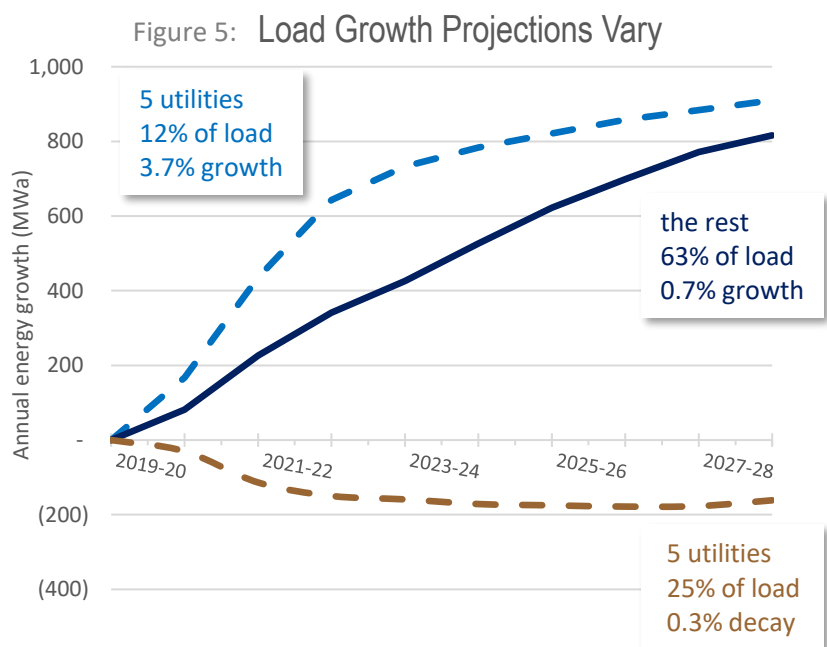
## Peak Demand Remains a Concern

The trends for meeting the region’s demand for power, especially during peak periods, might be as different as summer and winter – literally. Summer demand for electricity continues to stay on track. Multiple factors are likely contributing to this upward trend, including increased air conditioning. The projection for winter peak demand has slipped year over year. This is likely due to more energy efficiency, use of natural gas for heating, lost industrial load, among other drivers.



## Growth Varies Across the Region

The overall growth in demand is not consistent across the Northwest. Some utilities are experiencing significant growth, due largely to anticipated new industrial customers. Many of these utilities are located east of the Cascades in Oregon and Washington, where lower electricity costs, cheaper land prices and other factors are attracting new, large customers – particularly high-tech companies that need large amounts of electricity for data centers.



The annual average load growth for the region is less than 1 percent – 0.8 percent over the ten-year horizon. Yet, demand for electricity for just five utilities is growing at an average rate of 3.7 percent per year, while five other utilities are anticipating decaying loads on average of 0.3 percent per year. The region’s remaining utilities (over 60 percent of total demand) are expecting to grow on average at 0.7 percent annually.



Typically, the utilities with declining loads expect no new industrial customers to locate within their service territories. And while the number of residential customers is ticking up, energy use per customer is declining due to energy efficiency and federal codes and standards for new construction, use of natural gas for heating purposes or other factors.

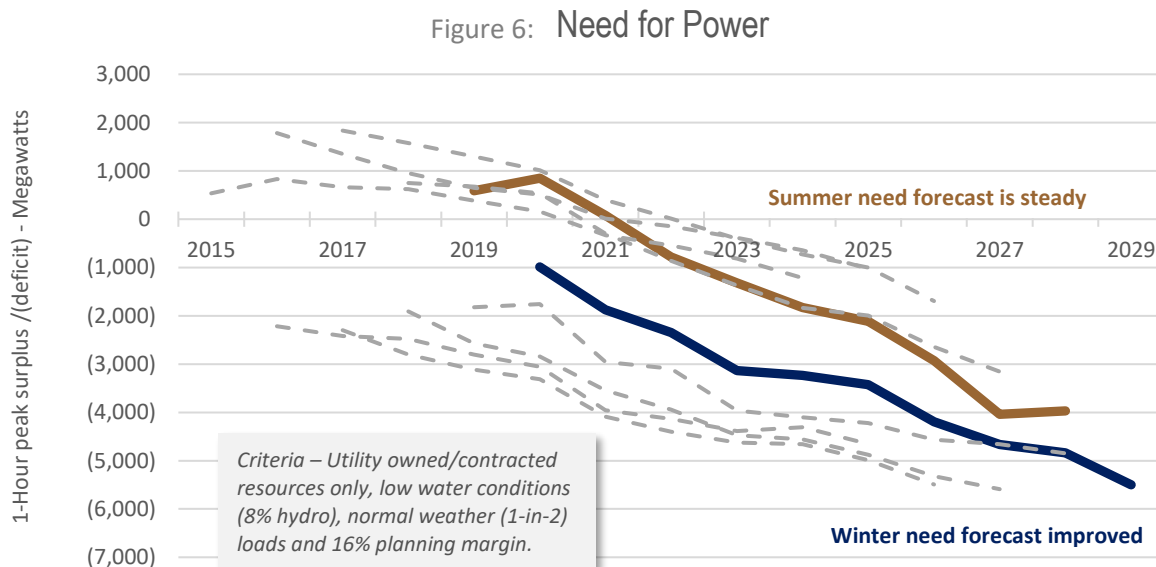
## Winter Need Remains, Summer Need Coming

The Northwest has adequate generation to meet customer demand during most times of the year. However, the winter peak need still exists under this forecast’s planning criteria. Although the picture has improved (in part due to the loss of large industrial load), the peak deficit grows through time if no future actions are taken.

The steady trend of a growing summer peak need is also drawing attention. Planning projections continue to indicate that within the *Forecast* horizon, summer peak requirements will outpace utilities’ firm generation, challenging utility planners to consider actions to address both winter and summer peak capacity need. This is underscored with the planned coal unit retirements (See Figure 1 above) and periodic experiences of tighter power supply throughout the west in the last few years.

This increasing sense of concern regarding winter and summer resource adequacy seems counterintuitive to the *Need for Power* pictured here. Summer need is similar to past reports and the winter picture is improving. However, we cannot look at the Northwest utilities’ load/resource balance picture in isolation.

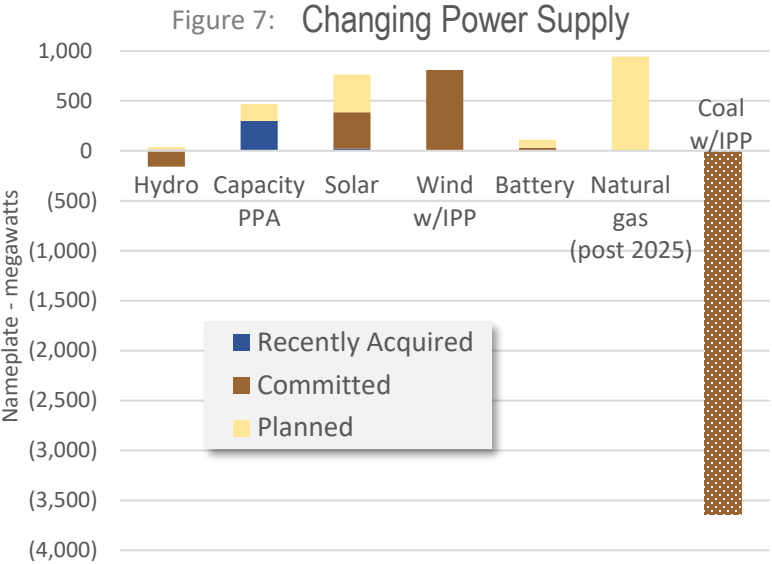
Northwest utilities have leaned on better than low hydro generation, power from independent power producers, and imports from outside the region to ease adequacy concerns. Looking ahead, those same opportunities may not exist. Hydro generation, depending on water supply, varies and can continue to provide non-firm power. However, as large thermal resources are retired throughout the Western Interconnection, the availability of non-firm power (the market) is shrinking, especially during hours of low renewable production. The retirements, along with the growing uncertainty of a utility or developer’s ability to build gas turbines to replace that lost generation, have triggered efforts to examine Northwest resource adequacy in a greater context.



## New Resource Plans Dynamic

This year’s *Forecast* reflects a quickening pace-of-change for utilities’ plans for acquiring new resources. New renewables are jumping in as committed, and planned new resources often show up one year and then fall away in another as utilities refine their plans to account for changing circumstances. Since last year’s *Forecast*, another coal unit closure has shown up in our planning horizon and been added to our tally for a total of over 3,600 MW of dispatchable capacity leaving the picture. In addition, the first large-scale battery (30 MW) will be integrated with a combined 350 MW wind and solar project in Eastern Oregon that has been committed to the Northwest.

The changes are stacking up. We expect more in next year’s report as utilities announce new goals for developing renewable generation and further decarbonizing their resource portfolios. Utilities have added 300 megawatts of contracts and 34 MW of new generation since last year. Nearly 900 megawatts of new generating resource, all wind and solar, are committed to be built in the next few years, as well as 200 MW of non-utility wind. Committed resources are included in the need for power assessment.



Utilities reported nearly 1,600 megawatts of nameplate capacity in the planning stage – mostly wind, batteries and solar power from 2019 to 2025. Starting in 2025, planned natural gas plants begin to appear, totaling over 900 MW by 2027. On the outgoing side, as mentioned earlier, are almost 3,600 MW of coal (including coal units owned by Independent Power Producers).

## The Future is Here

This year’s *Northwest Regional Forecast* continues a trend that is relatively new in its 70-year history. Over the past two decades, the region has transformed into a more diverse mix of resources and customers. Stepping up to meet this challenge, utilities are carefully navigating a path for a reliable, adequate, affordable future.

Changes in customer desires have impacted energy usage and future supply. We have met the challenge to integrate new wind and solar resources into our existing hydropower dominate system. We are looking at how to achieve new, more aggressive carbon-reduction goals at the state and national level, in a region that already leads the country in a low carbon power supply. And we are paying careful attention to resolving the impact of the retiring dispatchable resources in this changing power supply landscape.

As always, we will keep our collective eyes on emerging trends and developments as new technologies for power supply evolve and the desires of consumers change.

# Overview

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Each year the *Northwest Regional Forecast* compiles utilities' 10-year projections of electric loads and resources which provide information about the region's need to acquire new power supply. The Forecast is a comprehensive look at the capability of existing and new electric generation resources, long-term firm contracts, expected savings from demand side management programs and other components of electric demand for the Northwest.

This report presents estimates of annual average energy, seasonal energy and winter and summer peak capability in Tables 1 through 4 of the Northwest Region Requirements and Resources section. These metrics provide a multi-dimensional look at the Northwest's need for power and underscore the growing complexity of the power system.

Northwest generating resources are shown by fuel type. Existing resources include those resources listed in Tables 5, 6, 10 and 11. Table 5, Recently Acquired Resources, highlights projects and supply that became available most recently. Table 6, Committed New Supply, lists those generating projects where construction has started, as well as contractual arrangements that have been made for providing power at a future time. Table 10, Northwest Utility Generating Resources, is a comprehensive list of generating resources that make up the electric power supply for the Pacific Northwest that are utility-owned or utility contracted. Table 11, Independent Owned Generating Resources, lists generating projects owned by independent power producers and located in the Northwest.

In addition, utilities have demand side management programs in place to reduce the need for generating resources. Table 7, Demand-Side Management Programs, provides a snapshot of expected savings from these programs for the next ten years. Table 8, Planned Resources, is a compilation of what utilities have reported in their individual integrated resource plans to meet future need.

## Planning Area

The Northwest Regional Planning Area is the area defined by the *Pacific Northwest Electric Power Planning and Conservation Act*. It includes: the states of Oregon, Washington, and Idaho; Montana west of the Continental Divide; portions of Nevada, Utah, and Wyoming that lie within the Columbia River drainage basin; and any rural electric cooperative customer not in the geographic area described above, but served by BPA on the effective date of the *Act*.



# Northwest Region

## Requirements and Resources

**Table 1. Northwest Region Requirements and Resources – Annual Energy** shows the sum of the individual utilities’ requirements and firm resources for each of the next 10 years. Expected firm load and exports make up the total firm regional requirements.

Average Megawatts	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29
<b>Firm Requirements</b>										
Load <sup>1/</sup>	20,472	20,691	21,026	21,314	21,482	21,623	21,755	21,867	21,969	22,051
Exports	<u>476</u>	<u>465</u>	<u>467</u>	<u>467</u>	<u>467</u>	<u>467</u>	<u>467</u>	<u>467</u>	<u>467</u>	<u>467</u>
<b>Total</b>	20,947	21,157	21,493	21,781	21,949	22,090	22,222	22,334	22,436	22,518
<b>Firm Resources</b>										
Hydro <sup>2/</sup>	11,117	11,117	11,097	11,079	11,080	11,080	11,080	11,080	11,080	11,080
Natural Gas <sup>3/</sup>	4,637	4,627	4,586	4,481	4,462	4,359	4,340	4,136	4,137	4,094
Renewables-Other	235	233	230	227	227	227	224	214	215	216
Solar	189	254	269	268	268	267	268	268	268	268
Wind	1,308	1,397	1,378	1,337	1,322	1,314	1,314	1,299	1,261	1,258
Cogeneration	45	45	27	8	8	8	8	8	8	8
Imports	706	709	711	713	716	671	640	338	339	339
Nuclear	1,100	937	1,100	937	1,100	937	1,100	937	1,100	937
Coal	<u>3,621</u>	<u>3,664</u>	<u>3,111</u>	<u>3,108</u>	<u>2,912</u>	<u>2,847</u>	<u>2,741</u>	<u>2,796</u>	<u>2,732</u>	<u>2,248</u>
<b>Total</b>	22,958	22,984	22,509	22,160	22,094	21,711	21,713	21,076	21,140	20,448
<b>Surplus (Deficit)</b>	<b>2,011</b>	<b>1,827</b>	<b>1,017</b>	<b>379</b>	<b>145</b>	<b>(379)</b>	<b>(509)</b>	<b>(1,258)</b>	<b>(1,296)</b>	<b>(2,070)</b>

<sup>1/</sup> Loads net of energy efficiency

<sup>2/</sup> Firm hydro for energy is the generation expected assuming 1936-37 water conditions

<sup>3/</sup> There is likely more energy available from thermal units whose data shows only planned generation

**Table 2. Northwest Region Requirements and Resources – Monthly Energy** shows the monthly energy values for the 2019-2020 operating year.

Average Megawatts	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
<b>Firm Requirements</b>												
Load <sup>1/</sup>	20,346	18,609	18,709	20,767	23,536	23,213	21,649	20,459	19,129	18,848	19,737	20,977
Exports	<u>613</u>	<u>521</u>	<u>521</u>	<u>521</u>	<u>521</u>	<u>491</u>	<u>491</u>	<u>491</u>	<u>491</u>	<u>491</u>	<u>491</u>	<u>506</u>
<b>Total</b>	20,959	19,130	19,230	21,288	24,056	23,704	22,140	20,950	19,620	19,339	20,227	21,483
<b>Firm Resources</b>												
Hydro <sup>2/</sup>	11,715	9,136	9,526	10,863	11,595	11,202	9,144	9,581	9,412	11,341	14,633	13,512
Natural Gas <sup>3/</sup>	4,733	4,553	4,378	4,736	4,998	5,030	4,740	4,524	4,208	3,917	4,523	4,739
Renewables-Other	228	232	240	245	244	240	238	240	228	219	224	227
Solar	226	181	132	67	50	82	152	210	291	341	382	401
Wind	1,199	1,196	1,143	1,185	1,198	1,038	1,298	1,486	1,524	1,455	1,536	1,439
Cogeneration	43	45	47	47	55	55	51	54	46	40	28	43
Imports	701	659	671	705	744	762	729	736	674	677	697	721
Nuclear	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100	1,100
Coal	<u>3,852</u>	<u>3,852</u>	<u>3,852</u>	<u>3,852</u>	<u>3,852</u>	<u>3,737</u>	<u>3,737</u>	<u>3,647</u>	<u>3,220</u>	<u>2,966</u>	<u>2,876</u>	<u>3,737</u>
<b>Total</b>	23,798	20,953	21,088	22,799	23,835	23,247	21,190	21,577	20,703	22,056	25,998	25,918
<b>Surplus (Deficit)</b>	<b>2,839</b>	<b>1,823</b>	<b>1,858</b>	<b>1,511</b>	<b>(222)</b>	<b>(457)</b>	<b>(950)</b>	<b>627</b>	<b>1,083</b>	<b>2,717</b>	<b>5,771</b>	<b>4,435</b>

<sup>1/</sup> Loads net of energy efficiency

<sup>2/</sup> Firm hydro for energy is the generation expected assuming 1936-37 water conditions

<sup>3/</sup> There is likely more energy available from thermal units whose data shows only planned generation

**Table 3. Northwest Region Requirements and Resources – Winter Peak**

The sum of the individual utilities' firm requirements and resources for the peak hour in January for each of the next 10 years are shown in this table. Firm peak requirements include a planning margin to account for planning uncertainties.

Megawatts	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029
<b>Firm Requirements</b>										
Load <sup>1/</sup>	31,405	31,811	32,317	32,620	32,732	32,839	33,069	33,255	33,418	33,537
Exports	1,150	1,174	1,003	1,000	998	1,009	1,017	1,017	1,001	997
Planning Margin <sup>2/</sup>	<u>5,025</u>	<u>5,090</u>	<u>5,171</u>	<u>5,219</u>	<u>5,237</u>	<u>5,254</u>	<u>5,291</u>	<u>5,321</u>	<u>5,347</u>	<u>5,366</u>
<b>Total</b>	<b>37,580</b>	<b>38,075</b>	<b>38,490</b>	<b>38,840</b>	<b>38,967</b>	<b>39,102</b>	<b>39,378</b>	<b>39,593</b>	<b>39,766</b>	<b>39,900</b>
<b>Firm Resources</b>										
Hydro <sup>3/</sup>	22,549	22,549	22,549	22,546	22,546	22,546	22,546	22,546	22,546	22,546
Demand Response	42	86	92	120	146	169	206	224	228	228
Small Thermal & Misc.	167	167	167	167	167	167	167	167	165	165
Natural Gas	6,546	6,556	6,556	6,418	6,417	6,417	6,417	6,157	6,157	6,157
Renewables-Other	250	248	241	241	241	241	241	223	223	223
Solar	10	13	14	14	14	14	14	14	14	14
Wind	289	309	297	276	271	271	271	271	270	270
Cogeneration	59	59	9	9	9	9	9	9	9	9
Imports	1,367	1,471	1,475	1,479	1,483	1,407	1,010	1,013	1,016	1,016
Nuclear	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144	1,144
Coal	<u>4,168</u>	<u>3,598</u>	<u>3,598</u>	<u>3,291</u>	<u>3,291</u>	<u>3,291</u>	<u>3,157</u>	<u>3,157</u>	<u>3,157</u>	<u>2,627</u>
<b>Total</b>	<b>36,592</b>	<b>36,200</b>	<b>36,143</b>	<b>35,706</b>	<b>35,730</b>	<b>35,676</b>	<b>35,183</b>	<b>34,926</b>	<b>34,931</b>	<b>34,400</b>
<b>Surplus (Need)</b>	<b>(988)</b>	<b>(1,875)</b>	<b>(2,348)</b>	<b>(3,134)</b>	<b>(3,237)</b>	<b>(3,426)</b>	<b>(4,195)</b>	<b>(4,667)</b>	<b>(4,835)</b>	<b>(5,500)</b>

<sup>1/</sup> Expected (1-in-2) loads net of energy efficiency

<sup>2/</sup> Planning margin is 16% of load in every year (this is a change since 2018)

<sup>3/</sup> Firm hydro for capacity is the generation expected assuming critical (8%) water condition

**Table 4. Northwest Region Requirements and Resources – Summer Peak**

The sum of the individual utilities' firm requirements and resources for a peak hour in August for each of the next 10 years are shown in this table. Firm peak requirements include a planning margin to account for planning uncertainties.

Megawatts	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
<b>Firm Requirements</b>										
Load <sup>1/</sup>	28,380	28,375	28,674	29,140	29,450	29,805	30,051	30,315	30,529	30,652
Exports	1,726	1,491	1,504	1,510	1,580	1,689	1,637	1,619	2,250	2,037
Planning Margin <sup>2/</sup>	<u>4,541</u>	<u>4,540</u>	<u>4,588</u>	<u>4,662</u>	<u>4,712</u>	<u>4,769</u>	<u>4,808</u>	<u>4,850</u>	<u>4,885</u>	<u>4,904</u>
<b>Total</b>	34,647	34,405	34,766	35,312	35,742	36,263	36,496	36,785	37,664	37,594
<b>Firm Resources</b>										
Hydro <sup>3/</sup>	21,267	21,267	21,267	21,264	21,264	21,264	21,264	21,264	21,264	21,264
Demand Response	381	415	425	451	471	486	506	536	542	542
Small Thermal & Misc.	165	167	167	167	167	167	167	167	165	165
Natural Gas	6,084	6,095	6,095	6,097	5,962	5,962	5,961	5,957	5,720	5,720
Renewables-Other	253	251	249	243	243	243	243	225	225	225
Solar	249	336	389	406	406	406	406	406	406	406
Wind	298	306	325	293	293	284	284	284	280	280
Cogeneration	50	50	26	9	9	9	9	9	9	9
Imports	1,066	1,072	1,178	1,184	1,189	1,194	1,120	725	730	730
Nuclear	1,128	1,128	1,128	1,128	1,128	1,128	1,128	1,128	1,128	1,128
Coal	<u>4,295</u>	<u>4,168</u>	<u>3,598</u>	<u>3,291</u>	<u>3,291</u>	<u>3,291</u>	<u>3,291</u>	<u>3,157</u>	<u>3,157</u>	<u>3,157</u>
<b>Total</b>	35,235	35,254	34,846	34,532	34,423	34,435	34,379	33,859	33,625	33,625
<b>Surplus (Need)</b>	<b>588</b>	<b>849</b>	<b>81</b>	<b>(781)</b>	<b>(1,320)</b>	<b>(1,828)</b>	<b>(2,117)</b>	<b>(2,926)</b>	<b>(4,039)</b>	<b>(3,969)</b>

<sup>1/</sup> Expected (1-in-2) loads net of energy efficiency

<sup>2/</sup> Planning margin is 16% of load in every year (this is a change since 2018)

<sup>3/</sup> Firm hydro for capacity is the generation expected assuming critical (8%) water condition

# Northwest New and Existing Resources

**Table 5. Recently Acquired Resources** highlights projects that have recently become available.

Project	Fuel/Tech	Nameplate (MW)	Winter Peak (MW)	Summer Peak (MW)	Energy (MWa)	Utility/Owner
Calligan Creek	Hydro	6	6	2		Snohomish PUD
Hancock Creek	Hydro	6	6	3		Snohomish PUD
Adams Neilson PPA	Solar	22 (AC)				Avista/Strata Solar
BPA capacity PPA	PPA	200	200	200		PGE
AvanGrid capacity PPA	PPA	100	100	100		PGE
<b>Total</b>		<b>334</b>				

**Table 6. Committed New Supply** details contracts and generating projects where construction has started and that utilities are counting on to meet need. All supply listed in this table is included in the regional analysis of power needs.

Project	Year	Fuel/Tech	Name plate (MW)	Winter Peak (MW)	Summer Peak (MW)	Energy (MWa)	Utility/Owner
Vale 1 Solar	2019	Solar	3		5	2	Idaho Power
Brush Solar	2019	Solar	3		1	1	Idaho Power
Morgan Solar	2019	Solar	3		2	2	Idaho Power
Baker Solar Center	2019	Solar	15		8		Idaho Power
PacifiCorp Wind Repower	2019	Wind	25				PacifiCorp
Rattlesnake Flat	2020	Wind	144			50	Avista/Clearway
Skookumchuck	2020	Wind	139				PSE
Montauge Wind (IPP)	2020	Wind	200				Avangrid
Wheatfield Wind	2020	Wind	300	49	49	100	PGE/NextEra
Wheatfield Battery	2021	Battery	30				PGE/NextEra
East. WA. Solar	2021	Solar	150				PSE/Avangrid
Wheatfield Solar	2021	Solar	50				PGE/NextEra
Idaho/Twin Falls Solar	2022	Solar	120				Idaho Power/Jackpot
<b>Total</b>			<b>1,182</b>				



**Table 7. Demand-Side Management Programs** is a snapshot of the regional utilities’ efforts to manage demand. The majority of the energy efficiency savings are from utility programs and included in the regional analysis of power needs. This table also shows cumulative existing plus new demand response programs reported by utilities.

	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29
<b>Energy Efficiency (MWa)</b>										
Incremental	218	194	166	152	150	143	141	135	130	128
Cumulative	218	413	579	731	881	1,023	1,165	1,299	1,429	1,558
<b>Demand Response (MW)</b>										
Winter (exist. + forecast)	42	86	92	120	146	169	206	224	228	228
Summer (exist. + forecast)	381	415	425	451	471	486	506	536	542	542

**Table 8. Planned Resources** catalogues potential resources that utilities have identified to meet their own needs. These resources are not included in the regional analysis of power needs.

Project	Date	Fuel/Tech	Nameplate (MW)	Winter Peak (MW)	Summer Peak (MW)	Energy (MWa)	Utility
Generator Replacement	2019	Hydro	9	9	9		Grant County PUD
Generator Replacement	2019	Hydro	9	9	9		Grant County PUD
Generator Rebuild	2019	Hydro	9	9	9		Grant County PUD
Capacity PPA	2019	Unknown	50	50	-	5	Snohomish PUD
Hydro Upgrade	2020	Hydro	3	-	3		Idaho Power
Solar	2022	Solar	266	0			PSE
Battery	2023	Battery	50	38			PSE
Battery	2024	Battery	25	15			PSE
Solar	2024	Solar	112	0			PSE
Natural Gas Peaker	2025	Natural Gas	239	239			PSE
Natural Gas Peaker	2026	Natural Gas	192	204	177	178	Avista
Natural Gas Peaker	2026	Natural Gas	239	239			PSE
Thermal Upgrades	2026-2029	Natural Gas	34	34	35	31	Avista
Natural Gas Peaker	2027	Natural Gas	239	239			PSE
Capacity Resource	2028	Unknown	120	116	116	12	Snohomish PUD
Storage	2029	Unknown	5	5	5	0	Avista
<b>Total</b>			<b>1,599</b>				

**Table 9. Committed and Planned Dispatchable Resources Timeline** provides an expected schedule for new resource additions for both the committed resources already included in the load/resource picture, and planned resources that are not as far along in the acquisition/build process.

Nameplate MW	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	Total
Hydro	26	(160)										(134)
Capacity	50									120		170
Solar	24		200	266		112						741
Wind (inc. IPP)	25	783										808
Battery			30		50	25					5	110
Natural gas							239	431	273			943
Demand Response			44	6	28	26	23	37	17	5		186
Coal (inc. IPP)	(254)	(1,255)		(660)			(937)			(540)		(3,646)
<b>Total incremental</b>	<b>(129)</b>	<b>(632)</b>	<b>274</b>	<b>(248)</b>	<b>78</b>	<b>163</b>	<b>(675)</b>	<b>468</b>	<b>290</b>	<b>(416)</b>	<b>5</b>	
<b>Total cumulative</b>	<b>(129)</b>	<b>(761)</b>	<b>(487)</b>	<b>(735)</b>	<b>(657)</b>	<b>(494)</b>	<b>(1,169)</b>	<b>(701)</b>	<b>(411)</b>	<b>(827)</b>	<b>(823)</b>	

**Table 10. Northwest Utility Generating Resources** is a comprehensive list of utility-owned and utility contracted generating resources that make up those utilities electric power supply.

Project	Owner	NW Utility	Nameplate (MW)
<b>HYDRO</b>			<b>33,344</b>
Albeni Falls	US Corps of Engineers	Federal System (BPA)	43
Alder	Tacoma Power	Tacoma Power	50
American Falls	Idaho Power	Idaho Power	92
Anderson Ranch	US Bureau of Reclamation	Federal System (BPA)	40
Arena Drop	PURPA	Idaho Power	0
Arrowrock Dam	Clatskanie PUD/Irrigation Dist.	Clatskanie PUD	18
B. Smith	PacifiCorp	PacifiCorp	0
Baker City Hydro		Idaho Power	
Barber Dam		Idaho Power	4
Bell Mountain	PacifiCorp	PacifiCorp	1
Big Sheep Creek	Everand Jensen	Avista Corp.	0
Big Cliff	US Corps of Engineers	Federal System (BPA)	18
Birch Creek	PURPA	Idaho Power	0
Birch Creek	PacifiCorp	PacifiCorp	3
Black Canyon # 3	PURPA	Idaho Power	0
Black Canyon	US Bureau of Reclamation	Federal System (BPA)	10
Black Canyon Bliss Dam	PURPA	Idaho Power	-
Black Creek Hydro	Black Creek Hydro, Inc.	Puget Sound Energy	4
Blind Canyon	PURPA	Idaho Power	2
Boston Power		PacifiCorp	
Bliss	Idaho Power	Idaho Power	75
Boise River Diversion	US Bureau of Reclamation	Federal System (BPA)	2
Bonneville	US Corps of Engineers	Federal System (BPA)	1,102
Box Canyon-Idaho	PURPA	Idaho Power	0
Boundary	Seattle City Light	Seattle City Light	1,119
Box Canyon	Pend Oreille County PUD	Pend Oreille County PUD	70
Briggs Creek	PURPA	Idaho Power	1
Brownlee	Idaho Power	Idaho Power	585
Bypass	PURPA	Idaho Power	10
Cabinet Gorge	Avista Corp.	Avista Corp.	265
Calligan Creek	Snohomish County PUD	Snohomish County PUD	6
Calispel Creek	Pend Oreille County PUD	Pend Oreille County PUD	1
Canyon Springs	PURPA	Idaho Power	0
Carmen-Smith	Eugene Water & Electric Board	Eugene Water & Electric Board	105
Cascade	US Bureau of Reclamation	Idaho Power	12
CDM Hydro	PacifiCorp	PacifiCorp	6
Cedar Falls, Newhalem	PURPA	Seattle City Light	33
Central Oregon Siphon		PacifiCorp	5
Chandler	US Bureau of Reclamation	Federal System (BPA)	12

<b>Project</b>	<b>Owner</b>	<b>NW Utility</b>	<b>Nameplate (MW)</b>
Chelan	Chelan County PUD	Chelan County PUD	59
Chief Joseph	US Corps of Engineers	Federal System (BPA)	2,457
C. J. Strike	Idaho Power	Idaho Power	83
Clark Canyon Dam	PURPA	Idaho Power	8
Clear Lake	Idaho Power	Idaho Power	3
Clear Springs Trout	PURPA	Idaho Power	1
Clearwater #1	PacifiCorp	PacifiCorp	15
Clearwater #2	PacifiCorp	PacifiCorp	26
Cline Falls	COID	PacifiCorp	1
COID	PacifiCorp	PacifiCorp	7
Copco #1	PacifiCorp	PacifiCorp	20
Copco #2	PacifiCorp	PacifiCorp	27
Cougar	US Corps of Engineers	Federal System (BPA)	25
Cowlitz Falls	Lewis County PUD	Federal System (BPA)	70
Crystal Springs	PURPA	Idaho Power	2
Curry Cattle Company	PURPA	Idaho Power	0
Curtis Livestock	PacifiCorp	PacifiCorp	0
Cushman 1	Tacoma Power	Tacoma Power	43
Cushman 2	Tacoma Power	Tacoma Power	81
Deep Creek	Gordon Foster	Avista Corp.	0
Derr Creek	Jim White	Avista Corp.	0
Detroit	US Corps of Engineers	Federal System (BPA)	100
Dexter	US Corps of Engineers	Federal System (BPA)	15
Diablo Canyon	Seattle City Light	Seattle City Light	182
Dietrich Drop	PURPA	Idaho Power	5
Dry Creek		PacifiCorp	4
D. Wiggins		PacifiCorp	
Dworshak	US Corps of Engineers	Federal System (BPA)	400
Dworshak/ Clearwater		Federal System (BPA)	
Eagle Point	PacifiCorp	PacifiCorp	3
East Side	PacifiCorp	PacifiCorp	3
Eight Mile Hydro	PURPA	Idaho Power	0
Electron	Electron Hydro, LLC	Puget Sound Energy	23
Elk Creek	PURPA	Idaho Power	2
Eltopia Branch Canal	SEQCBID	Seattle City Light	2
Esquatzel Small Hydro	Green Energy Today, LLC	Franklin County PUD	1
Fall Creek	PacifiCorp	PacifiCorp	3
Falls Creek	Clallam PUD	Other Public (BPA)	0
Falls River	PURPA	Idaho Power	9
Faraday	Portland General Electric	Portland General Electric	37
Fargo Drop Hydro	PURPA	Idaho Power	1
Farmers Irrigation	PacifiCorp	PacifiCorp	3

<b>Project</b>	<b>Owner</b>	<b>NW Utility</b>	<b>Nameplate (MW)</b>
Faulkner Ranch	PURPA	Idaho Power	1
Fish Creek	PacifiCorp	PacifiCorp	11
Fisheries Development Co.	PURPA	Idaho Power	0
Foster	US Corps of Engineers	Federal System (BPA)	20
Frontier Technologies	PacifiCorp	PacifiCorp	4
Galesville Dam	PacifiCorp	PacifiCorp	2
Gem State Hydro		Other Publics (BPA)	23
Geo-Bon No 2	PURPA	Idaho Power	1
Georgetown Power	PacifiCorp	PacifiCorp	0
Gorge	Seattle City Light	Seattle City Light	207
Grand Coulee	US Bureau of Reclamation	Federal System (BPA)	6,494
Green Peter	US Corps of Engineers	Federal System (BPA)	80
Green Springs	US Bureau of Reclamation	Federal System (BPA)	16
Hailey CSPP	PURPA	Idaho Power	0
Hancock Creek	Snohomish County PUD	Snohomish County PUD	6
Hazelton A	PURPA	Idaho Power	8
Hazelton B	PURPA	Idaho Power	8
Head of U Canal	PURPA	Idaho Power	1
Hells Canyon	Idaho Power	Idaho Power	392
Hills Creek	US Corps of Engineers	Federal System (BPA)	30
Hood Street Reservoir	Tacoma Power	Tacoma Power	1
Horseshoe Bend	PURPA	Idaho Power	10
Hungry Horse	US Bureau of Reclamation	Federal System (BPA)	428
Hutchinson Creek	STS Hydro	Puget Sound Energy	1
Ice Harbor	US Corps of Engineers	Federal System (BPA)	603
Idaho Falls - City Plant		Federal System (BPA)	8
Idaho Falls - Lower Plant		Federal System (BPA)	8
Idaho Falls - Upper Plant		Federal System (BPA)	8
Ingram Warm Springs	PacifiCorp	PacifiCorp	1
Iron Gate	PacifiCorp	PacifiCorp	18
Island Park		Fall River Rural Electric Cooperative	5
Jackson (Sultan)	Snohomish County PUD	Snohomish County PUD	112
James Boyd		PacifiCorp	
Jim Ford Creek	Ford Hydro	Avista Corp.	2
Jim Knight	PURPA	Idaho Power	0
John C. Boyle	PacifiCorp	PacifiCorp	90
John Day	US Corps of Engineers	Federal System (BPA)	2,160
John Day Creek	Dave Cereghino	Avista Corp.	1
John H Koyle	PURPA	Idaho Power	1
Joseph Hydro		PacifiCorp	
Kasel-Witherspoon	PURPA	Idaho Power	1
Kerr	NorthWestern Corporation	NorthWestern Energy	194

<b>Project</b>	<b>Owner</b>	<b>NW Utility</b>	<b>Nameplate (MW)</b>
Koma Kulshan	Koma Kulshan Associates	Puget Sound Energy	11
La Grande	Tacoma Power	Tacoma Power	64
Lacomb Irrigation	PacifiCorp	PacifiCorp	1
Lake Creek		Other Publics (BPA)	
Lake Oswego Corp.		Portland General Electric	1
Lateral No. 10	PURPA	Idaho Power	2
Leaburg	Eugene Water & Electric Board	Eugene Water & Electric Board	16
Lemolo #1	PacifiCorp	PacifiCorp	32
Lemolo #2	PacifiCorp	PacifiCorp	33
Lemoyne	PURPA	Idaho Power	0
Libby	US Corps of Engineers	Federal System (BPA)	525
Lilliwaup Falls		Other Public (BPA)	1
Little Falls	Avista Corp.	Avista Corp.	32
Little Goose	US Corps of Engineers	Federal System (BPA)	810
Little Wood	PURPA	Idaho Power	3
Little Wood/Arkoosh	PURPA	Idaho Power	1
Little Wood River Ranch II	PURPA	Idaho Power	1
Lloyd Fery	PacifiCorp	PacifiCorp	0
Long Lake	Avista Corp.	Avista Corp.	70
Lookout Point	US Corps of Engineers	Federal System (BPA)	120
Lost Creek	US Corps of Engineers	Federal System (BPA)	49
Lower Baker	Puget Sound Energy	Puget Sound Energy	115
Lower Granite	US Corps of Engineers	Federal System (BPA)	810
Lower Malad	Idaho Power	Idaho Power	14
Lower Monumental	US Corps of Engineers	Federal System (BPA)	810
Lower Salmon	Idaho Power	Idaho Power	60
Lowline #2	PURPA	Idaho Power	3
Lowline Canal	PURPA	Idaho Power	3
Lowline Midway	Idaho Power	Idaho Power	8
Lucky Peak	US Corps of Engineers	Seattle City Light	113
Magic Reservoir	PURPA	Idaho Power	9
Main Canal Headworks	SEQCBID	Seattle City Light	26
Malad River	PURPA	Idaho Power	1
Mayfield	Tacoma Power	Tacoma Power	162
McNary	US Corps of Engineers	Federal System (BPA)	980
McNary Fishway	US Corps of Engineers	Other Publics (BPA)	10
Merwin	PacifiCorp	PacifiCorp	136
Meyers Falls	Hydro Technology Systems	Avista Corp.	1
Middlefork Irrigation	PacifiCorp	PacifiCorp	3
Mile 28	PURPA	Idaho Power	2
Mill Creek (Cove)		Idaho Power	1
Mill Creek		Other Publics (BPA)	1

<b>Project</b>	<b>Owner</b>	<b>NW Utility</b>	<b>Nameplate (MW)</b>
Milner	Idaho Power	Idaho Power	59
Minidoka	US Bureau of Reclamation	Federal System (BPA)	28
Mink Creek	PacifiCorp	PacifiCorp	3
Mitchell Butte	PURPA	Idaho Power	2
Monroe Street	Avista	Avista Corp.	15
Mora Drop	PURPA	Idaho Power	2
Morse Creek		Port Angeles	1
Mossyrock	Tacoma Power	Tacoma Power	300
Mountain Energy	PacifiCorp	PacifiCorp	0
Mount Tabor	City of Portland	Portland General Electric	0
Moyie Springs	City of Bonners Ferry	Other Publics (BPA)	4
Mud Creek/S&S	PURPA	Idaho Power	1
Mud Creek/White	Mud Creek Hydro	Idaho Power	0
N-32 Canal (Marco Ranches)	Ranchers Irrigation Inc.	Idaho Power	1
Nicols Gap	PacifiCorp	PacifiCorp	1
Nicolson SunnyBar	PacifiCorp	PacifiCorp	0
Nine Mile	Avista Corp.	Avista Corp.	26
Nooksack	Puget Sound Hydro, LLC	Puget Sound Energy	2
North Gooding		Idaho Power	
North Fork	Portland General Electric	Portland General Electric	41
North Fork Sprague	PacifiCorp	PacifiCorp	1
N.R. Rousch	PacifiCorp	PacifiCorp	0
Noxon Rapids	Avista Corp.	Avista Corp.	466
Odell Creek	PacifiCorp	PacifiCorp	0
Oak Grove	Portland General Electric	Portland General Electric	51
O.J. Power	PacifiCorp	PacifiCorp	0
Opal Springs	PacifiCorp	PacifiCorp	5
Ormsby		PacifiCorp	
Owyhee Dam	PURPA	Idaho Power	5
Oxbow	Idaho Power Company	Idaho Power	190
Packwood	Energy Northwest	Multiple Utilities	26
Palisades	US Bureau of Reclamation	Federal System (BPA)	177
PEC Headworks	SEQCBID	Grant County PUD	7
Pelton Reregulation	Warm Springs Tribe	Portland General Electric	19
Pelton	Portland General Electric	Multiple Utilities	110
Phillips Ranch	Glen Phillips	Avista Corp.	0
Pigeon Cove	PURPA	Idaho Power	2
Portland Hydro-Project	City of Portland	Portland General Electric	36
Portneuf River		PacifiCorp	1
Potholes East Canal 66 Headworks	SEQCBID	Seattle City Light	2
Post Falls	Avista Corp.	Avista Corp.	15

<b>Project</b>	<b>Owner</b>	<b>NW Utility</b>	<b>Nameplate (MW)</b>
Preston City	PacifiCorp	PacifiCorp	0
Powerdale	PacifiCorp	PacifiCorp	6
Pristine Springs	PURPA	Idaho Power	0
Priest Rapids	Grant County PUD	Multiple Utilities	956
Pristine Springs #3	PURPA	Idaho Power	0
Prospect projects	PacifiCorp	PacifiCorp	44
Quincy Chute	SEQCBID	Grant County PUD	9
R.D. Smith	SEQCBID	Seattle City Light	6
Reynolds Irrigation	PURPA	Idaho Power	0
Reeder Gulch	City of Ashland	Other Publics (BPA)	0
Rock Creek No. 1	PURPA	Idaho Power	2
River Mill	Portland General Electric	Portland General Electric	19
Rock Creek No. 2	PURPA	Idaho Power	2
Rocky Brook	Mason County PUD #3	Other Public (BPA)	2
Sagebrush	PURPA	Idaho Power	0
Rock Island	Chelan County PUD	Multiple Utilities	629
Rocky Reach	Chelan County PUD	Multiple Utilities	1,300
Ross	Seattle City Light	Seattle City Light	450
Round Butte	Portland General Electric	Multiple Utilities	247
Roza	US Bureau of Reclamation	Federal System (BPA)	13
Sahko	PURPA	Idaho Power	1
Santiam	PacifiCorp	PacifiCorp	0
Schaffner	PURPA	Idaho Power	1
Sheep Creek	Glen Phillips	Avista Corp.	2
Shingle Creek	PURPA	Idaho Power	0
Shoshone II	PURPA	Idaho Power	1
Shoshone CSPP	PURPA	Idaho Power	0
Slide Creek	PacifiCorp	PacifiCorp	18
Shoshone Falls	Idaho Power	Idaho Power	13
Soda Springs	PacifiCorp	PacifiCorp	11
Smith Creek	Smith Creek Hydro, LLC	Eugene Water & Electric Board	38
Snedigar Ranch	PURPA	Idaho Power	1
Snoqualmie Falls	Puget Sound Energy	Puget Sound Energy	54
Spokane Upriver	City of Spokane	Avista Corp.	16
Soda Creek	City of Soda Springs	Other Publics (BPA)	1
Snake River Pottery	PURPA	Idaho Power	
South Fork Tolt	Seattle City Light	Seattle City Light	17
Stauffer Dry Creek		PacifiCorp	
Summer Falls	SEQCBID	Seattle City Light	92
Stone Creek	Eugene Water & Electric Board	Eugene Water & Electric Board	12
Strawberry Creek	South Idaho Public Agency	Other Publics (BPA)	
Sygitowicz	Cascade Clean Energy	Puget Sound Energy	0



<b>Project</b>	<b>Owner</b>	<b>NW Utility</b>	<b>Nameplate (MW)</b>
Swan Falls	Idaho Power	Idaho Power	25
Swift 1	PacifiCorp	Multiple Utilities	219
Swift 2	Cowlitz County PUD	Multiple Utilities	-
TGS/Briggs		PacifiCorp	
Tiber Dam	PURPA	Idaho Power	8
The Dalles	US Corps of Engineers	Federal System (BPA)	1,807
The Dalles Fishway	Northern Wasco Co. PUD	Northern Wasco Co. PUD	5
Thompson Falls	NorthWestern Corporation	NorthWestern Energy	94
Thousand Springs	Idaho Power	Idaho Power	9
Toketee	PacifiCorp	PacifiCorp	43
Trout Company	PURPA	Idaho Power	0
Trail Bridge	Eugene Water & Electric Board	Eugene Water & Electric Board	10
Tunnel #1	PURPA	Idaho Power	7
Twin Falls	PURPA	Puget Sound Energy	20
Twin Falls	Idaho Power	Idaho Power	53
Walla Walla	PacifiCorp	PacifiCorp	2
TW Sullivan	Portland General Electric	Portland General Electric	15
Upper Baker	Puget Sound Energy	Puget Sound Energy	105
Upper Falls	Avista Corp.	Avista Corp.	10
Upper Malad	Idaho Power	Idaho Power	8
Upper Salmon 1 & 2	Idaho Power	Idaho Power	18
Upper Salmon 3 & 4	Idaho Power	Idaho Power	17
Weeks Falls	So. Fork II Assoc. LP	Puget Sound Energy	5
Wallowa Falls	PacifiCorp	PacifiCorp	1
Walterville	Eugene Water & Electric Board	Eugene Water & Electric Board	8
Wanapum	Grant County PUD	Multiple Utilities	934
West Side	PacifiCorp	PacifiCorp	1
Wells	Douglas County PUD	Multiple Utilities	774
White Water Ranch	PURPA	Idaho Power	0
Wilson Lake Hydro	PURPA	Idaho Power	8
Woods Creek	Snohomish County PUD	Snohomish County PUD	1
Yakima-Tieton	PacifiCorp	PacifiCorp	3
Wynoochee	Tacoma Power	Tacoma Power	13
Yale	PacifiCorp	PacifiCorp	134
Yelm		Other Publics (BPA)	12
Young's Creek	Snohomish County PUD	Snohomish County PUD	8

<b>Project</b>	<b>Owner</b>	<b>NW Utility</b>	<b>Nameplate (MW)</b>
<b>COAL</b>			<b>5,429</b>
Boardman	Portland General Electric	Multiple Utilities	575
Colstrip #1	PP&L Montana, LLC	Multiple Utilities	330
Colstrip #2	PP&L Montana, LLC	Multiple Utilities	330
Colstrip #3	PP&L Montana, LLC	Multiple Utilities	740
Colstrip #4	NorthWestern Energy	Multiple Utilities	805
Jim Bridger #1	PacifiCorp / Idaho Power	Multiple Utilities	540
Jim Bridger #2	PacifiCorp / Idaho Power	Multiple Utilities	540
Jim Bridger #3	PacifiCorp / Idaho Power	Multiple Utilities	540
Jim Bridger #4	PacifiCorp / Idaho Power	Multiple Utilities	508
Valmy #1	NV Energy / Idaho Power	Multiple Utilities	254
Valmy #2	NV Energy / Idaho Power	Multiple Utilities	267
<b>NUCLEAR</b>			<b>1,230</b>
Columbia Generating Station	Energy Northwest	Federal System (BPA)	1,230
<b>NATURAL GAS</b>			<b>6,878</b>
Alden Bailey	Clatskanie PUD	Clatskanie PUD	11
Beaver	Portland General Electric	Portland General Electric	516
Beaver 8	Portland General Electric	Portland General Electric	25
Bennett Mountain	Idaho Power	Idaho Power	173
Boulder Park	Avista Corp.	Avista Corp.	25
Carty	Portland General Electric	Portland General Electric	440
Chehalis Generating Facility	PacifiCorp	PacifiCorp	517
Coyote Springs I	Portland General Electric	Portland General Electric	266
Coyote Springs II	Avista Corp.	Avista Corp.	287
Danskin	Idaho Power	Idaho Power	92
Danskin 1	Idaho Power	Idaho Power	179
Dave Gates	NorthWestern Energy	NorthWestern Energy	150
Encogen	Puget Sound Energy	Puget Sound Energy	159
Ferndale Cogen Station	Puget Sound Energy	Puget Sound Energy	245
Frederickson	EPCOR Power L.P./PSE	Multiple Utilities	258
Fredonia 1 & 2	Puget Sound Energy	Puget Sound Energy	208
Fredonia 3 & 4	Puget Sound Energy	Puget Sound Energy	108
Fredrickson 1 & 2	Puget Sound Energy	Puget Sound Energy	149
Goldendale	Puget Sound Energy	Puget Sound Energy	298
Hermiston Generating P.	PacifiCorp/Hermiston Gen. Comp.	PacifiCorp	469
Kettle Falls CT	Avista Corp.	Avista Corp.	7
Lancaster Power Project	Avista Corp.	Avista Corp.	270
Langley Gulch	Idaho Power	Idaho Power	319
Mint Farm Energy Center	Puget Sound Energy	Puget Sound Energy	312
Northeast A&B	Avista Corp.	Avista Corp.	62

<b>Project</b>	<b>Owner</b>	<b>NW Utility</b>	<b>Nameplate (MW)</b>
Port Westward	Portland General Electric	Portland General Electric	415
Port Westward Unit 2	Portland General Electric	Portland General Electric	220
Rathdrum 1 & 2	Avista Corp.	Avista Corp.	167
River Road	Clark Public Utilities	Clark Public Utilities	248
Rupert (Magic Valley)	Rupert Illinois Holdings	Idaho Power	10
Sumas Energy	Puget Sound Energy	Puget Sound Energy	127
Whitehorn #2 & 3	Puget Sound Energy	Puget Sound Energy	149
<b>COGENERATION</b>			<b>147</b>
Billings Cogeneration	Billings Generation, Inc.	NorthWestern Energy	64
Hampton Lumber		Snohomish County PUD	5
International Paper Energy	Eugene Water & Electric Board	Eugene Water & Electric Board	26
Simplot-Pocatello	PURPA	Idaho Power	12
Tasco-Nampa	Tasco	Idaho Power	2
Tasco-Twin Falls	Tasco	Idaho Power	3
Wauna (James River)	Western Generation Agency	Multiple Utilities	36
<b>RENEWABLES-OTHER</b>			<b>307</b>
Bannock County Landfill	PURPA	Idaho Power	3
Bettencourt B6	PURPA	Idaho Power	2
Bettencourt Dry Creek	PURPA	Idaho Power	2
Big Sky West Dairy	PURPA	Idaho Power	2
Bio Energy		Puget Sound Energy	1
Bio Fuels, WA		Puget Sound Energy	5
Biomass One	PacifiCorp	PacifiCorp	25
City of Spokane Waste to E.	City of Spokane	Avista Corp.	26
Coffin Butte Resource	Power Resources Cooperative		6
Cogen Company	Prairie Wood Products Co-Gen Co.	Oregon Trail Coop	8
Co-Gen II - DR Johnson	PacifiCorp	PacifiCorp	8
Columbia Ridge Landfill Gas	Waste Management	Seattle City Light	13
Convanta Marion	Portland General Electric	Portland General Electric	16
Double A Digester	PURPA	Idaho Power	5
Dry Creek Landfill	Dry Creek Landfill Inc.	PacifiCorp	3
Edaleen Dairy		Puget Sound Energy	1
Farm Power Tillamook	Tillamook	Tillamook	1
Fighting Creek	PURPA	Idaho Power	3
Flathead County Landfill	Flathead Electric Cooperative	Flathead Electric Cooperative	2
Hidden Hollow Landfill	PURPA	Idaho Power	3
Hooley Digester	Tillamook PUD	Tillamook PUD	1
H. W. Hill Landfill	Allied Waste Companies	Multiple Utilities	10.5
Interfor Pacific-Gilchrist	Midstate Electric Co-op	Midstate Electric Co-op	2
Kettle Falls	Avista Corp.	Avista Corp.	51

<b>Project</b>	<b>Owner</b>	<b>NW Utility</b>	<b>Nameplate (MW)</b>
Lynden	Farm Power	Puget Sound Energy	1
Mill Creek (Cove)		Idaho Power	1
Neal Hot Springs	U.S Geothermal	Idaho Power	23
Olympic View 1&2	Mason County PUD #3	Mason County PUD #3	5
Pine Products	PacifiCorp	PacifiCorp	6
Plum Creek NLSL	Plum Creek MDF	Flathead Electric Cooperative	6
Pocatello Wastewater	PURPA	Idaho Power	0
Portland Wastewater	City of Portland	Portland General Electric	1.7
Qualco Dairy Digester		Snohomish PUD	1
Raft River 1	US Geothermal	Idaho Power	16
Rainier Biogas		Puget Sound Energy	1
Rexville	Farm Power	Puget Sound Energy	1
River Bend Landfill	McMinnville Water & Light	McMinnville Water & Light	5
Rock Creek Dairy	PURPA	Idaho Power	4
Seneca	Seneca Sustainable Energy, LLC	Eugene Water & Electric Board	20
Short Mountain		Emerald PUD	3
Skookumchuck		Puget Sound Energy	1
Smith Creek		Puget Sound Energy	0
Stimson Lumber	Stimson Lumber	Avista Corp.	7
Stoltze Biomass	F.H. Stoltze Land & Lumber	Flathead Electric Coop	3
Tamarack	PURPA	Idaho Power	5
Van Dyk		Puget Sound Energy	0
VanderHaak Dairy	VanderHaak Dairy, LLC	Puget Sound Energy	1
Whitefish Hydro	City of Whitefish	Flathead Electric Cooperative	0

<b>SOLAR</b>			<b>956</b>
Ashland Solar Project		BPA	0
American Falls Solar	PURPA	Idaho Power	20
American Falls Solar II	PURPA	Idaho Power	20
Baker Solar	PURPA	Idaho Power	10
Bellevue Solar	EDF Renewable Energy	Portland General Electric	2
Boise City Solar (ID Solar 1)	PURPA	Idaho Power	40
Brush Solar	PURPA	Idaho Power	3
Finn Hill Solar		Puget Sound Energy	0
Grand View Solar	PURPA	Idaho Power	80
Grove Solar	PURPA	Idaho Power	10
Hylina Solar Center	PURPA	Idaho Power	10
Island Solar		Puget Sound Energy	0
King Estate Solar	Lane County Electric Coop	Lane County Electric Coop	-
Morgan Solar	PURPA	Idaho Power	3
Mountain Home Solar	PURPA	Idaho Power	20
Moyer-Tolles Solar	Umatilla Electric Coop		1

<b>Project</b>	<b>Owner</b>	<b>NW Utility</b>	<b>Nameplate (MW)</b>
Murphy Flat Power	PURPA	Idaho Power	20
Neilson Solar		Avista	19
Open Range Solar Center	PURPA	Idaho Power	10
Orchard Ranch Solar	PURPA	Idaho Power	10
PacifiCorp Solar Bundle		PacifiCorp	193
PGE QF Solar		Portland General Electric	230
Puget Eastern WA		Puget Sound Energy	150
Railroad Solar Center	PURPA	Idaho Power	10
Simco Solar	PURPA	Idaho Power	20
Thunderegg Solar Center	PURPA	Idaho Power	10
Vale I Solar	PURPA	Idaho Power	3
Vale Air Solar	PURPA	Idaho Power	10
Wheatridge Solar	NextEra	PGE	50
Wild Horse Solar Project	Puget Sound Energy	Puget Sound Energy	1
Yamhill Solar	EDF Renewable Energy	Portland General Electric	1

<b>WIND</b>			<b>4,992</b>
3Bar-G Wind		Puget Sound Energy	0
Bennett Creek	PURPA	Idaho Power	21
Benson Creek Wind	PURPA	Idaho Power	10
Big Top	Big Top LLC (QF)	PacifiCorp	2
Biglow Canyon - 1	Portland General Electric	Portland General Electric	125
Biglow Canyon - 2	Portland General Electric	Portland General Electric	150
Biglow Canyon - 3	Portland General Electric	Portland General Electric	174
Burley Butte Wind Farm	PURPA	Idaho Power	21
Butter Creek Power	Butter Creek Power LLC	PacifiCorp	5
Camp Reed Wind Park	PURPA	Idaho Power	23
Cassia Wind Farm	PURPA	Idaho Power	11
Coastal Energy	CCAP	Grays Harbor PUD	6
Cold Springs	PURPA	Idaho Power	23
Combine Hills I	Eurus Energy of America	PacifiCorp	41
Combine Hills II	Eurus Energy of America	Clark Public Utilities	63
Condon Wind	Goldman Sachs /SeaWest NW	Federal System (BPA)	25
Desert Meadow Windfarm	PURPA	Idaho Power	23
Durbin Creek	PURPA	Idaho Power	10
Elkhorn Wind	Telocaset Wind Power Partners	Idaho Power	101
Foote Creek Rim 1	PacifiCorp & EWEB	Multiple Utilities	41
Foote Creek Rim 2	PPM Energy	Federal System (BPA)	2
Foote Creek Rim 4	PPM Energy	Federal System (BPA)	17
Fossil Gulch Wind	PURPA	Idaho Power	11
Four Corners Windfarm	Four Corners Windfarm LLC	PacifiCorp	10
Four Mile Canyon Windfarm	Four Mile Canyon Windfarm LLC	PacifiCorp	10

<b>Project</b>	<b>Owner</b>	<b>NW Utility</b>	<b>Nameplate (MW)</b>
Golden Valley Wind Farm	PURPA	Idaho Power	12
Goodnoe Hills	PacifiCorp	PacifiCorp	94
Hammett Hill Windfarm	PURPA	Idaho Power	23
Harvest Wind	Summit Power	Multiple Utilities	99
Hay Canyon Wind	Hay Canyon Wind Project LLC	Snohomish County PUD	101
High Mesa Wind	PURPA	Idaho Power	40
Hopkins Ridge	Puget Sound Energy	Puget Sound Energy	157
Horseshoe Bend	PURPA	Idaho Power	9
Horseshoe Bend	PURPA	Idaho Power	9
Jett Creek	PURPA	Idaho Power	10
Judith Gap	Invenergy Wind, LLC	NorthWestern Energy	135
Klondike I	PPM Energy	Federal System (BPA)	24
Klondike II	PPM Energy	Portland General Electric	75
Klondike III	PPM Energy	Multiple Utilities	221
Knudson Wind		Puget Sound Energy	0
Leaning Juniper 1	PPM Energy	PacifiCorp	101
Lime Wind Energy	PURPA	Idaho Power	3
Lower Snake River 1	Puget Sound Energy	Puget Sound Energy	342
Lime Wind Energy	PURPA	Idaho Power	3
Marengo	Renewable Energy America	PacifiCorp	140
Marengo II	PacifiCorp	PacifiCorp	70
Milner Dam Wind Farm	PURPA	Idaho Power	20
Moe Wind	Two Dot Wind	NorthWestern Energy	1
Nine Canyon	Energy Northwest	Multiple Utilities	96
Oregon Trail Windfarm	Oregon Trail Windfarm LLC	PacifiCorp	10
Oregon Trails Wind Farm	PURPA	Idaho Power	14
Pa Tu Wind Farm	Pa Tu Wind Farm, LLC	Portland General Electric	9
Pacific Canyon Windfarm	Pacific Canyon Windfarm LLC	PacifiCorp	8
Palouse Wind	Palouse Wind, LLC	Avista Corp.	105
Paynes Ferry Wind Park	PURPA	Idaho Power	21
Pilgrim Stage Station Wind	PURPA	Idaho Power	11
Prospector Wind	PURPA	Idaho Power	10
Rattlesnake Flats		Avista Corp.	144
Rockland Wind	PURPA	Idaho Power	80
Ryegrass Windfarm	PURPA	Idaho Power	23
Salmon Falls Wind Farm	PURPA	Idaho Power	22
Sand Ranch Windfarm	Sand Ranch Windfarm LLC	PacifiCorp	10
Sawtooth Wind	PURPA	Idaho Power	21
Sheep Valley Ranch	Two Dot Wind	NorthWestern Energy	1
Skookumchuck		Puget Sound Energy	131
Stateline Wind	NextEra	Multiple Utilities	300
Swauk Wind		Puget Sound Energy	4

<b>Project</b>	<b>Owner</b>	<b>NW Utility</b>	<b>Nameplate (MW)</b>
Thousand Springs Wind	PURPA	Idaho Power	12
Three Mile Canyon	Momentum RE	PacifiCorp	10
Tuana Gulch Wind Farm	PURPA	Idaho Power	11
Tuana Springs Expansion	PURPA	Idaho Power	36
Tucannon	Portland General Electric	Portland General Electric	267
Two Ponds Windfarm	PURPA	Idaho Power	23
Vansycle Ridge	ESI Vansycle Partners	Portland General Electric	25
Wagon Trail Windfarm	Wagon Trail Windfarm LLC	PacifiCorp	3
Ward Butte Windfarm	Ward Butte Windfarm LLC	PacifiCorp	7
Wheat Field Wind Project	Wheat Field Wind LLC	Snohomish County PUD	97
Wheatridge	PGE/NextEra	PGE/NextEra	300
White Creek	White Creek Wind I LLC	Multiple Utilities	205
Wild Horse	Puget Sound Energy	Puget Sound Energy	273
Willow Spring Windfarm	PURPA	Idaho Power	10
Wolverine Creek	Invenergy	PacifiCorp	65
Yahoo Creek Wind Park	PURPA	Idaho Power	21
<b>SMALL THERMAL AND MISCELLANEOUS</b>			<b>130</b>
Crystal Mountain	Puget Sound Energy	Puget Sound Energy	3
PGE DSG		Portland General Electric	127
Wheatridge battery	PGE/NextEra	PGE/NextEra	30
<b>Total</b>			<b>53,502</b>

**Table 11. Independent Owned Generating Resources** is a comprehensive list of independently owned electric power supply located in the region. The nameplate values listed below show full availability. Some of these units have partial contracts (reflected in the load/resource tables) with Northwest utilities.

Project	Owner	Nameplate (MW)
<b>HYDRO</b>		<b>15</b>
Big Creek (Hellroaring)		-
PEC Headworks	SEQCBID	7
Soda Point Project		-
Sygitowicz	Cascade Clean Energy	0
Owyhee Tunnel No.1	Owyhee Irrigation District	8
<b>COAL</b>		<b>1,340</b>
Centralia #1	TransAlta	670
Centralia #2	TransAlta	670
<b>NATURAL GAS</b>		<b>2,081</b>
Grays Harbor (Satsop)	Invenergy	650
Hermiston Power Project	Hermiston Power Partners (Calpine)	689
Klamath Cogen Plant	Iberdrola Renewables	502
Klamath Peaking Units 1-4	Iberdrola Renewables	100
March Point 1	March Point Cogen	80
March Point 2	March Point Cogen	60
<b>COGENERATION</b>		<b>28</b>
Boise Cascade		9
Freres Lumber	Evergreen BioPower	10
Rough & Ready Lumber	Rough & Ready	1
Warm Springs Forest		8
<b>RENEWABLES-OTHER</b>		<b>26</b>
Spokane MSW	City of Spokane	23
Treasure Valley		3
<b>Solar</b>		<b>56</b>
Gala Solar Farm		56



<b>Project</b>	<b>Owner</b>	<b>Nameplate (MW)</b>
<b>WIND</b>		<b>3,447</b>
Big Horn	Iberdrola Renewables	199
Big Horn-Phase 2	Iberdrola Renewables	50
Cassia Gulch	John Deere	21
Glacier Wind - Phase 1	Naturener	107
Glacier Wind - Phase 2	Naturener	104
Goshen North	Ridgeline Energy	125
Juniper Canyon - Phase 1	Iberdrola Renewables	151
Kittitas Valley	Horizon	101
Klondike IIIa	Iberdrola Renewables	77
Lava Beds Wind		18
Leaning Juniper II-North	Iberdrola Renewables	90
Leaning Juniper II-South	Iberdrola Renewables	109
Linden Ranch	NW Wind Partners	50
Magic Wind Park		20
Martinsdale Colony North	Two Dot Wind	1
Martinsdale Colony South	Two Dot Wind	2
Montague Wind	AvanGrid	200
Notch Butte Wind		18
Pebble Springs Wind	Iberdrola Renewables	99
Rattlesnake Rd Wind (aka Arlington)	Horizon Wind	103
Shepards Flat Central	Caithness Energy	290
Shepards Flat North	Caithness Energy	265
Shepards Flat South	Caithness Energy	290
Stateline Wind	NextEra	300
Vancycle II (Stateline III)	NextEra	99
Vantage Wind	Invenergy	90
Willow Creek	Invenergy	72
Windy Flats	Cannon Power Group	262
Windy Point	Tuolumne Wind Project Authority	137
<b>SMALL THERMAL AND MISCELLANEOUS</b>		<b>44</b>
Colstrip Energy LP Coal	Colstrip Energy Limited Partnership	44
<b>Total</b>		<b>7,038</b>

# Report Description

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This report provides a regional firm needs assessment (Tables 1 - 4) using annual energy (August through July), monthly energy, winter peak-hour and summer peak-hour metrics. The monthly energy picture is provided to underscore the variability of the power need within an average year. A seasonal or weekly snapshot would tell a similar story. The peak need reflects information for January and August, as they present the greatest need for their respective seasons. These metrics provide a multi-dimensional look at the Northwest's need for power and underscore the growing complexity of the power system.

This information reflects the summation of individual utilities' load forecasts and generating resources expected to meet their load, as well as the presents the total of utilities' planned resource acquisitions to meet future needs. The larger utilities, in most cases, prepared their own projections for their integrated resource plans. BPA provides much of the information for its smaller customers. This section includes procedures used in preparing the load resource comparisons, a list of definitions, and a list of the utilities summarized by this report (Table 12).

## Load Estimate

Regional loads are the sum of demand estimated by the Northwest utilities and BPA for its federal agency customers, certain non-generating public utilities, and direct service industrial customers (DSI – currently not a significant part of regional load). Load projections reflect network transmission and distribution losses, reductions in demand due to rising electricity prices, and the effects of appliance efficiency standards and energy building codes. Savings from demand-side management programs, such as energy efficiency, are also reflected in the regional load forecasts.

## Energy Loads

A ten-year forecast of monthly firm energy loads is provided. This forecast reflects normal (1-in-2) weather conditions. The tabulated information includes the annual average load for the year forecast period as well as the monthly load for the first year of the report.

## Peak Loads

Northwest regional peak loads are provided for each month of the ten-year forecast period. The tabulated loads for winter and summer peak are the highest estimated 60-minute clock-hour average demand for that month, assuming normal (1-in-2) weather conditions. The regional firm peak load is the sum of the individual utility peak loads, and does not account for the fact that each utility may

experience its peak load at a different hour than other Northwest utilities. Hence the regional peak load is considered non-coincident. The federal system (BPA) firm peak load is adjusted to reflect a federal coincident peak among its many utility customers.

## Federal System Transmission Losses

Federal System (BPA) transmission losses for both firm loads and contractual obligations are embedded in federal load. These losses represent the difference between energy generated by the federal system (or delivered to a system interchange point) and the amount of energy sold to customers. System transmission losses are calculated by BPA for firm loads utilizing the federal transmission system.

## Planning Margin

In the derivation of regional peak requirements, a planning margin is added to the load. Like the *2018 Forecast*, this year's planning margin is different from past reports. The planning margin is set to 16 percent of the total peak load for every year of the planning horizon. In many *Forecast's* before 2018 the planning margin started at 12 percent for the first year and grew a percent a year until it reached 20 percent and remained at 20 percent thereafter. The justification for this change is three-fold.

- The purpose for the growing planning margin was in part to address uncertainty of planning for generating resources with long planning and construction lead times (coal and nuclear power plants). Utilities are not currently planning for these types of resources.
- The growing planning margin as a percent of load overstated the growing regional requirements and resulting need for power.
- A flat planning margin simplifies comparison analyzes of reports from different years.

This planning margin is intended to cover, for planning purposes, operating reserves and all elements of uncertainty not specifically accounted for in determining loads and resources. These include forced-outage reserves, unanticipated load growth, temperature variations, hydro maintenance and project construction delays.

## Demand-Side Management Programs

Savings from demand-side management efforts are reported in *Table 7. Demand-Side Management Programs*. These estimates are the savings for the ten-year study period and include expected future energy savings from existing and new programs in the areas of energy efficiency, distribution efficiency, some market transformation, fuel conversion, fuel switching, energy storage and other efforts that reduce the demand for electricity. These estimates reflect savings from programs that

utilities fund directly, or through a third-party, such as the Northwest Energy Efficiency Alliance and Energy Trust of Oregon.

Demand response activity is reported in *Table 7* as well. The total load reduction reported is the cumulative sum of different utilities' agreements with their customers. Each program has its own characteristics and limitations.

## Generating Resources

This report catalogues existing resources, committed new supply (including resources under construction), as well as planned resources. For the assessment of need only the existing and committed resources are reflected in the regional tabulations. In addition, only those generating resources (or shares) that are firmly committed to meeting Northwest loads are included in the regional analysis.

### Hydro

Major hydro resource capabilities are estimated from a regional analysis using a computer model that simulates reservoir operation of past hydrologic conditions with today's operating constraints and requirements. The historical stream flow record used covers the 80-year period from August 1928 through July 2008. The bulk of the hydro modeling used in this report is provided by BPA, the US Army Corps of Engineers, and/or project owners.

### Energy

The firm energy capability of hydro plants is the amount of energy produced during the operating year with the lowest 12-month average generation. The lowest generation occurred in 1936-37 given today's river operating criteria. The firm energy capability is the average of 12 months, August 1936 to July 1937. Generation for projects that are influenced by downstream reservoirs reflects the reduction due to encroachment.

### Peak Capability

For this report the peak capability of the hydro system represents the maximum sustained hourly generation available to meet peak demand during the period of heavy load. Historically, a 50-hour sustained peak (10 hours/day for 5 days) has been reported.

The peaking capability of the hydro system maximizes available energy and capacity associated with the monthly distribution of streamflow. The peaking capability is the hydro system's ability to continuously produce power for a specific time period by utilizing the limited water supply while meeting power and non-power requirements, scheduled maintenance, and operating reserves (including wind reserves).

Computer models are used to estimate the operational hydro peaking capability of the major projects, based on their monthly average energy for 70 or 80 water conditions, depending on the source of information. The peaking capability used for this report is the 8<sup>th</sup> percentile of the resulting hourly peak capabilities for January and August to indicate winter and summer peak capability respectively. These models shape the monthly hydro energy to maximize generation in the heavy load hours.

### **Columbia River Treaty**

Since 1961 the United States has had a treaty with Canada that outlines the operation of U.S. and Canadian storage projects to increase the total combined generation. Hydropower generation in this analysis reflects the firm power generated by coordinating operation of three Canadian reservoirs, Duncan, Arrow and Mica with the Libby reservoirs and other power facilities in the region. Canada's share of the coordinated operation benefits is called Canadian Entitlement. BPA and each of the non-Federal mid-Columbia project owners are obligated to return their share of the downstream power benefits owed to Canada. The delivery of the Entitlement is reflected in this analysis.

### **Downstream Fish Migration**

Another requirement incorporated in the computer simulations is modified river operations to provide for the downstream migration of anadromous fish. These modifications include adhering to specific flow limits at some projects, spilling water at several projects, and augmenting flows in the spring and summer on the Columbia, Snake and Kootenai rivers. Specific requirements are defined by various federal, regional and state mandates, such as project licenses, biological opinions and state regulations.

### **Thermal and Other Renewable Resources**

Thermal resources are reported in a variety of categories. Coal, cogeneration, nuclear, and natural gas projects are each totaled and reported as individual categories.

Renewable resources other than hydropower are categorized as solar, wind and other renewables and are each totaled and reported separately. Other renewables include energy from biomass, geothermal, municipal solid waste projects and other miscellaneous projects.

All existing generating plants, regardless of size, are included in amounts submitted by each utility that owns or is purchasing the generation. The energy and peaking capabilities of plants are submitted by the sponsors of the projects and take into consideration scheduled maintenance (including refueling), forced outages and other expected operating constraints. Some small fossil-fuel plants and combustion turbines are included as peaking resources and their reported energy

capabilities are only the amounts necessary for peaking operations. Additional energy may be available from these peaking resources but is not included in the regional load/resource balance.

## New and Future Resources

The latest activity with new and future resource developments, including expected savings from demand-side management, are tabulated in this report. These resources are reported as *Recently Acquired Resources*, *Committed New Supply* and *Planned Resources* to reflect the different stages of development.

### Recently Acquired Resources

*The Recently Acquired Resources* reported in *Table 5* have been acquired in the past year and are serving Northwest utility loads as of December 31, 2018. They are reflected as part of the regional firm needs assessment.

### Committed New Supply

*Committed New Supply* reported in *Table 6* includes those projects under construction or committed resources and supply to meet Northwest load that are not delivering power as of December 31, 2018. In this report, resources being built by utilities or resources where their output is firmly committed to utilities are included in the regional load-resource analysis. Future savings from committed demand-side management programs are reported in *Table 7*.

### Planned Resources

*Planned Resources* presented in *Table 8* include specific resources and/or blocks of generic resources identified in utilities' most current integrated resource plans. Projects specifically named in *Planned Resources* are not yet under construction, are not part of the regional analysis, and are in some ways speculative.

## Contracts

Imports and exports include firm arrangements for interchanges with systems outside the region, as well as with third-party developers/owners within the region. These arrangements comprise firm contracts with utilities to the East, the Pacific Southwest and Canada. Contracts to and from these areas are amounts delivered at the area border and include any transmission losses associated with deliveries.

Short term purchases from Northwest independent power producers and other spot market purchases are not reflected in the tables that present the firm load resource comparisons.

## Non-Firm Resources

The *Forecast* omits from the load/resource comparisons non-firm power supply that may be available to utilities to meet needs. These non-firm sources include generation from uncommitted Northwest independent power producers, imports from power plants located outside the region, and hydro generation likely available when water supply is greater than the assumed critical water.

*Independent Owned Generating Resources*, presented in *Table 11*, include thermal independent power producers (IPP) located in the region. The table below shows the nameplate amount of dispatchable non-firm generation over the next five years. Due to maintenance, unplanned outages, fuel availability, unit commitments to out-of-region buyers, and other factors, the actual amount of resource available from these sources may be less. Note the decrease from 2020 to 2021 as Centralia Unit 1 retires.

Thermal Northwest IPP Nameplate MW				
2019	2020	2021	2022	2023
3,095	3,095	2,425	2,425	2,425

Non-firm imports depend on several factors including availability of out-of-region resources, availability of transmission interties, and market friction. In their *2018 Resource Adequacy* study for year 2023, the Northwest Power and Conservation Council assumed 2,500 MW of available spot imports from California in the winter, and zero for summer (3,000 MW of generation was assumed to be available off-peak year-round in a day-ahead market). However, as noted earlier a trend of large thermal resource retirements in the Western Interconnection could impact power available for import into the Northwest in the coming years.

Looking at hydropower, the Forecast assumes critical water (8%) during peak hours. Most years the water supply for the hydro system is not at critical levels. During an average, the region could expect an additional 4,100 MW of sustained peaking generation in January and 2,200 MW in August.

**Table 12. Utilities included in the Northwest Regional Forecast**

Albion, City of	Fall River Rural Electric Cooperative	Pacific County PUD #2
Alder Mutual	Farmers Electric Co-op	PacifiCorp
Ashland, City of	Ferry County PUD #1	Parkland Light & Water
Asotin County PUD #1	Fircrest, Town of	Pend Oreille County PUD
Avista Corp.	Flathead Electric Cooperative	Peninsula Light Company
Bandon, City of	Forest Grove Light & Power	Plummer, City of
Benton PUD	Franklin County PUD	PNGC Power
Benton REA	Glacier Electric	Port of Seattle – SEATAC
Big Bend Electric Co-op	Grant County PUD	Portland General Electric
Blachly-Lane Electric Cooperative	Grays Harbor PUD	Puget Sound Energy
Blaine, City of	Harney Electric	Raft River Rural Electric
Bonnors Ferry, City of	Hermiston, City of	Ravalli Co. Electric Co-op
Bonneville Power Administration	Heyburn, City of	Richland, City of
Burley, City of	Hood River Electric	Riverside Electric Co-op
Canby Utility	Idaho County L & P	Rupert, City of
Cascade Locks, City of	Idaho Falls Power	Salem Electric Co-op
Central Electric	Idaho Power	Salmon River Electric Cooperative
Central Lincoln PUD	Inland Power & Light	Seattle City Light
Centralia, City of	Kittitas County PUD	Skamania County PUD
Chelan County PUD	Klickitat County PUD	Snohomish County PUD
Cheney, City of	Kootenai Electric Co-op	Soda Springs, City of
Chewelah, City of	Lakeview L & P (WA)	Southside Electric Lines
City of Port Angeles	Lane Electric Cooperative	Springfield Utility Board
Clallam County PUD #1	Lewis County PUD	Steilacoom, Town of
Clark Public Utilities	Lincoln Electric Cooperative	Sumas, City of
Clatskanie PUD	Lost River Electric Cooperative	Surprise Valley Elec. Co-op
Clearwater Power Company	Lower Valley Energy	Tacoma Power
Columbia Basin Elec. Co-op	Mason County PUD #1	Tanner Electric Co-op
Columbia Power Co-op	Mason County PUD #3	Tillamook PUD
Columbia REA	McCleary, City of	Troy, City of
Columbia River PUD	McMinnville Water & Light	Umatilla Electric Cooperative
Consolidated Irrigation Dist. #19	Midstate Electric Co-op	Umpqua Indian Utility Co-op
Consumers Power Inc.	Milton, Town of	United Electric Cooperative
Coos-Curry Electric Cooperative	Milton-Freewater, City of	US Corps of Engineers
Coulee Dam, City of	Minidoka, City of	US Bureau of Reclamation
Cowlitz County PUD	Missoula Electric Co-op	Vera Water & Power
Declo, City of	Modern Electric Co-op	Vigilante Electric Co-op
Douglas County PUD	Monmouth, City of	Wahkiakum County PUD #1
Douglas Electric Cooperative	Nespelem Valley Elec. Co-op	Wasco Electric Co-op
Drain, City of	Northern Lights Inc.	Weiser, City of
East End Mutual Electric	Northern Wasco Co. PUD	Wells Rural Electric Co.
Eatonville, City of	NorthWestern Energy	West Oregon Electric Cooperative
Ellensburg, City of	Ohop Mutual Light Company	Whatcom County PUD
Elmhurst Mutual P & L	Okanogan Co. Electric Cooperative	Yakama Power
Emerald PUD	Okanogan County PUD #1	
Energy Northwest	Orcas Power & Light	
Eugene Water & Electric Board	Oregon Trail Co-op	



# Definitions

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## Annual Energy

Energy value in megawatts that represents the average output over the period of one year. Expressed in average megawatts.

## Average Megawatts

(MWA) Unit of energy for either load or generation that is the ratio of energy (in megawatt-hours) expected to be consumed or generated during a period of time to the number of hours in the period.

## Biomass

Any organic matter which is available on a renewable basis, including forest residues, agricultural crops and waste, wood and wood wastes, animal wastes, livestock operation residue, aquatic plants, and municipal wastes.

## Canadian Entitlement

Canada is entitled to one-half the downstream power benefits resulting from Canadian storage as defined by the Columbia River Treaty. Canadian entitlement returns estimated by Bonneville Power Administration.

## Coal

This category of generating resources includes the region's coal-fired plants.

## Cogeneration

Cogeneration is the technology of producing electric energy and other forms of useful energy (thermal or mechanical) for industrial and commercial heating or cooling purposes through sequential use of an energy source.

## Combustion Turbines

These are plants with combined-cycle or simple-cycle natural gas-fired combustion turbine technology for producing electricity.

## Committed Resources

These projects are under construction and/or committed resources and supply to meet Northwest load but not delivering power as of December 31, 2018.

## Conservation

Any reduction in electrical power consumption as a result of increases in the efficiency of energy use, production, or distribution. For the purposes of this report used synonymously with energy efficiency.

## Demand Response

Control of load through customer/utility agreements that result in a temporary change in consumers' use of electricity.

## Demand-side Management

Peak and energy savings from conservation/energy efficiency measures, distribution efficiency, market transformation, demand response, fuel conversion, fuel switching, energy storage and other efforts that that serve to reduce electricity demand.

## Dispatchable Resource

A term referring to controllable generating resources that are able to be dispatched for a specific time and need.

## Direct Service Industries (DSI)

Large electricity-intensive industries such as aluminum smelters and metals-reduction plants that purchase power directly from the Bonneville Power Administration for their own use. Very few of these customers exist in the region today.

## Distribution Efficiency

Infrastructure upgrades to utilities' transmission and distribution systems that save energy by minimizing losses.

## Encroachment

A term used to describe a situation where the operation of a hydroelectric project causes an increase in the level of the tailwater of the project that is directly upstream.

## Energy Efficiency

Any reduction in electrical power consumption as a result of increases in the efficiency of energy use, production, or distribution. For the purposes of this report used synonymously with conservation.

## Energy Load

The demand for power averaged over a specified period of time.

## Energy Storage

Technologies for storing energy in a form that is convenient for use at a later time when a specific energy demand is greater.

## Exports

Firm interchange arrangements where power flows from regional utilities to utilities outside the region or to non-specific, third-party purchasers within the region.

## Federal System (BPA)

The federal system is a combination of BPA's customer loads and contractual obligations, and resources from which BPA acquires the power it sells. The resources include plants operated by the U.S. Army Corps of Engineers (COE), U.S. Bureau of Reclamation (USBR) and Energy Northwest. BPA markets the thermal generation from Columbia Generating Station, operated by Energy Northwest.

## Federal Columbia River Power System (FCRPS)

Thirty federal hydroelectric projects constructed and operated by the Corps of Engineers and the Bureau of Reclamation, and the Bonneville Power Administration transmission facilities.

## Firm Energy

Electric energy intended to have assured availability to customers over a defined period.

## Firm Load

The sum of the estimated firm loads of private utility and public agency systems, federal agencies and BPA industrial customers.

## Firm Losses

Losses incurred on the transmission system of the Northwest region.

## Fuel Conversion

Consumers' efforts to make a permanent change from electricity to natural-gas or other fuel source to meet a specific energy need, such as heating.

## Fuel Switching

Consumers' efforts to make a temporary change from electricity to another fuel source to meet a specific energy need.

## Historical Streamflow Record

A database of unregulated streamflows for 80 years (July 1928 to June 2008). Data is modified to take into account adjustments due to irrigation depletions, evaporations, etc. for the particular operating year being studied.

## Hydro Maintenance

The amount of energy lost due to the estimated maintenance required during the critical period. Peak hydro maintenance is included in the peak planning margin calculations.

## Hydro Regulation

A study that utilizes a computer model to simulate the operation of the Pacific Northwest hydroelectric power system using the historical streamflows, monthly loads, thermal and other non-hydro resources, and other hydroelectric plant data for each project.

## Imports

Firm interchange arrangements where power flows to regional utilities from utilities outside the region or third-party developer/owners of generation within the region.

## Independent Power Producers (IPPs)

Non-utility entities owning generation that may be contracted (fully or partially) to meet regional load.

## Intermittent Resource (a.k.a. Variable Energy Resource)

An electric generating source with output controlled by the natural variability of the energy resource rather than dispatched based on system requirements. Intermittent output usually results from the direct, non-stored conversion of naturally occurring energy fluxes such as solar and wind energy.

## Investor-Owned Utility (IOU)

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

## Market Transformation

A strategic process of intervening in a market to accelerate the adoption of cost-effective energy efficiency.

## Megawatt (MW)

A unit of electrical power equal to 1 million watts or 1,000 kilowatts.

### Nameplate Capacity

A measure of the approximate generating capability of a project or unit as designated by the manufacturer.

### Natural Gas-Fired Resources

This category of resources includes the region's natural gas-fired plants, mostly single-cycle and combined-cycle combustion turbines. It may include projects that are considered cogeneration plants.

### Non-Firm Resources

Electric energy acquired through short term purchases of resources not committed as firm resources. This includes generation from hydropower in better than critical water conditions, independent power producers and imports from outside the region.

### Non-Utility Generation

Facilities that generate power whose percent of ownership by a sponsoring utility is 50 percent or less. These include PURPA-qualified facilities (QFs) or non-qualified facilities of independent power producers (IPPs).

### Nuclear Resources

The region's only nuclear plant, the Columbia Generating Station, is included in this category.

### Operating Year

Twelve-month period beginning on August 1 of any year and ending on July 31 of the following year. For example, operating year 2017 is August 1, 2016 through July 31, 2017.

### Other Publics (BPA)

Refers to the smaller, non-generating public utility customers whose load requirements are estimated and served by Bonneville Power Administration.

### Peak Load

In this report the peak load is defined as one-hour maximum demand for power.

### Planned Resources

These resources include specific resources and/or blocks of generic resources identified in utilities' most current integrated resource plans. These projects are not yet under construction, are not part of the regional analysis, and are in some ways speculative.

## Planning Margin

A component of regional requirements that is included in the peak needs assessment to account for various planning uncertainties. In the 2018 *Forecast* the planning margin changed to a flat 16% of the regional load for each year of the study. Earlier reports included a growing planning margin that started at 12% of load, increasing 1% per year until it reached 20%.

## Private Utilities

Same as investor-owned utilities.

## Publicly-Owned Utilities

One of several types of not-for-profit utilities created by a group of voters and can be a municipal utility, a public utility district, or an electric cooperative.

## PURPA

Public Utility Regulatory Policies Act of 1978. The first federal legislation requiring utilities to buy power from qualifying independent power producers.

## Renewables - Other

A category of resources that includes projects that produce power from such fuel sources as geothermal, biomass (includes wood, municipal solid-waste facilities), and pilot level projects including tidal and wave energy.

## Requirements

For each year, a utility's projected loads, exports, and contracts out. Peak requirements also include the planning margin.

## Small Thermal & Miscellaneous Resources

This category of resources includes small thermal generating resources such as diesel generators used to meet peak and/or emergency loads.

## Solar Resources

Resources that produce power from solar exposure. This includes utility scale solar photovoltaic systems and other utility scale solar projects. This category does not include customer side distributed solar generation.

## Thermal Resources

Resources that burn coal, natural gas, oil, diesel or use nuclear fission to create heat which is converted into electricity.

### Variable Energy Resource (a.k.a. Intermittent Resource)

An electric generating source with output controlled by the natural variability of the energy resource rather than dispatched based on system requirements. Intermittent output usually results from the direct, non-stored conversion of naturally occurring energy fluxes such as solar and wind energy.

### Wind Resources

This category of resources includes the region's wind powered projects.