MEMORANDUM

EUGENE WATER & ELECTRIC BOARD

Rely on us.

TO:	Commissioners Carlson, Barofsky, McRae, Schlossberg, and Brown
FROM:	Frank Lawson, CEO & General Manager
DATE:	August 28, 2023 (September 5, 2023, Board Meeting)
SUBJECT:	PNUCC 2023 NW Regional Forecast
OBJECTIVE:	Information/Education

Issue

The executive director and analytics and policy director of the Pacific Northwest Utility Conference Committee (PNUCC) will present the 2023 Northwest Regional Forecast of Power Loads and Resources (2023-2033). The full report, including an Executive Summary, is attached.

Background/Discussion

The Northwest Regional Forecast (Forecast) has provided a consistent assessment of the region's electric power system for over 70 years. By examining utility-reported information, the Forecast provides a utility perspective on trends in the evolving power system, such as changes in demand, resources and emerging technologies for meeting future electric power needs. This year's snapshot is particularly significant given recent record-breaking winter and summer peaks, which have utilities focused on the need for sufficient capacity to meet a rising demand for electricity on top of the transition to clean energy. The 2023 Forecast shows Northwest utilities are anticipating a significant increase in loads over the next five years and working to meet a growing demand for electricity with renewable resources, energy storage and dependable capacity.

Guest Speakers

Crystal Ball is the Executive Director of the Pacific Northwest Utilities Conference Committee (PNUCC). In her role she helps PNUCC members look for opportunities and provides a regular forum where utility and other power industry leaders share information and perspectives on national, regional and local power issues. Crystal is an experienced electric utility professional who is focused on developing sustainable strategies for managing change and delivering strong leadership through collaborative relationships. Her experience includes advising executives on state and federal energy and environmental policies and overseeing the implementation of the Pacific Northwest region's most comprehensive fish and wildlife mitigation program. Prior to working at PNUCC, Crystal worked for the Bonneville Power Administration for 25 years. She has a sophisticated understanding of the power industry and a strong reputation as a strategic thinker and competent communicator.

Aliza Seelig is the Analytics & Policy Director of the Pacific Northwest Utilities Conference Committee (PNUCC). In her role she provides analytical leadership and strategic support for PNUCC's member agenda and priorities. Aliza facilitates the System Planning Committee and works closely with regional utilities and industry organizations to assess the state of the system that is published annually in PNUCC's Northwest Regional Forecast. Aliza is an energy industry expert with 25 years of experience in resource acquisition and planning, and analysis of energy policy. She has worked in the Pacific Northwest for both Seattle City Light and Puget Sound Energy. At those utilities she served in key positions supporting the development of wind generation and regional tools and programs including the Western Resource Adequacy Program. She is eager to help the Pacific Northwest lead the way in developing a modern, resilient and equitable electricity grid.

Pacific Northwest Utility Conference Committee (PNUCC)

PNUCC is a not-for-profit trade association of consumer-owned and investor-owned electric utilities and other power industry partners that share a common interest in the efficacy and reliability of the Northwest Power system. This forum facilitates a unique function in the Northwest where complex and divisive industry issues are brought to the table and discussed in an environment where members put aside competitive differences to chart a mutually beneficial course forward.

This voluntary, informal organization of public and private utilities formed in 1946 to assess regional power supply and to support federal appropriations for power projects in the region. PNUCC was founded on the idea that policy positions are strongest when forged from consensus of diverse groups. The PNUCC forum provides opportunities for member utilities and industry partners to discuss common interests, explore differences and – to the extent possible – reach consensus.

In 1986, PNUCC was incorporated under Oregon law as a nonprofit corporation. Today PNUCC members include public and private electric utilities from four Northwest states – Washington, Montana, Oregon and Idaho. PNUCC is active in resource planning efforts and in analysis and evaluation of the region's power supply and the implications of energy related policy decisions. PNUCC's mission continues to bring the power of good ideas together to assist members in fulfilling their company missions in this ever-changing industry.

Recommendation

Following a brief presentation, Commissioners are encouraged to provide comments and ask questions on the topic.

Requested Board Action

No Board Action is requested.

Attachment:

Northwest Regional Forecast of Power Loads and Resources (August 2023 through July 2033)

Northwest Regional Forecast

of Power Loads and Resources

August 2023 through July 2033

PNUCC

May 2023

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

Electronic copies of this report are available on the

PNUCC website

www.PNUCC.org

Pacific Northwest Utilities Conference Committee

101 SW Main Street, Suite 930

Portland, OR 97204

503.294.1268

Table of Contents

2023 Northwest Regional Forecast

Executive Summary

The *Northwest Regional Forecast* (*Forecast*) has provided a consistent assessment of the region's electric power system for over 70 years. By examining utility-reported information, the *Forecast* provides a utility perspective on trends in the evolving power system, such as changes in demand, resources and emerging technologies for meeting future electric power needs.

This year's snapshot is particularly significant given recent record-breaking winter and summer peaks, which have utilities focused on the need for sufficient capacity to meet a rising demand for electricity on top of the transition to clean energy. The *2023 Forecast* shows Northwest utilities are anticipating a significant increase in loads over the next five years and working to meet a growing demand for electricity with renewable resources, energy storage and dependable capacity.

Loads Show Up with More Certainty

The 2023 *Forecast* reflects accelerated and steeper regional load growth compared to previous years. Much of this load growth is attributed to more certainty in prospective new industrial loads over the next five years.

Figure 1: Load Forecasts Comparison 2023 vs. 2022

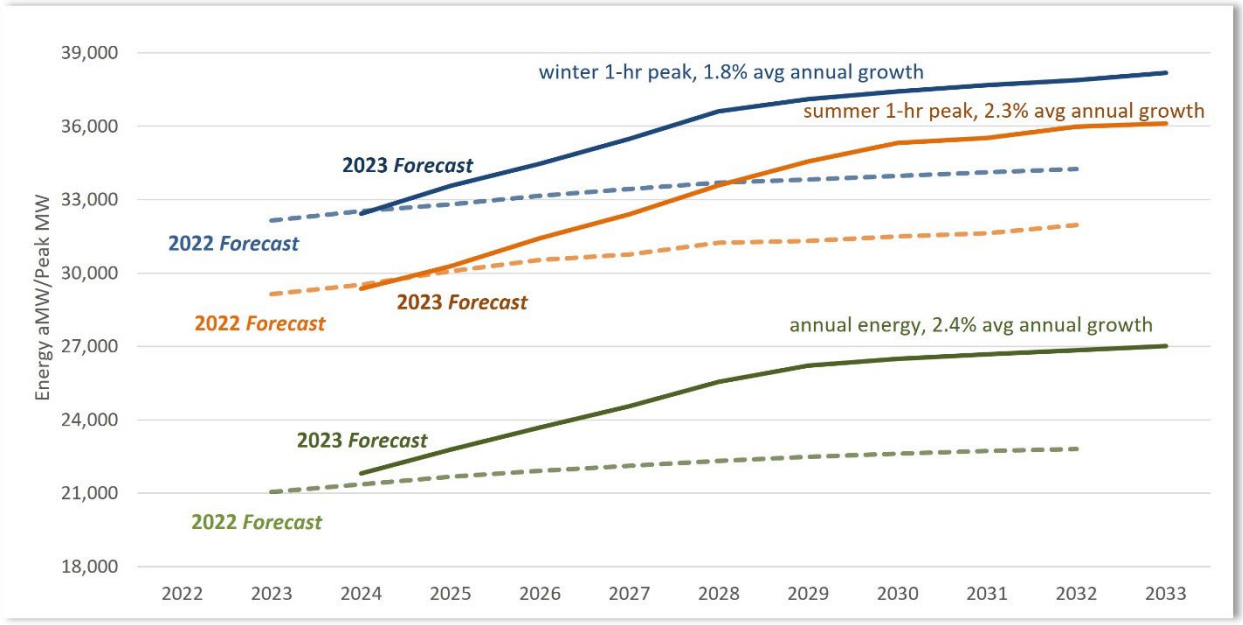
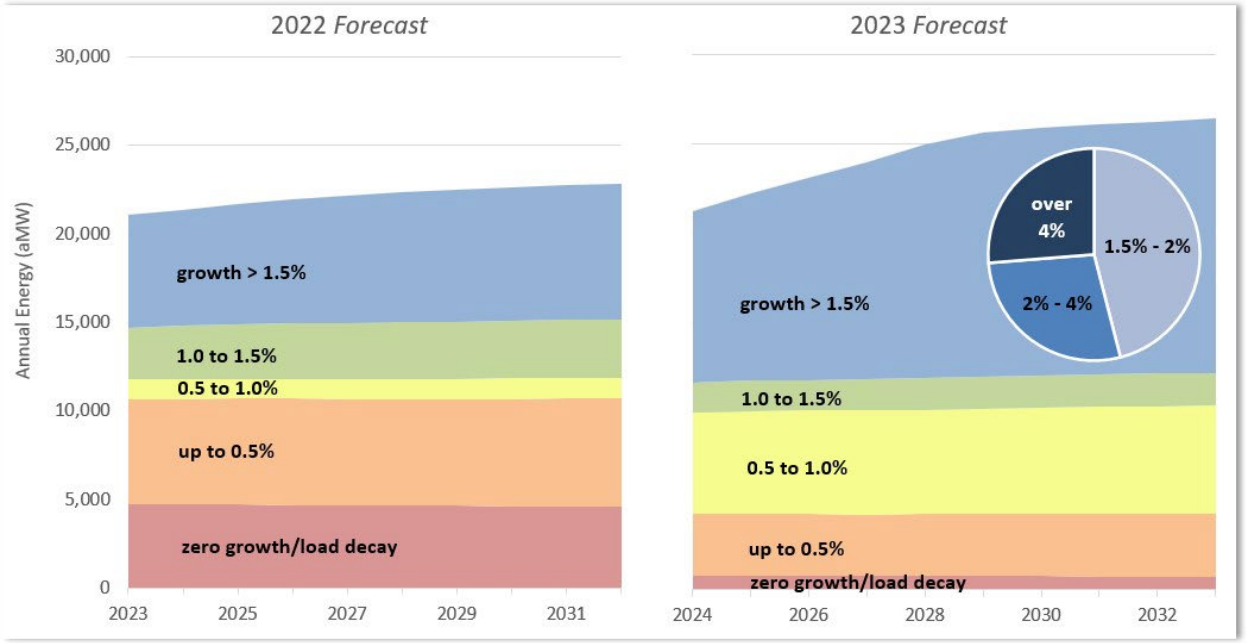


Figure 1 on page 4 shows the 2023 load forecasts in solid lines and last year's forecasts in the dashed lines. The 2023 loads reflect a markedly different trajectory than past forecasts, with a 20 percent increase in load growth in the first five years. Much of the expected growth can be attributed to new industrial customers' solidifying plans and schedules for development. The projected loads flatten out over the latter five years of the *2023 Forecast*. Annual energy, winter and summer peak forecasts increase at roughly the same magnitude in the first five years, indicating that prospective new load is flat and not necessarily seasonal.

Most utilities projecting load growth

Anticipated load growth is based on utilities' unique circumstances such as service territory characteristics, local economic factors and energy policies. This results in varying load projections, with some utilities expecting flat or little load growth and other utilities anticipating marginal to substantial increases in load growth.

Figure 2: Load Forecast Growth Rate Comparison 2022 vs. 2023



In general, utility load growth rates are shifting up, as evidenced by the comparison of the 2022 and 2023 *Forecasts* in Figure 2 above. Here individual utility annual energy loads are aggregated into ten-year load growth bins. For example, the yellow bin is the aggregate load of utilities projecting a load growth between 0.5 percent and 1 percent. In the 2022 *Forecast*, utilities with the highest projected load growth (over 1.5 percent, blue bin) represented roughly a quarter of the regional load by the last year of the forecast. In this year's *Forecast*, the share of load from utilities projecting load growth above 1.5 percent has doubled and now represents about half of the Northwest load by 2033. Within the blue bin, about a quarter represents load growth above 4 percent.

As noted earlier, the primary driver for increased growth rates is new industrial loads. While these loads are starting to show up in the utility load projections with more certainty, supply chain issues and changing economic conditions can affect the timing of these new large industrial customer loads.

Electrification and climate change effects still coming

Two elements that will impact future loads are electrification and climate change, both of which are expected to unfold and affect loads differently across the region. Machines that currently run on fossil fuels like cars and heating systems are being replaced with electric versions, but electrification is a formidable task and hard to predict, which is why the potential impact of electrification is slight in this year's *Forecast*.

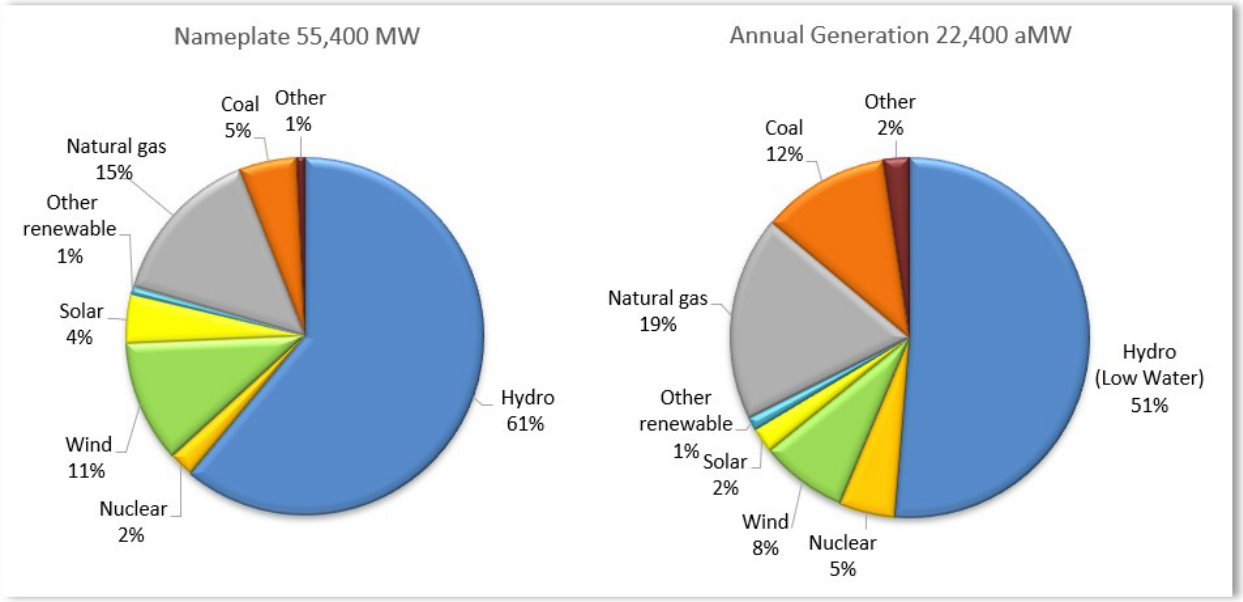
As electric vehicle adoption among consumers increases, some utilities are starting to project increases in demand. Electrification is not expected to impact utilities uniformly and other potential electrification opportunities driven by new building codes, for example, have yet to be completely understood and incorporated. The overall effect of electrification and our understanding of it is expected to increase over the next several years.

Experiences from weather can influence customer choices which impact load such as new or increased use of air conditioning. Many utilities are reporting that effects of climate change have increased their summer peak and/or decreased their winter peak. Utilities are including the effects of climate change into projected loads at different levels of granularity. Some utilities are emphasizing more recent years of weather and temperature, capturing the extreme events we are starting to see more frequently. Other utilities have incorporated global climate models into their forecasting to simulate what future climate effects on load could look like. Utilities representing about one third of the total load have not incorporated climate change into their projected loads.

Hydropower, Energy Efficiency Remain Strong Foundation

The majority of Northwest generation is carbon-free, and hydropower remains the foundation. In Figure 3 on page 7, the left pie shows Northwest utilities' generating resources nameplate capacity (similar to last year at about 55,400 MW), and the right pie is the expected annual energy from these resources. Resource fuel types move around the clock from clean to carbon emitting. Even under low water conditions, hydropower provides over half of total utility generation on an energy basis and clean energy resources make up almost 70 percent of the total annual utility generation. With increasing projected load and the push to decarbonize the power sector, wind and solar along with other clean resources will increase in share. Hydropower will continue to play an important role in reliability because of the Northwest's hydropower's storage and flexibility characteristics.

Figure 3: Northwest Utilities Generating Resources 2023



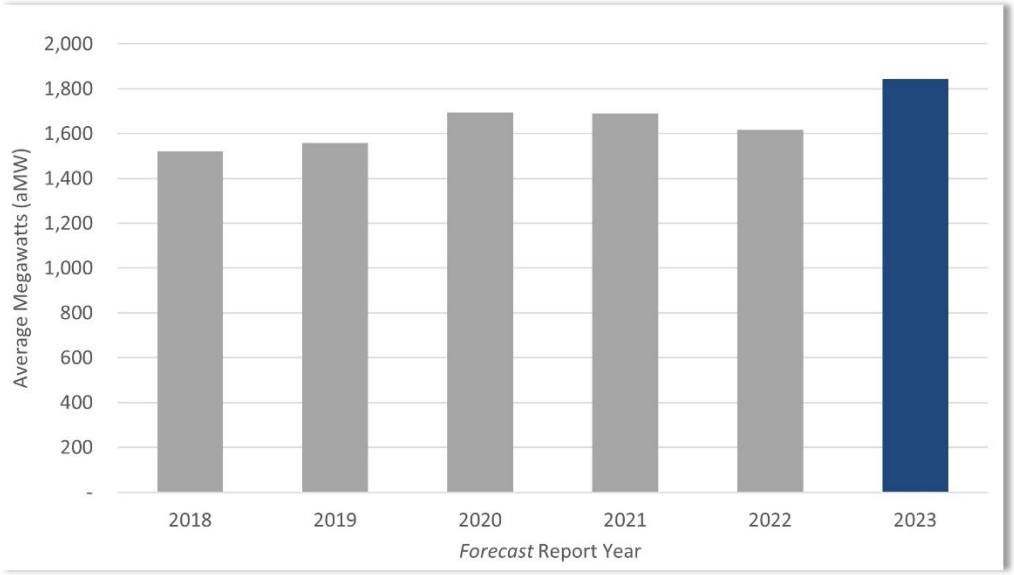
On path for decarbonizing power supply

Several utilities are steadily phasing out coal-fired generation. By 2026, these utilities will have reduced their reliance on coal by over 4,800 megawatts since 2019. As utilities keep some options on the table to meet near-term increases in demand during a period with high resource development risk, plans are shifting. Compared to last year's *Forecast*, 222 megawatts of planned coal exits were pushed back from no later than the end of 2025 to be no later than the end of 2029. Also, natural gas resources are forecast to have an increased role for reliability until energy storage and other emerging technologies are proven. Plans are progressing to convert Jim Bridger coal units 1 and 2 to natural gas in 2024. These resources provide a bridge to meet peak demand and fill in during potential low water years until sufficient new capacity resource technologies and transmission can be added. Over time as emissions and clean energy targets increase, natural gas use is projected to diminish.

Energy efficiency and demand-side innovations are mainstays

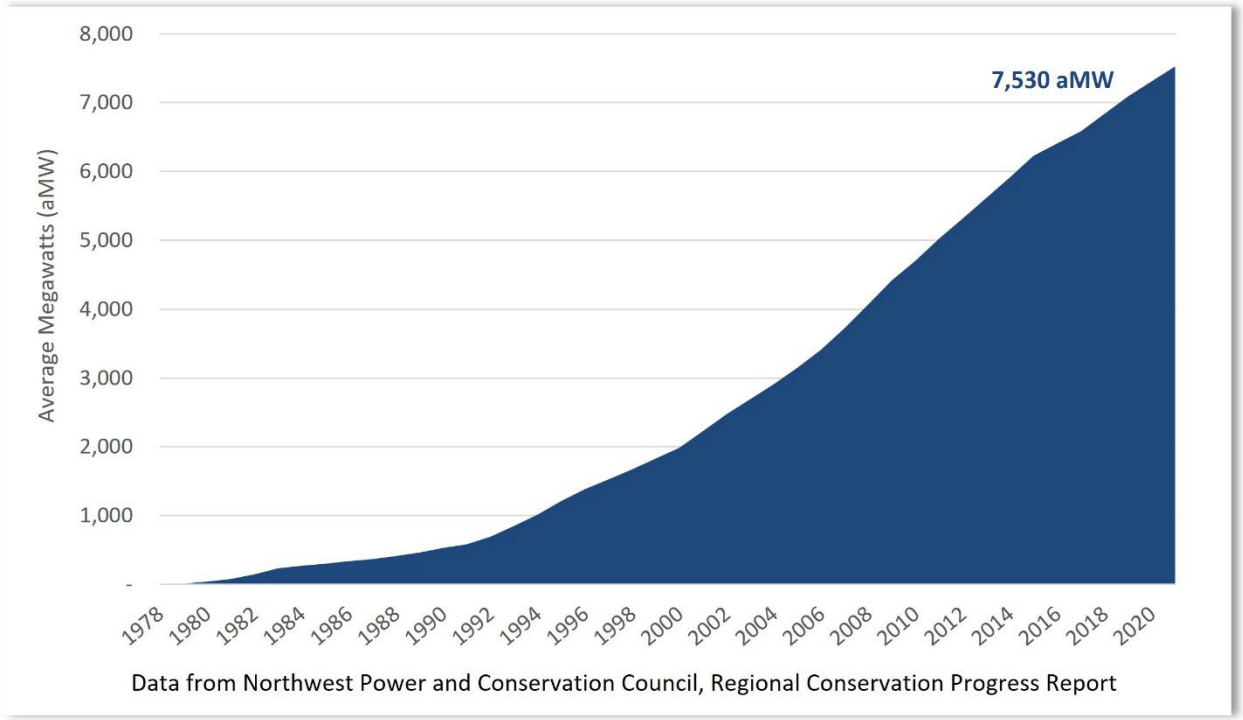
Utilities are projecting greater energy efficiency savings compared to last year's forecast, recognizing energy efficiency as a key resource in the region. Figure 4 on page 8 is a snapshot of the ten-year projected cumulative savings from the past several *Forecasts*. The ten-year savings projected in the 2023 *Forecast* are slightly higher, as utilities seek more savings to meet growing capacity and energy needs during the clean energy transition.

Figure 4: 10-year Cumulative Energy Efficiency Projections



Over the past 40 years, the region has achieved over 7,500 average megawatts of energy efficiency savings – over 60% of which are from utility programs, per the Northwest Power and Conservation Council (Figure 5). The remaining savings come from the Northwest Energy Efficiency Alliance market transformation efforts, state codes and federal standards, and other savings occurring in the market beyond direct program dollars.

Figure 5: Cumulative Regional Energy Efficiency Savings

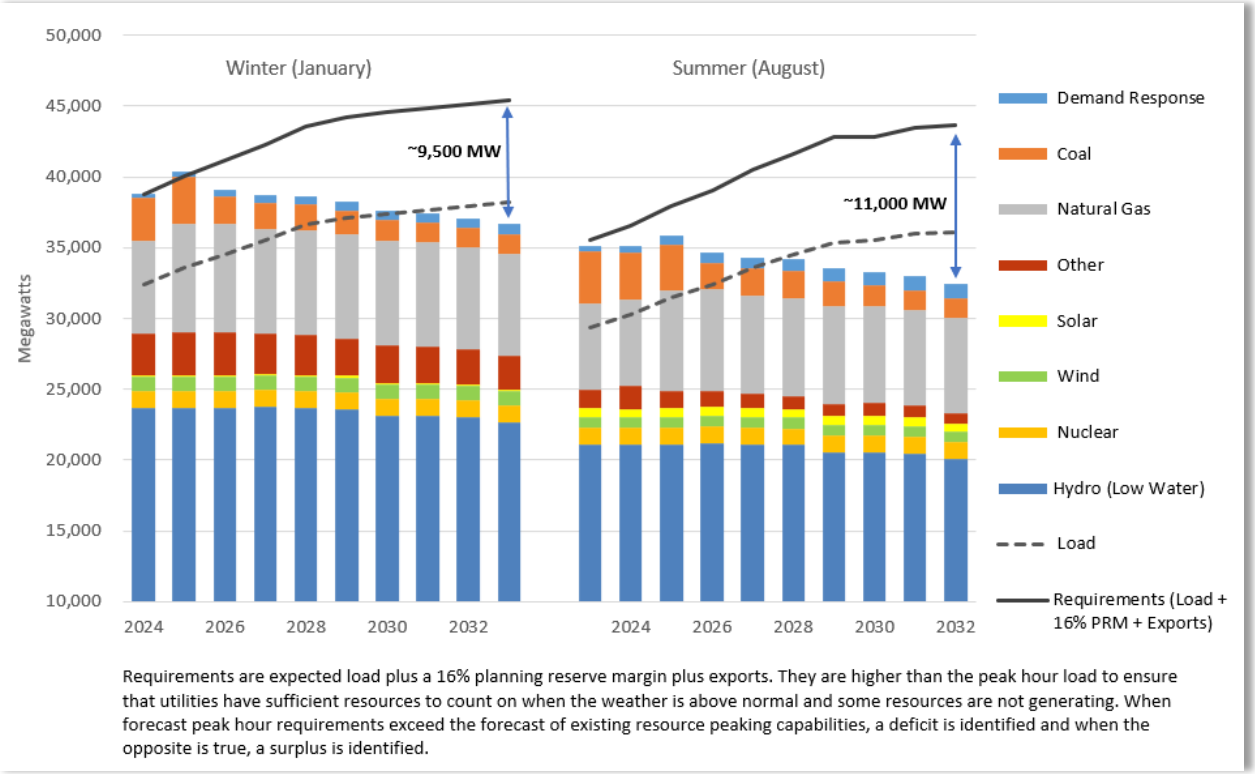


In addition to energy efficiency, utilities continue to deploy and find new ways to rely on customers to reduce energy use at peak times. The *Forecast* projects regional demand response programs will grow. For example, summer demand response is projected to reduce the region's one hour peak by about 400 megawatts in 2024 and by over 950 megawatts in 2033. On average, summer demand response programs provide about 35 percent more peak hour load reduction compared to winter programs. Regional utilities continue to seek opportunities for demand response programs that can provide mutual benefits to the customer and the grid.

Summer Peak Trend Changes

For the first time, the *Forecast* projects the region needs higher amounts of summer capacity resources to meet summer peak hour demand (electricity use) compared to the winter capacity needs. Figure 6 below shows the winter and summer peak load and resource picture if no planned future resources are procured. By the last year of the *Forecast*, the summer peak deficit grows to over 11,000 megawatts and the winter deficit gets above 9,000 megawatts. Winter peak hour demand remains higher than summer. Observed changes in resources are a bigger factor than changes in loads. Generating resources are forecast to contribute more to meet peak hour demand in winter. Summer generating resource contributions are changing less. On the load side, summer peak hour loads are increasing faster than winter peak hour loads.

Figure 6: Peak Capacity Load/Resource Picture



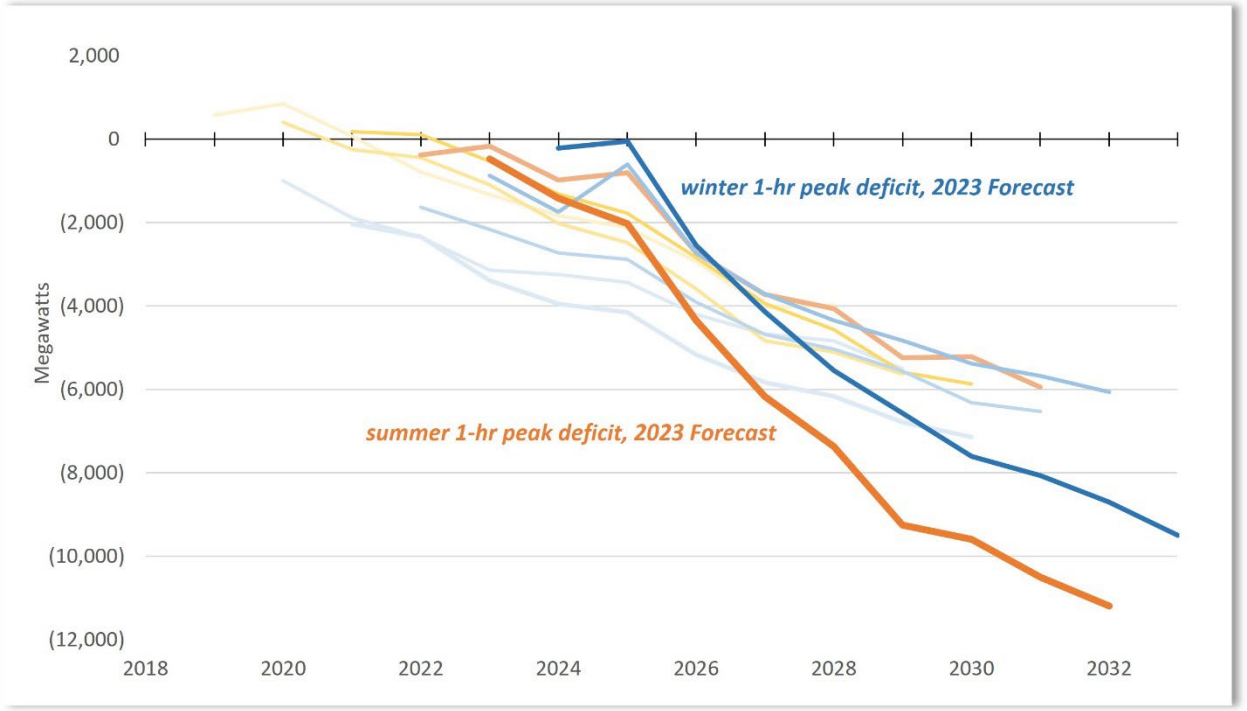
Requirements are expected load plus a 16% planning reserve margin plus exports. They are higher than the peak hour load to ensure that utilities have sufficient resources to count on when the weather is above normal and some resources are not generating. When forecast peak hour requirements exceed the forecast of existing resource peaking capabilities, a deficit is identified and when the opposite is true, a surplus is identified.

The *Forecast* provides a comparison of Northwest utilities' peak hour requirements to the anticipated resource peaking capabilities. A deficit is not a bright line for how much generation needs to be added to keep the lights on. Rather, the *Forecast's* value is the observation of trends over time and brings another element of situational awareness for the region's utilities to identify areas for additional coordination. The figure also shows the region's move away from coal and expectation that natural gas resources play a steady role in serving peak in the region. Utilities are announcing coal plant retirements and exits as they continue to explore the options for their replacements.

Figure 7 below compares the summer and winter 1-hour peak surplus or deficit across *Forecasts* from 2019 to 2023. The solid bold line is this year's projection. The dashed bold line is the 2022 *Forecast's* projections. In the next five years, the summer peak deficit and need for power is anticipated to grow to about 8,000 megawatts and winter approaches 6,000 megawatts.

This view does not include planned future resources. It is also based on a fixed set of assumptions including normal weather loads, a 16 percent planning reserve margin, low hydro generation, the expected 1-hour peaking capability for generating resources and zero short-term market purchases. The region is monitoring the higher summer peak deficit and the growing magnitude of the deficit. The observed summer deficit can reverse back to higher winter deficits if insufficient winter supply is added and if electrification increases winter peak loads.

Figure 7: Peak Capacity Surplus/Deficit *2019 - 2023 Forecasts*

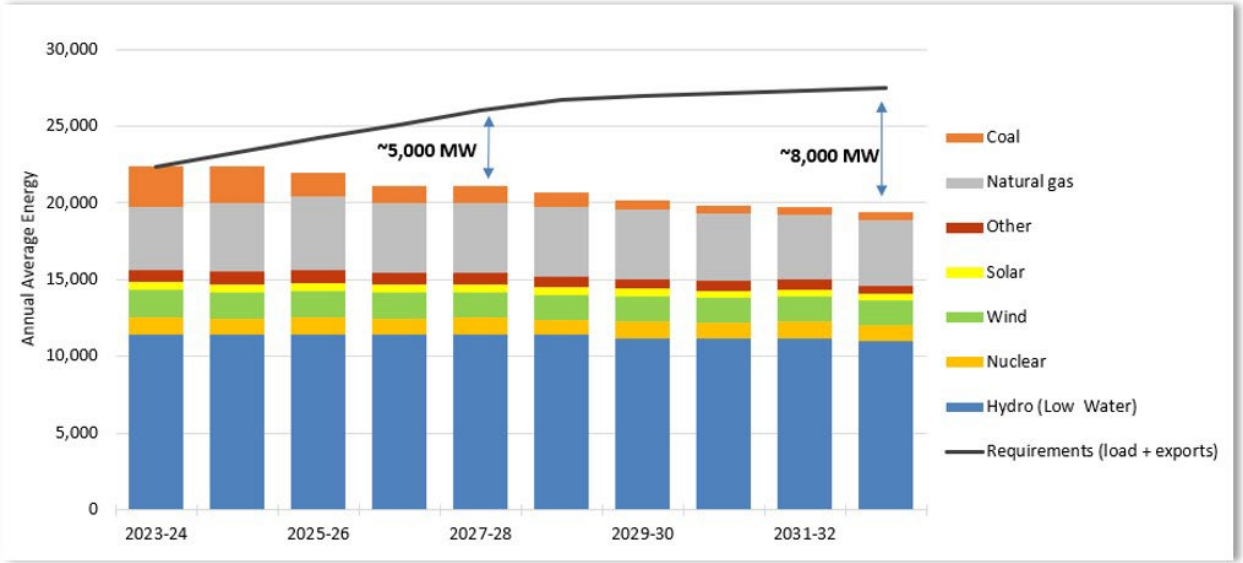


Energy picture helps gage reliability

Monitoring energy deficits can help determine the balance between energy and capacity resources needed in the region. Non-utility owned generation in the region, available power surpluses in interconnected regions, better than low hydro generation and transmission upgrades and expansion can help fill the gaps. Utilities are attentive to these factors as they determine what new resources can best complement their existing power supply.

In addition to summer and winter peak needs, the *Forecast* monitors annual energy needs (electricity demand across all hours of the year). This year's *Forecast*, like last year, shows a growing annual energy deficit (Figure 8) if planned future resources are not acquired. Compared to last year's *Forecast,* where an almost 4,000 average megawatts need was predicted by year ten, this *Forecast's* energy deficit reaches over 8,000 average megawatts in ten years. Watching changes in these trends provides the region with greater situational awareness and identifies areas where more coordination can help.

Figure 8. Annual Energy Picture



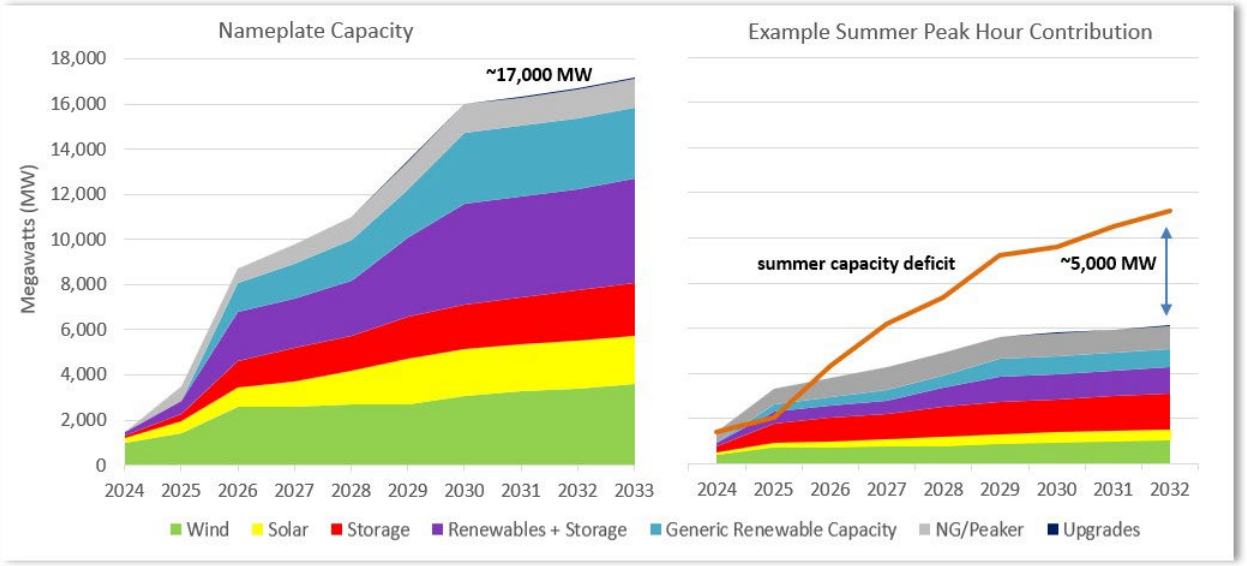
Renewables Combined with Energy Storage Dominate Utility Plans

Utilities are planning for new wind, solar and battery projects to provide much of the new generation to meet rising electric demand and emission reduction goals at a pace that exceeds previous levels. For meeting needs in the next five years, utilities increased the nameplate capacity additions in their preferred portfolios compared to last year's *Forecast*. This translates to over 11,000 megawatts of additions in the next five years, which is up by almost 3,000 megawatts compared to last year's *Forecast*. This *Forecast* anticipates new resource build commitments to start to line up and announcements to roll out before the next *Forecast*. In addition, some utility customers may be procuring their own resources and this *Forecast* may not reflect those additions.

Figure 9 below shows what resources Northwest utilities plan to add to meet their needs. In addition to the increasing amount of renewable energy co-located with storage resources and standalone storage, utilities are looking at capacity resources that include natural gas, peaker and "generic" capacity resources. Some utilities have identified an intention to run the peakers using alternative fuels such as biodiesel or hydrogen.

Figure 9 also shows how these resources might contribute on a regional planning basis to the summer picture highlighted in Figures 6 and 7. The Nameplate capacity (in megawatts), is a measure of the maximum output of a given electric generation plant under optimal conditions, like strong winds or full sun. Generation, measured in megawatt hours, is how much electricity is actually produced. Given the generic nature of the utilities' preferred resource portfolios, this illustration can vary considerably based on assumptions made about the resources' geographic location, type, storage capacity amongst other factors. Using the assumptions made in preparing Figure 9 (Example Summer Peak Hour Contribution), the summer capacity deficit shrinks with planned future resources. However, it also shows the region may require additional resources to fill the gap. Peak contributions will also vary depending on the time of year.

Figure 9: Planned Future Resources Picture



Landmark clean energy legislation and unprecedented federal government funding can help advance clean energy technology and modernize the grid. Emerging technologies including advanced nuclear, offshore wind, renewable hydrogen and long-duration storage are being championed as part of the grid of the future. While these technologies are being explored, they do not show up in the information reported in this year's *Forecast*. In the coming decade, technological advancements will continue to help utilities diversify the mix of clean generation, and utilities will continue to adapt their plans as more information about future loads and resources and transmission opportunities are known.

Transmission solutions and regional coordination crucial to keeping a reliable grid

Several utilities also identify new transmission projects in their preferred resource portfolios and are working to enhance the transmission system. This has been outside the scope of the *Forecast* data tracking. However, transmission is a critical component to delivering generation, much of it from renewable resources, to load centers. New transmission can also make more efficient use of existing resources, possibly reducing the new resource additions required.

Utilities are also enhancing regional coordination by working together to address adequacy concerns and develop enhanced market solutions. The Western Resource Adequacy Program approved by the Federal Energy Regulatory Commission in February 2023 has been recognized as a first-of-a-kind program for resource adequacy that will operate with participants across a wide geographic footprint. Tools like the Western Energy Imbalance Market give system operators real-time visibility across the interconnected grid, which helps share load and resource diversity more efficiently. Expanding coordinated wholesale energy markets can help make more efficient use of existing and newly added resources.

Overview

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, long-term firm contracts, expected savings from demand side management programs, and other components of electric supply and demand in 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 multidimensional look at the Northwest's need for power and underscore the growing complexity of the power system. The information is intended to identify regional trends and general themes based on utilities' integrated resource planning results, rather than provide a precise metric of resource adequacy.

Northwest new and existing generating resources are shown by fuel type. Existing and committed resources are 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 projects where construction has started or supply is firmly committed, 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. Lastly, 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	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33
Firm Requirements										
Load [1/]	21,814	22,791	23,694	24,558	25,545	26,225	26,485	26,681	26,841	27,006
Exports	520	502	502	501	501	501	501	501	501	501
Total	22,334	23,293	24,195	25,060	26,046	26,726	26,986	27,182	27,342	27,507
Firm Resources										
Hydro [2/]	11,459	11,439	11,424	11,462	11,424	11,402	11,200	11,200	11,161	11,005
Small Thermal/Misc.	28	28	28	28	28	18	11	11	11	11
Natural Gas [3/]	4,107	4,497	4,801	4,551	4,546	4,544	4,474	4,426	4,225	4,222
Renewables-Other	276	275	273	274	269	268	268	266	264	260
Solar	503	503	503	502	502	501	501	500	498	483
Wind	1,757	1,747	1,747	1,721	1,661	1,623	1,611	1,596	1,596	1,622
Cogeneration	41	41	34	32	31	31	31	31	31	31
Imports	488	488	467	467	453	380	324	310	310	222
Nuclear	1,116	994	1,116	994	1,116	994	1,116	994	1,116	994
Coal	2,583	2,356	1,593	1,065	1,068	891	593	479	497	508
Total	22,357	22,366	21,985	21,096	21,097	20,652	20,127	19,810	19,708	19,357
Surplus (Deficit)	**22**	**(927)**	**(2,210)**	**(3,963)**	**(4,949)**	**(6,074)**	**(6,859)**	**(7,372)**	**(7,634)**	**(8,150)**

[1/] Load net of energy efficiency
[2/] Firm hydro for energy is the generation expected assuming critical (8%) water condition (the methodology is changed for the 2023 report)
[3/] More energy may be available from natural gas power plants

Table 2. Northwest Region Requirements and Resources – Monthly Energy shows the monthly energy values for the 2023-2024 operating year.

Average Megawatts	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul
Firm Requirements												
Load [1/]	21,304	19,497	19,744	21,984	24,383	24,475	23,492	21,768	20,586	20,069	21,042	22,349
Exports	685	660	501	495	495	455	455	455	455	455	533	597
Total	21,989	20,157	20,245	22,479	24,878	24,930	23,947	22,223	21,041	20,524	21,576	22,946
Firm Resources												
Hydro [2/]	11,335	9,198	9,927	12,737	12,077	12,509	10,513	10,859	10,382	10,057	14,644	13,042
Small Thermal/Misc.	26	26	27	29	31	30	30	30	30	29	22	25
Natural Gas	4,198	3,998	3,784	4,138	4,434	4,436	4,163	4,065	3,658	3,521	4,140	4,190
Renewables-Other	270	275	282	287	284	280	281	283	267	260	267	272
Solar	707	588	403	210	156	174	314	464	611	707	790	832
Wind	1,635	1,466	1,696	1,880	1,801	1,709	1,776	1,870	1,956	1,780	1,902	1,689
Cogeneration	32	40	37	43	45	45	46	43	42	41	40	35
Imports	508	504	560	765	853	553	558	475	378	367	377	379
Nuclear	1,116	1,116	1,116	1,116	1,116	1,116	1,116	1,116	1,116	1,116	1,116	1,116
Coal	3,247	3,090	2,617	2,802	2,611	2,408	2,387	2,466	1,962	2,236	2,426	2,739
Total	23,075	20,299	20,449	24,007	23,406	23,261	21,184	21,672	20,401	20,113	25,724	24,317
Surplus (Deficit)	**1,086**	**142**	**204**	**1,528**	**(1,472)**	**(1,669)**	**(2,763)**	**(551)**	**(640)**	**(411)**	**4,149**	**1,372**

[1/] Load net of energy efficiency

[2/] Firm hydro for monthly energy is the generation expected assuming critical (8%) water condition (the methodology is changed for the 2023 report)

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	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Firm Requirements										
Load[1/]	32,424	33,557	34,471	35,485	36,601	37,111	37,417	37,673	37,886	38,180
Exports	1,143	1,143	1,142	1,142	1,142	1,142	1,142	1,142	1,142	1,142
Planning Margin[2/]	5,188	5,369	5,515	5,678	5,856	5,938	5,987	6,028	6,062	6,109
Total	38,755	40,069	41,128	42,304	43,599	44,190	44,546	44,842	45,089	45,430
Firm Resources										
Hydro[3/]	23,670	23,669	23,669	23,761	23,662	23,618	23,136	23,136	23,043	22,672
Demand Response	295	385	455	539	613	620	654	679	696	720
Small Thermal/Misc.	193	193	195	193	194	175	176	177	178	180
Natural Gas	6,566	7,629	7,630	7,370	7,370	7,370	7,370	7,370	7,137	7,137
Renewables-Other	327	327	327	319	319	319	319	315	311	311
Solar	99	100	100	100	100	100	100	100	99	99
Wind	1,062	1,079	1,067	1,046	1,044	1,054	1,062	1,060	1,041	1,051
Cogeneration	38	38	38	36	36	36	36	36	36	36
Imports	2,072	2,108	2,027	1,738	1,715	1,498	1,495	1,314	1,272	1,145
Nuclear	1,169	1,169	1,169	1,169	1,169	1,169	1,169	1,169	1,169	1,169
Coal	3,056	3,327	1,905	1,902	1,832	1,661	1,430	1,428	1,410	1,410
Total	38,547	40,024	38,582	38,172	38,053	37,621	36,947	36,784	36,393	35,931
Surplus (Deficit)	**(208)**	**(45)**	**(2,546)**	**(4,132)**	**(5,546)**	**(6,569)**	**(7,599)**	**(8,059)**	**(8,696)**	**(9,499)**

[1/] Expected (1-in-2) load net of energy efficiency

[2/] Planning margin is 16% of load (this assumption was updated and set with the *2018 Northwest Regional Forecast*)

[3/] Firm hydro for capacity is the generation expected assuming critical peaking capability as determined by the utility sponsor.

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	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Firm Requirements										
Load [1/]	29,362	30,272	31,429	32,396	33,577	34,557	35,311	35,514	35,987	36,121
Exports	1,443	1,443	1,443	1,442	1,539	1,516	1,812	1,657	1,706	1,706
Planning Margin [2/]	4,698	4,844	5,029	5,183	5,372	5,529	5,650	5,682	5,758	5,779
Total	35,502	36,558	37,900	39,021	40,488	41,602	42,773	42,853	43,450	43,606
Firm Resources										
Hydro [3/]	21,101	21,101	21,101	21,193	21,101	21,057	20,574	20,574	20,482	20,111
Demand Response	385	516	629	717	807	882	879	910	936	954
Small Thermal/Misc.	192	192	194	191	192	192	183	184	185	187
Natural Gas	6,036	6,091	7,154	7,150	6,912	6,912	6,912	6,912	6,693	6,693
Renewables-Other	330	329	329	321	321	321	321	321	317	312
Solar	583	566	605	602	601	602	600	598	592	587
Wind	792	756	793	788	780	764	764	771	765	736
Cogeneration	41	41	41	32	30	30	30	30	30	30
Imports	792	1,065	616	606	499	399	359	359	359	209
Nuclear	1,163	1,163	1,163	1,163	1,163	1,163	1,163	1,163	1,163	1,163
Coal	3,687	3,323	3,244	1,910	1,907	1,903	1,737	1,431	1,431	1,431
Total	35,101	35,142	35,868	34,673	34,313	34,226	33,522	33,254	32,951	32,412
Surplus (Deficit)	**(401)**	**(1,416)**	**(2,032)**	**(4,348)**	**(6,175)**	**(7,376)**	**(9,251)**	**(9,599)**	**(10,500)**	**(11,194)**

[1/] Expected (1-in-2) load net of energy efficiency

[2/] Planning margin is 16% of load (this assumption was updated and set with the *2018 Northwest Regional Forecast*)

[3/] Firm hydro for capacity is the generation expected assuming critical peaking capability as determined by the utility sponsor

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)	Annual Energy (aMW)	Utility/Owner
Box Canyon	Hydro	90	90			Clark PUD
Contract	Hydro	40	25	40	28	Franklin PUD
Short-Term Winter Capacity Product	Contract	25	25			Snohomish PUD
Firm Winter Energy Product	Hydro	25	25			Snohomish PUD
Columbia Basin Hydro projects	Hydro	146				Avista
Mid C Extension-Rock Island & Rocky Reach 2	Hydro	87.5				Avista
Mid C Extension-Rock Island & Rocky Reach 3	Hydro	87.5				Avista
Durkee Solar	Solar	3				Idaho Power
Jackpot Holdings, LLC	Solar	120				Idaho Power
MTSUN	Solar	80				NorthWestern Energy
Solarize Rogue Comm. Solar	Solar	0.1				PacifiCorp
Wallowa County Community Solar, LLC	Solar	0.4				PacifiCorp
Wheatridge Renewable Energy Facility	Solar	50				Portland General Elec.
Wheatridge Renewable Energy Facility	Battery	30				Portland General Elec.
Lund Hill Solar	Solar	150				Puget Sound Energy
Total (Nameplate)		**935**				

Table 6. Committed Resources details firm contracts and generating projects that are committed to come online. All supply listed in this table is included in the regional analysis of power needs.

Project	Year	Fuel/Tech	Nameplate (MW)	Utility/Owner
Moore's Hollow	2023	Solar	42	Idaho Power
Prairie City	2023	Solar	29	Idaho Power
Apex Solar	2023	Solar	80	NorthWestern Energy
Black Eagle Upgrade	2023	Hydro	2	NorthWestern Energy
Holter Upgrade	2023	Hydro	1	NorthWestern Energy
Yellowstone Co. Generating Station	est. 2024	Nat.Gas	175	NorthWestern Energy
Sunnyside Solar, LLC	2023	Solar	5	PacifiCorp
Clearwater Wind	2023	Wind	311	Portland General Electric
Daybreak Solar	2023	Solar	138	Portland General Electric
Wasco County Solar	2023	Solar	60	Portland General Electric
Li-Ion Battery Energy Storage	2025	Battery	25	Snohomish County PUD
Total (Nameplate)			**868**	

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.

	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33
Energy Efficiency (aMW)										
Incremental	176	203	180	186	186	183	193	185	178	172
Cumulative	176	379	559	745	931	1,115	1,308	1,492	1,670	1,842
Demand Response (MW) existing + forecast[1]										
Winter	198	198	272	363	444	508	539	567	595	619
Summer	401	401	504	599	688	764	819	846	876	903

[1] Values are program effectiveness, nameplate values are higher.

Table 8. Planned Future Resources catalogues future resources that utilities have identified to meet their own needs. These resources are subject to change and are not included in the regional analysis of power needs.

Project	Year	Fuel/Tech	Nameplate (MW)	Utility
Kettle Falls Modernization	2027	Biomass	12	Avista
Montana Wind	2025, 2028	Wind	200	Avista
Reciprocating ICE	2031	Natural Gas	55	Avista
Combustion Turbine – ID	2027	Natural Gas	84	Avista
Combustion Turbine – WA	2027	Natural Gas	84	Avista
Post Falls Hydro Modernization	2026	Hydro	8	Avista
River Road Cap. Increase	2024	Natural Gas	-	Clark Public Utilities
Palouse Junction	2025	Solar PV	10	Franklin PUD
Natural Gas	2024	Natural Gas	357	Idaho Power
Solar PV	2025 - 2029	Solar PV	985	Idaho Power
Storage	2023 – 2032	Storage	705	Idaho Power
Wind	2024	Wind	700	Idaho Power
Broadview	TBD	Solar + Battery	160	NorthWestern Energy
Caithness Beaver Creek II	TBD	Wind + Battery	60	NorthWestern Energy
Caithness Beaver Creek III	TBD	Wind + Battery	60	NorthWestern Energy
Cochrane Upgrade	2024	Hydro	2	NorthWestern Energy
ConEd Pondera	TBD	Wind	20	NorthWestern Energy
ConEd Teton	TBD	Wind	19	NorthWestern Energy
ConEd Wheatland	TBD	Wind	75	NorthWestern Energy
Hauser Upgrade	2025	Hydro	1	NorthWestern Energy
Jawbone	TBD	Wind	80	NorthWestern Energy
Meadowlark	TBD	Solar + Battery	20	NorthWestern Energy
Thompson Falls Upgrade	2031	Hydro	4	NorthWestern Energy
Trident	TBD	Solar + Battery	160	NorthWestern Energy
Battery	2026	Battery	200	PacifiCorp
Solar + Storage	2025 - 2030	Solar + Storage	2,861	PacifiCorp
Wind	2026 - 2030	Wind	767	PacifiCorp
Wind + Storage	2029	Wind + Storage	160	PacifiCorp
Generic Capacity Resource	2026	Capacity	1326	Portland General Electric
Generic Capacity Resource	2027	Capacity	201	Portland General Electric
Generic Capacity Resource	2028	Capacity	254	Portland General Electric
Generic Capacity Resource	2029	Capacity	351	Portland General Electric
Generic Capacity Resource	2030	Capacity	1005	Portland General Electric
DER Solar Ground	2025	Solar PV	10	Puget Sound Energy
DER Solar Rooftop	2025 – 2033	Solar PV	260	Puget Sound Energy
DER Storage	2026 – 2031	Storage	150	Puget Sound Energy
Frame Peaker Biodiesel	2024, 2026, 2028	Biodiesel	711	Puget Sound Energy
Li-ion 4hr Battery	2025 – 2032	Battery	700	Puget Sound Energy
Li-ion 6hr Battery	2033	Battery	100	Puget Sound Energy
MT Pumped Hydro	2026	Storage	200	Puget Sound Energy
MT Wind East	2026	Wind	400	Puget Sound Energy

Project	Year	Fuel/Tech	Nameplate (MW)	Utility
Solar + Battery	2024, 2029	Solar PV + Battery	450	Puget Sound Energy
WA East Solar	2024 – 2029	Solar PV	700	Puget Sound Energy
Wind	2024 – 2030	Wind	1000	Puget Sound Energy
WA Pumped Hydro	2026	Storage	200	Puget Sound Energy
Wind + Battery	2025 - 2029	Wind + Battery	750	Puget Sound Energy
Wind + Solar + Battery	2026	Wind + Solar PV + Battery	250	Puget Sound Energy
WY East Wind	2031-2033	Wind	400	Puget Sound Energy
E WA Solar	2026 - 2032	Solar PV	-	Seattle City Light
Montana Wind	2032-2033	Wind	50	Seattle City Light
E WA Solar – Large Customers	2024	Solar PV	100	Seattle City Light
Gorge Wind	2026	Wind	225	Seattle City Light
SE Oregon Solar	2026	Solar PV	75	Seattle City Light
Li-ion Battery Storage	2025	Battery	25	Snohomish PUD
Local Utility-scale Solar	2029	Solar PV	5	Snohomish PUD
Long-duration Energy Storage	2030	Storage	50	Snohomish PUD
Short-term Winter Capacity Market Product	2024	Market	25	Snohomish PUD
Total (Nameplate)			**17,822**	

Table 9. Planned Future Resources Timeline displays the cumulative supply-side resource additions over time, combining the nameplate MW values of resources from Table 8 (NW utility owned/contracted only, IPP additions not included).

Nameplate MW	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Wind	1000	1,400	2,572	2,572	2,672	2,792	3,292	3,492	3,617	3,807
Solar	200	540	860	1,140	1,490	2,025	2,055	2,085	2,115	2,145
Storage	120	350	1,175	1,505	1,585	1,865	1,995	2,075	2,230	2,330
Renewables w. Storage	150	562	2,162	2,162	2,437	3,517	4,471	4,471	4,471	4,624
Natural Gas/Peaker	619	619	856	1,024	1,261	1,261	1,236	1,291	1,291	1,291
Generic Renewable Capacity	-	-	1,326	1,527	1,781	2,132	3,137	3,137	3,137	3,137
Upgrades	12	13	21	33	33	33	33	37	37	37
TOTAL	2,101	3,484	8,972	9,963	11,259	13,625	16,219	16,588	16,898	17,371
Total renewables	1,350	2,502	6,920	7,401	8,380	10,466	12,955	13,185	13,340	13,713

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. This table includes recently acquired and committed resources – some of the resources listed may not currently be operating. Potential resources are not included in the table.

Project	Owner	NW Utility	Nameplate (MW)
HYDRO			**33,824**
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	0.5
Arrowrock Dam	Clatskanie PUD/Irr Dist	Clatskanie PUD	18
B. Smith	PacifiCorp	PacifiCorp	0.03
Baker City Hydro	PURPA	Idaho Power	0.24
Barber Dam	PURPA	Idaho Power	4
Bell Mountain	PacifiCorp	PacifiCorp	1
Big Sheep Creek	Everand Jensen	Avista Corp.	0.1
Big Cliff	US Corps of Engineers	Federal System (BPA)	18
Birch Creek	PURPA	Idaho Power	0.1
Birch Creek	PacifiCorp	PacifiCorp	3
Black Canyon # 3	PURPA	Idaho Power	0.1
Black Canyon	US Bureau of Reclamation	Federal System (BPA)	10
Black Canyon Bliss Dam	PURPA	Idaho Power	0.1
Black Creek Hydro	Black Creek Hydro, Inc.	Puget Sound Energy	4
Black Eagle	NorthWestern Energy	NorthWestern Energy	23
Blind Canyon	PURPA	Idaho Power	2
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	0.4
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
Broadwater Dam	Dept. of Natural Res. & Cons.	NorthWestern Energy	10
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	0.1
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 Draw Creek	PURPA	Idaho Power	2

Project	Owner	NW Utility	Nameplate (MW)
Cedar Falls, Newhalem	Seattle City Light	Seattle City Light	33
Central Oregon Siphon		PacifiCorp	5
Chandler	US Bureau of Reclamation	Federal System (BPA)	12
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
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
Cochrane	NorthWestern Energy	NorthWestern Energy	60
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	0.2
Curtis Livestock	PacifiCorp	PacifiCorp	0.1
Cushman 1	Tacoma Power	Tacoma Power	43
Cushman 2	Tacoma Power	Tacoma Power	81
Deep Creek	Gordon Foster	Avista Corp.	0.5
Derr Creek	Jim White	Avista Corp.	0.3
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
Dworshak	US Corps of Engineers	Federal System (BPA)	400
Dworshak/ Clearwater		Federal System (BPA)	3
Eagle Point	PacifiCorp	PacifiCorp	3
East Side	PacifiCorp	PacifiCorp	3
Eight Mile Hydro	PURPA	Idaho Power	0.4
Elk Creek	PURPA	Idaho Power	3
Eltopia Branch Canal[2]	Columbia Basin Hydro	Multiple Utilities	2
Esquatzel Small Hydro	Green Energy Today, LLC	Franklin County PUD	1
Fall Creek	PacifiCorp	PacifiCorp	3
Falls Creek	Clallam PUD	Other Public (BPA)	0.03
Fall River	PURPA	Idaho Power	9
Faraday	Portland General Electric	Portland General Electric	37
Fargo Drop Hydro	PURPA	Idaho Power	1

Project	Owner	NW Utility	Nameplate (MW)
Farmers Irrigation	PacifiCorp	PacifiCorp	3
Faulkner Ranch	PURPA	Idaho Power	1
Fish Creek	PacifiCorp	PacifiCorp	11
Fisheries Development Co.	PURPA	Idaho Power	0.3
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	0.4
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	0.1
Hancock Creek	Snohomish County PUD	Snohomish County PUD	6
Hauser	NorthWestern Energy	NorthWestern Energy	19
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
Holter	NorthWestern Energy	NorthWestern Energy	53
Hood Street Reservoir	Tacoma Power	Tacoma Power	1
Horseshoe Bend	PURPA	Idaho Power	9
Hungry Horse	US Bureau of Reclamation	Federal System (BPA)	428
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 Elect. Co-op	5
Jackson (Sultan)	Snohomish County PUD	Snohomish County PUD	112
James Boyd		PacifiCorp	0.2
Jim Ford Creek	Ford Hydro	Avista Corp.	2
Jim Knight	PURPA	Idaho Power	0.3
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
Koyle Small Hydro	PURPA	Idaho Power	1
Joseph Hydro		PacifiCorp	1
MC6 Hydro	PURPA	Idaho Power	2

Project	Owner	NW Utility	Nameplate (MW)
Koma Kulshan	Koma Kulshan Associates	Puget Sound Energy	12
La Grande	Tacoma Power	Tacoma Power	64
Lacomb Irrigation	PacifiCorp	PacifiCorp	1
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	0.1
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 Rvr Res	PURPA	Idaho Power	3
Little Wood/Arkoosh	PURPA	Idaho Power	1
Little Wood River Ranch II	PURPA	Idaho Power	1
Lloyd Fery	PacifiCorp	PacifiCorp	0.04
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	111
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
Low Line Canal	PURPA	Idaho Power	8
Low Line Midway	PURPA	Idaho Power	3
Lucky Peak	US Corps of Engineers	Seattle City Light	113
Madison	Northwestern Energy	NorthWestern Energy	13
Magic Reservoir	PURPA	Idaho Power	9
Main Canal Headworks[2]	Columbia Basin Hydro	Multiple Utilities	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		Other Publics (BPA)	1

Project	Owner	NW Utility	Nameplate (MW)
Milner	Idaho Power	Idaho Power	60
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
Morony	NorthWestern Energy	NorthWestern Energy	49
Morse Creek		Port Angeles	1
Mossyrock	Tacoma Power	Tacoma Power	300
Mountain Energy	PacifiCorp	PacifiCorp	0.1
Mount Tabor	City of Portland	Portland General Electric	0.2
Moyie Springs	City of Bonners Ferry	Other Publics (BPA)	4
Mud Creek/S&S	PURPA	Idaho Power	1
Mud Creek/White	PURPA	Idaho Power	0.2
Mystic	NorthWestern Energy	NorthWestern Energy	73
N-32 Canal (Marco Ranches)	PURPA	Idaho Power	12
Nicols Gap	PacifiCorp	PacifiCorp	1
Nicolson SunnyBar	PacifiCorp	PacifiCorp	0.4
Nine Mile	Avista Corp.	Avista Corp.	26
Nooksack	Puget Sound Hydro, LLC	Puget Sound Energy	-
North Gooding Main Hydro		Idaho Power	1
North Fork	Portland General Electric	Portland General Electric	41
North Fork Sprague	PacifiCorp	PacifiCorp	1
N.R. Rousch	PacifiCorp	PacifiCorp	0.1
Noxon Rapids	Avista Corp.	Avista Corp.	466
Odell Creek	PacifiCorp	PacifiCorp	0.2
Oak Grove	Portland General Electric	Portland General Electric	51
O.J. Power	PacifiCorp	PacifiCorp	0.3
Opal Springs	PacifiCorp	PacifiCorp	5
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[2]	Columbia Basin Hydro	Multiple Utilities	6.60
Pelton Reregulation	Warm Springs Tribe	Portland General Electric	19
Pelton	Portland General Electric	Multiple Utilities	110
Phillips Ranch	Glen Phillips	Avista Corp.	0.02
Pigeon Cove	PURPA	Idaho Power	2
Portneuf River		PacifiCorp	1
Potholes East Canal 66 Headworks[2]	Columbia Basin Hydro	Multiple Utilities	2
Post Falls	Avista Corp.	Avista Corp.	15
Preston City	PacifiCorp	PacifiCorp	0.40

Project	Owner	NW Utility	Nameplate (MW)
Powerdale	PacifiCorp	PacifiCorp	6
Pristine Springs	PURPA	Idaho Power	0.1
Priest Rapids	Grant County PUD	Multiple Utilities	956
Pristine Springs #3	PURPA	Idaho Power	0.2
Prospect projects	PacifiCorp	PacifiCorp	44
Quincy Chute[2]	Columbia Basin Hydro	Multiple Utilities	9
R.D. Smith[2]	Columbia Basin Hydro	Multiple Utilities	6
Reynolds Irrigation	PURPA	Idaho Power	0.3
Reeder Gulch	City of Ashland	Other Publics (BPA)	0.1
River Mill	Portland General Electric	Portland General Electric	19
Rock Creek No. 1	PURPA	Idaho Power	2
Rock Creek No. 2	PURPA	Idaho Power	2
Rocky Brook	Mason County PUD #3	Other Public (BPA)	2
Rainbow	NorthWestern Energy	NorthWestern Energy	59
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
Ryan	NorthWestern Energy	NorthWestern Energy	71
Sagebrush	PURPA	Idaho Power	0.4
Sahko	PURPA	Idaho Power	1
Santiam	PacifiCorp	PacifiCorp	0.2
Schaffner	PURPA	Idaho Power	1
Seli'š Ksanka Qlispe'	Conf. Salish/Kootenai Tribes	NorthWestern Energy	194
Sheep Creek	Glen Phillips	Avista Corp.	2
Shoshone II	PURPA	Idaho Power	1
Shoshone CSPP	PURPA	Idaho Power	0.4
Slide Creek	PacifiCorp	PacifiCorp	18
Shoshone Falls	Idaho Power	Idaho Power	14
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	0.1
South Fork Tolt	Seattle City Light	Seattle City Light	17
Stauffer Dry Creek		PacifiCorp	1
Summer Falls[2]	Columbia Basin Hydro	Multiple Utilities	92
Stone Creek	Eugene Water & Electric Board	Eugene Water & Electric Board	12
Strawberry Creek	South Idaho Public Agency	Other Publics (BPA)	2
Sygitowicz	Cascade Clean Energy	Puget Sound Energy	0.4

Project	Owner	NW Utility	Nameplate (MW)
Swan Falls	Idaho Power	Idaho Power	25
Swift 1	PacifiCorp	Multiple Utilities	219
Swift 2	Cowlitz County PUD	Multiple Utilities	73
TGS/Briggs		PacifiCorp	0.2
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	0.2
Trail Bridge	Eugene Water & Electric Board	Eugene Water & Electric Board	10
Tunnel #1	PURPA	Idaho Power	7
Turnbull Hydro		NorthWestern Energy	7
Twin Falls	PURPA	Puget Sound Energy	20
Twin Falls	Idaho Power	Idaho Power	53
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
Walla Walla	PacifiCorp	PacifiCorp	2
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	0.2
Clark Canyon Dam	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
Youngs Creek	Snohomish County PUD	Snohomish County PUD	8

[2] Avista Corp. signed contract agreement with Columbia Basin Hydro to purchase project generation as existing contracts expire with Seattle City Light, Tacoma Power and Grant PUD.

Project	Owner	NW Utility	Nameplate (MW)
COAL			**3,907**
Colstrip #3	PP&L Montana, LLC	Multiple Utilities	740
Colstrip #4	NorthWestern Energy	Multiple Utilities	740
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	540
Valmy #2	NV Energy / Idaho Power	Multiple Utilities	267
NUCLEAR			**1,230**
Columbia Generating Station	Energy Northwest	Federal System (BPA)	1,230
NATURAL GAS			**7,001**
Alden Bailey	Clatskanie PUD	Clatskanie PUD	11
Basin Creek	NorthWestern Energy	NorthWestern Energy	52
Beaver	Portland General Electric	Portland General Electric	486
Beaver 8	Portland General Electric	Portland General Electric	23
Bennett Mountain	Idaho Power	Idaho Power	173
Boulder Park	Avista	Avista	25
Carty	Portland General Electric	Portland General Electric	437
Chehalis	PacifiCorp	PacifiCorp	491
Coyote Springs I	Portland General Electric	Portland General Electric	252
Coyote Springs II	Avista	Avista	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	166
Ferndale	Puget Sound Energy	Puget Sound Energy	244
Frederickson	EPCOR Power L.P./PSE	Multiple Utilities	258
Fredonia 1 & 2	Puget Sound Energy	Puget Sound Energy	234
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	280
Hermiston GP	PacifiCorp/Hermiston Generating	PacifiCorp	468
Kettle Falls CT	Avista	Avista	7
Lancaster Power Project	Avista	Avista	270
Langley Gulch	Idaho Power	Idaho Power	319
Laurel Generating Station	NorthWestern Energy	NorthWestern Energy	175
Mint Farm Energy Center	Puget Sound Energy	Puget Sound Energy	276
Northeast A&B	Avista	Avista	62
Port Westward	Portland General Electric	Portland General Electric	411
Port Westward Unit 2	Portland General Electric	Portland General Electric	225
Rathdrum 1 & 2	Avista	Avista	167

Project	Owner	NW Utility	Nameplate (MW)
River Road	Clark Public Utilities	Clark Public Utilities	248
Sumas Energy	Puget Sound Energy	Puget Sound Energy	129
Whitehorn #2 & #3	Puget Sound Energy	Puget Sound Energy	149
COGENERATION			**119**
Billings Cogeneration	Billings Generation, Inc.	NorthWestern Energy	64
Hampton Lumber	Hampton Lumber Mills	Snohomish County PUD PPA	5
International Paper Energy Center	Eugene Water & Electric Board	Eugene Water & Electric Board	26
Port Townsend Mill	Port Townsend Paper	BPA (other publics)	8
Simplot-Pocatello	PURPA	Idaho Power	12
Tasco-Nampa	Tasco	Idaho Power	2
Tasco-Twin Falls	Tasco	Idaho Power	3
RENEWABLES-OTHER			**402**
Bannock County Landfill	PURPA	Idaho Power	3
Bettencourt Dry Creek	PURPA	Idaho Power	2
Biomass One	PacifiCorp	PacifiCorp	25
Bloks Evergreen Dairy	Puget Sound Energy	Puget Sound Energy	0
DR Johnson Lumber	PacifiCorp	PacifiCorp	8
Columbia Ridge Landfill	Waste Management	Seattle City Light	13
Dry Creek Landfill	Dry Creek Landfill Inc.	PacifiCorp	3
Emerald City I		Puget Sound Energy	5
Emerald City II		Puget Sound Energy	5
Fighting Creek	PURPA	Idaho Power	3
Flathead County Landfill	Flathead Electric Cooperative	Flathead Electric Cooperative	2
Hidden Hollow Landfill	PURPA	Idaho Power	3
H. W. Hill Landfill	Allied Waste Companies	Multiple Utilities	37
Interfor Pacific-Gilchrist	Midstate Electric Co-op	Midstate Electric Co-op	2
Kettle Falls	Avista Corp.	Avista Corp.	51
Neal Hot Springs	U.S Geothermal	Idaho Power	33
Pico Energy, LLC	PURPA	Idaho Power	2
Pine Products	PacifiCorp	PacifiCorp	6
Plum Creek NLSL	Plum Creek MDF	Flathead Electric Cooperative	6
Pocatello Wastewater	PURPA	Idaho Power	0.5
Port of Tillamook Digester		Tillamook PUD	1
PGE non solar QFs		Portland General Electric	73
Qualco Dairy Digester		Snohomish PUD	0.7
Raft River 1	US Geothermal	Idaho Power	16
River Bend Landfill	McMinnville Water & Light	McMinnville Water & Light	5
Rock Creek Dairy	PURPA	Idaho Power	3
Seneca	Seneca Sustainable Energy, LLC	Eugene Water & Electric Board	20
Short Mountain		Emerald PUD	3
Sierra Pacific		Grays Harbor	16

Project	Owner	NW Utility	Nameplate (MW)
SPI Biomass		Puget Sound Energy	17
Spokane Waste Energy	City of Spokane	Avista Corp.	26
Stimson Lumber	Stimson Lumber	Avista	7
Stoltze Biomass	F.H. Stoltze Land & Lumber	Flathead Electric Cooperative	3
Tamarack	PURPA	Idaho Power	5
Whitefish Hydro	City of Whitefish	Flathead Electric Cooperative	0.2
SOLAR			**2,472**
Adams Solar Center		PacifiCorp	10
American Falls Solar	PURPA	Idaho Power	20
American Falls Solar II	PURPA	Idaho Power	20
Ashland Solar Project		BPA	0.1
Baker Solar	PURPA	Idaho Power	15
Bear Creek		PacifiCorp	10
Bellevue Solar	EDF Renewable Energy	Portland General Electric	2
Black Eagle Solar		NorthWestern Energy	3
Black Cap		PacifiCorp	2
Black Cap II		PacifiCorp	8
Bly Solar Center		PacifiCorp	9
Cleanera Apex I		NorthWestern Energy	80
Brush Solar	PURPA	Idaho Power	3
Captain Jack Solar		PacifiCorp	3
Chiloquin		PacifiCorp	10
Collier		PacifiCorp	10
Daybreak Solar		Portland General Electric	138
Durkee Solar	PURPA	Idaho Power	3
Elbe		PacifiCorp	10
Ewauna (I & II)		PacifiCorp	4
Grand View Solar	PURPA	Idaho Power	80
Great Divide Solar		NorthWestern Energy	3
Green Meadows Solar		NorthWestern Energy	3
Grove Solar	PURPA	Idaho Power	6
Horn Rapids		Energy Northwest	3
Hyline Solar Center	PURPA	Idaho Power	9
ID Solar 1	Boise City Solar, LLC	Idaho Power	40
IKEA Solar		Puget Sound Energy	1
Jackpot Solar	Jackpot Holdings, LLC	Idaho Power	120
King Estate Solar	Lane Co. Electric Cooperative	Lane Co. Electric Cooperative	0.2
Lund Hill	Lane Co. Electric Cooperative	Puget Sound Energy	150
Magpie Solar		NorthWestern Energy	3
Merrill Solar LLC		PacifiCorp	10
Millican Solar Energy		PacifiCorp	60
Moore's Hollow	PURPA	Idaho Power	42
Morgan Solar	PURPA	Idaho Power	3

Project	Owner	NW Utility	Nameplate (MW)
Mountain Home Solar	PURPA	Idaho Power	20
Moyer-Tolles Solar	Umatilla Electric Cooperative	Umatilla Electric Cooperative	1
MTSun LLC		NorthWestern Energy	80
Murphy Flat Power	PURPA	Idaho Power	20
Neilson Solar		Avista	19
Norwest Projects		PacifiCorp	32
Old Mill		PacifiCorp	5
Ontario Solar Center	PURPA	Idaho Power	3
Open Range Solar Center	PURPA	Idaho Power	10
Orchard Ranch Solar	PURPA	Idaho Power	20
OR Solar projects		PacifiCorp	58
OSIP		PacifiCorp	10
Pachwáywit Solar		Portland General Electric	162
Prairie City	PURPA	Idaho Power	29
PGE QF Solar		Portland General Electric	528
Prineville		PacifiCorp	40
PSE Small Solar Projects		Puget Sound Energy	15
Railroad Solar Center	PURPA	Idaho Power	5
River Bend Solar		NorthWestern Energy	3
Simco Solar	PURPA	Idaho Power	20
South Mills Solar 1		NorthWestern Energy	3
Solarize Rogue LLC	Oregon Clean Power	PacifiCorp	0
Sunnyside Solar	OneEnergy Renewables	PacifiCorp	5
Thunderegg Solar Center	PURPA	Idaho Power	10
Tumbleweed		PacifiCorp	10
Vale I Solar	PURPA	Idaho Power	3
Vale Air Solar	PURPA	Idaho Power	10
Wasco Co Solar		Portland General Electric	60
Wheatridge Solar	Portland General/NextEra Energy	PGE/NextEra	50
WIND			**6,100**
71 Ranch LP		NorthWestern Energy	3
Bennett Creek	PURPA	Idaho Power	21
Benson Creek Wind	PURPA	Idaho Power	10
Big Timber Wind		NorthWestern Energy	25
Biglow Canyon - 1	Portland General Electric	Portland General Electric	125
Biglow Canyon - 2	Portland General Electric	Portland General Electric	163
Biglow Canyon - 3	Portland General Electric	Portland General Electric	161
Burley Butte Wind Farm	PURPA	Idaho Power	21
Camp Reed Wind Park	PURPA	Idaho Power	23
Cassia Wind Farm	PURPA	Idaho Power	11
Chopin		PacifiCorp	10
Clearwater	NextEra	Multiple Utilities	661
Coastal Energy	CCAP	Grays Harbor PUD	6

Project	Owner	NW Utility	Nameplate (MW)
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
Cycle Horseshoe Bend Wind		NorthWestern Energy	9
DA Wind Investors		NorthWestern Energy	3
Desert Meadow Windfarm	PURPA	Idaho Power	23
Durbin Creek	PURPA	Idaho Power	10
Elkhorn Wind	Telocaset Wind Power Partners	Idaho Power	101
Fairfield Wind		NorthWestern Energy	10
Fossil Gulch Wind	PURPA	Idaho Power	11
Golden Hills	Avangrid	Puget Sound Energy	200
Golden Valley Wind Farm	PURPA	Idaho Power	12
Goodnoe Hills	PacifiCorp	PacifiCorp	94
Gordon Butte Wind		NorthWestern Energy	10
Greenfield Wind		NorthWestern Energy	25
Hammett Hill Windfarm	FALSE	Idaho Power	23
Harvest Wind	Summit Power	Multiple Utilities	99
Hay Canyon Wind	Hay Canyon Wind Project LLC (Iberdrola)	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
Hot Springs Wind	Hot Springs Wind	Idaho Power	21
Jett Creek	PURPA	Idaho Power	10
Judith Gap	Invenergy Wind, LLC	NorthWestern Energy	135
Klondike II	PPM Energy	Portland General Electric	75
Klondike III	PPM Energy	Multiple Utilities	221
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
Mainline Wind Farm	PURPA	Idaho Power	23
Marengo	Renewable Energy America	PacifiCorp	140
Marengo II	PacifiCorp	PacifiCorp	70
Mariah Wind		PacifiCorp	10
Milner Dam Wind Farm	PURPA	Idaho Power	20
Musselshell Wind 1		NorthWestern Energy	10
Musselshell Wind 2		NorthWestern Energy	10
Nine Canyon	Energy Northwest	Multiple Utilities	96
NWE small Wind aggregate		NorthWestern Energy	5
Orchard Wind		PacifiCorp	40
Oregon Wind Farms I & II		PacifiCorp	65
Oregon Trails Wind Farm	PURPA	Idaho Power	14

Project	Owner	NW Utility	Nameplate (MW)
Orem Family Wind		PacifiCorp	10
Oversight Resources		NorthWestern Energy	3
Palouse Wind	Palouse Wind, LLC	Avista Corp.	105
Paynes Ferry Wind Park	PURPA	Idaho Power	21
Pilgrim Stage Station	PURPA	Idaho Power	11
Prospector Wind	PURPA	Idaho Power	10
Rattlesnake Flat Wind		Avista Corp.	146
Rockland Wind	PURPA	Idaho Power	80
Ryegrass Windfarm	PURPA	Idaho Power	23
Salmon Falls Wind Farm	PURPA	Idaho Power	22
Sawtooth Wind	PURPA	Idaho Power	22
Skookumchuck	Puget Sound Energy	Puget Sound Energy	137
Stateline Wind	NextEra	Multiple Utilities	275
Stillwater Wind		NorthWestern Energy	80
South Peak Wind		NorthWestern Energy	80
Spion Kop Wind		NorthWestern Energy	40
Thousand Springs	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 Dot Wind		NorthWestern Energy	11
Two Ponds Windfarm	PURPA	Idaho Power	23
Vansycle Ridge	ESI Vansycle Partners	Portland General Electric	25
Wheat Field Wind Project	Wheat Field Wind LLC	Snohomish County PUD	97
Wheatridge Wind Project	PGE/Nextera Energy	Portland General Electric	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
Yahoo Creek Wind Park	PURPA	Idaho Power	21
SMALL THERMAL AND MISCELLANEOUS			**299**
Bangor Base 1&2	US Navy-Bangor	BPA/Other publics	18
Yellowstone Energy LP	Yellowstone Energy Limited Partnership	Northwestern Energy	52
Crystal Mountain	Puget Sound Energy	Puget Sound Energy	3
Li-Ion Battery Energy Storage		Snohomish PUD	50
PGE DSG		Portland General Electric	127
Puget Sound Shipyard	U.S. Navy-Bangor	BPA/Other publics	12
Wheatridge Battery	PGE/NextEra	Portland General Electric	30
Total Generating Resources Nameplate MW			**55,354**

Table 11. Independent Owned Generating Resources is a partial list of independently owned electric power supply located in the region. Some of these units have partial contracts (reflected in the load/resource tables) with Northwest utilities. PNUCC does not collect data from independent power producers (IPPs) – this is information gathered from various sources including Bonneville Power and the NW Power & Conservation Council.

Project	Owner	Nameplate (MW)
HYDRO		**90**
Big Creek (Hellroaring)		-
Electron	Electron Hydro, LLC	24
Felt	CDM Hydro	7.4
PEC Headworks	Columbia Basin Hydro	7
Soda Point Project		-
Sygitowicz	Cascade Clean Energy	0.5
Owyhee Tunnel No.1	Owyhee Irrigation District	8
Portland Hydro Project		36
Wilson Lake	Hazelton/Wilson	8.4
COAL		**924**
Centralia #2	TransAlta	670
Valmy #1	NV Energy	254
NATURAL GAS		**2,081**
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
COGENERATION		**268**
Boise Cascade		9
Clearwater Paper	Clearwater Paper	94
Cosmo Fibers TG1	Cosmo	8
Cosmo Fibers TG2	Cosmo	8
Freres Lumber	Evergreen BioPower	10
Plummer Forest		6
Rough & Ready Lumber	Rough & Ready	1
Simpson CoGen		55
Warm Springs Forest		8
Wauna	Western Generation Agency	36
Weyerhaeuser TG 1	Weyerhaeuser	5
Weyerhaeuser TG 1	Weyerhaeuser	5
RENEWABLES-OTHER		**26**
Spokane MSW	City of Spokane	23
Treasure Valley		3

Project	Owner	Nameplate (MW)
SOLAR		**56**
Gala Solar Farm		56
WIND		**3,695**
Big Horn	Iberdrola Renewables	199
Big Horn-Phase 2	Iberdrola Renewables	50
Big Top		2
Butter Creek Power	Butter Creek Power LLC	5
Campbell Hill		99
Cassia Gulch	John Deere	21
Chevron Casper	Chevron	17
Foote Creek III		25
Four Corners Windfarm	Four Corners Windfarm LLC	10
Four Mile Canyon Windfarm	Four Mile Canyon Windfarm LLC	10
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 for Apple	202
Notch Butte Wind		18
Pacific Canyon Windfarm	Pacific Canyon Windfarm LLC	8
Pebble Springs Wind	Iberdrola Renewables	99
Rattlesnake Rd Wind	Horizon Wind	103
Rock River I	Shell Wind Energy	50
Sand Ranch Windfarm	Sand Ranch Windfarm LLC	10
Shepherds Flat Central	Caithness Energy	290
Shepherds Flat North	Caithness Energy	265
Shepherds Flat South	Caithness Energy	290
Stateline Wind	NextEra	300
Vancycle II (Stateline III)	NextEra	99
Vantage Wind	Invenergy	90
Wagon Trail Windfarm	Wagon Trail Windfarm LLC	3
Ward Butte Windfarm	Ward Butte Windfarm LLC	7
Willow Creek	Invenergy	72
Windy Flats	Cannon Power Group	262
Windy Point	Tuolumne Wind Project Authority	137
Independent Owned Total Nameplate MW		**7,139**

Report Description

This report provides a regional firm needs estimate over the ten-year study period for annual energy (August through July, *Table 1*), monthly energy (*Table 2*), winter peak-hour (*Table* 3) and summer peak-hour (*Table 4*). The monthly energy picture is provided to underscore the variability of the power need within an average year. 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 total of utilities committed and planned resources to meet future needs and policy requirements. The larger utilities, in most cases, prepare their own projections for their integrated resource plans. Bonneville Power Administration (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 and certain non-generating public utilities. Direct service industrial customers are no longer a significant part of regional load. Utilities are asked to provide their native load forecast. Load projections include network transmission and distribution losses and are net of existing and forecasted energy efficiency savings (including codes & standards). Demand response program savings are not reflected in loads, rather they are included on the supply side in this report. Since the *Forecast* is completed annually, utilities may provide load forecasts that are updated and out of sync with their last integrated resource plan.

Energy Loads

Northwest firm energy loads are provided for each month of the ten-year forecast period. This forecast reflects normal (1-in-2) weather conditions.

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 hourly loads for that month, assuming normal (1-in-2) weather conditions. The regional firm peak load is the sum of the individual utilities' peak loads and does not account for a utility potentially experiencing a peak load at a different day/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 included. The planning margin is set to 16 percent of the total peak load for every year of the planning horizon.[1]

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 (*Table 7*) are for the ten-year study period and include data provided by utilities such as utility energy efficiency programs, some market transformation, 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 programs are also tallied on *Table 7* showing the programs' winter peak and summer peak contributions to need. The regional demand response data is from the cumulative sum of all utilities' agreements with their customers (for both existing and future programs). Each program has its own characteristics and limitations that are reflected in the data provided.

Generating Resources

This report catalogues existing resources, committed new supply (including resources under construction), and planned future 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. A list of all resources included in the report load/resource tabulations is in *Table 10*.

[1] When making comparisons to *Northwest Regional Forecasts* prior to 2018, be aware that the planning margin was previously set at 12 percent for the first year of the report and grew a percent a year until it reached 20 percent and remained at 20 percent thereafter. This escalation was in part to address uncertainty of planning for generating resources with long planning and construction lead times.

Hydro

Major hydro resource capabilities are estimated from a regional analysis using computer models that simulate reservoir operation of past hydrologic conditions with today's operating constraints and requirements. New for the 2023 *Forecast* is the availability of ten more years of the historical stream flow record. The data available covers the 90-year period from August 1928 through July 2018. The bulk of the hydro modeling used in this report is provided by BPA, the US Army Corps of Engineers, and/or project owners/sponsors.

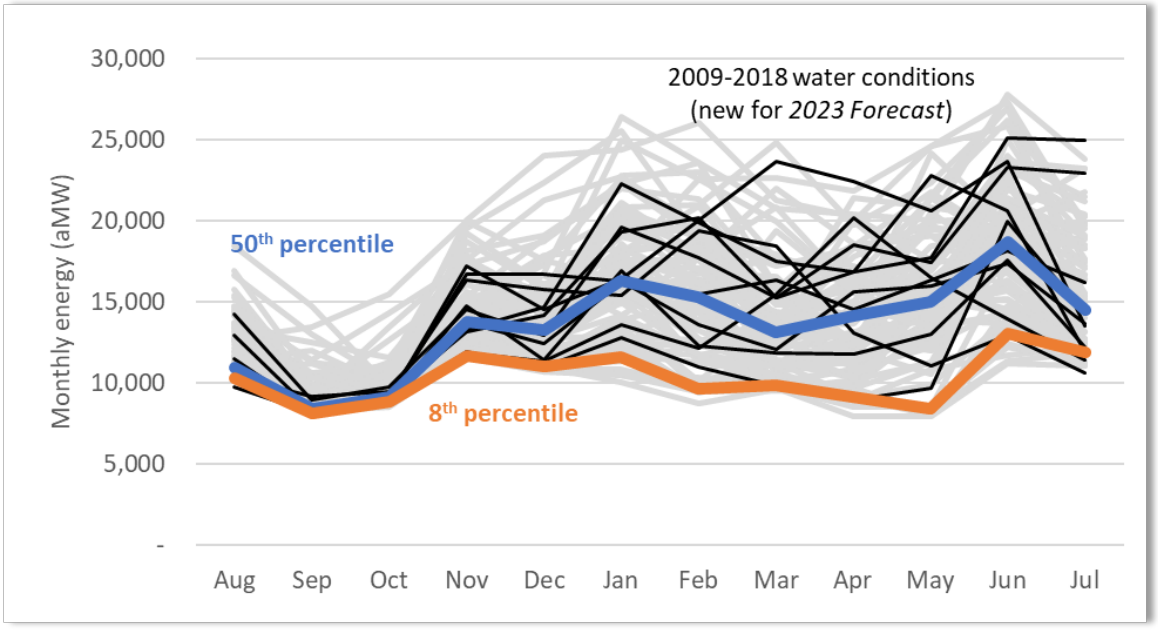
Annual and Monthly Energy

The bulk of the hydro energy data in this report comes from the US Army Corps of Engineers. Generation for projects that are influenced by downstream reservoirs reflects the reduction due to encroachment. New this year, the firm energy capability of hydro plants is the amount of energy produced using the 8th percentile monthly energy production from the 90-year historical river flow given today's river operating criteria. This provides an updated view of the critically low value for planning. The firm annual energy capability is the average of the 8th percentile monthly generation for the 90-year period. This synthetic water year ensures each month and year are evaluated similarly and under critically low streamflow.

Variability of Hydro

The variability of hydro generation is due to the hydrology of the river systems in the Northwest. Monthly hydro energy generation estimates from the major developments in the coordinated hydro system are shown for each of the 90 different river flow conditions using current system operating criteria in Figure 10. For perspective, the 50th percentile, 8th percentile and the added 10-years of water conditions are highlighted. The 8th percentile monthly energy difference is indistinguishable between the 80-year and 90-year historical river flows.

Figure 10. Monthly Hydro Generation Across 90-year historical record



Peak Capability

For this report the peak capability of the hydro system represents maximum sustained hourly generation available to meet peak demand during the period of heavy load. Hydro-project owners submit a sustained peak capability for each project.[2] The bulk of the peak data in this report come from BPA. BPA has updated its critical peak planning from 1936-37 to the 10th percentile from the most recent 30-year historical record for water conditions. This increased the Federal system winter hydropower peaking capability and slightly reduced summer peaking capability.

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.

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 and makes up the bulk of the region's exports in this year's report.

Downstream Fish Migration

Another requirement incorporated in the hydro modeling are 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 Renewable Resources

Thermal resources are reported in a variety of categories including coal, natural gas, nuclear and other. Other includes cogeneration, diesel and oil.

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 projects.

[2] Historically, a 50-hour sustained peak (10 hours/day for 5 days) was reported. Project owners/sponsors use a variety of peak capability metrics today.

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 projects' owners and take into consideration scheduled maintenance (including refueling), forced outages, and other expected operating constraints. Some small thermal 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 energy load/resource balance.

Battery Storage

In recent years battery storage resources have made their way into the region's resource mix, with a relatively large amount planned in the next 10 years (albeit with a relatively small amount online/firmly committed as of this year's report). Battery storage is showing up as a standalone resource and in combination with solar and wind generation. It is reflected as supply during the peak hour of the month. Due to the small magnitude online/firmly committed at this time the capability is tallied within the Small Thermal and Miscellaneous resources category – this will change as more come online.

New and Future Resources

The latest activity with new and future resource developments, including expected savings from demand-side management actions, are tabulated in this report. These resources are reported as recently acquired, committed new supply, and planned future 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, 2022. They are reflected as part of the regional firm needs assessment.

Committed New Supply

Committed New Supply reported in *Table 6* includes projects under construction or firmly committed to meet Northwest load that are not delivering power as of December 31, 2022. These resources are included in the regional load-resource analysis. Future energy efficiency and demand response programs are included in the load-resource analysis as well (see *Table 7*).

Planned Future Resources

Planned Future Resources presented in *Table 8* includes specific resources and/or blocks of generic resources identified in utilities' most current integrated resource plans or planning studies. Projects in *Planned Future Resources* are not yet under construction, are not part of the regional analysis, and are subject to change until the time for acquiring them is closer. As the resource build date nears, more

information about these resources will likely become available, and they typically move into the *Committed New Supply* category prior to coming online. Often, the utility will undergo a request for proposal process before moving a resource from *Planned* to *Committed.* Resources in this category are *referred to as Potential Resources* in some previous *Northwest Regional Forecasts*.

Contracts

Imports and exports include firm arrangements for trade 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 California and Canada. Contracts to and from these areas are amounts delivered at the area border and include transmission losses associated with deliveries.

Long-term intraregional contracts between Northwest utilities net to zero in the regional picture and consequently are not tallied for this report. In addition, short-term and/or spot purchases from Northwest independent power producers and from out-of-region are not reflected in the tables that present the firm load resource comparisons in this report.

Non-Firm Resources

The *Northwest Regional Forecast* omits from the load/resource balance 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 (IPPs), imports from power plants located outside the region, uncommitted hydro generation owned by Northwest utilities, and hydro generation likely available when water supply is greater than the assumed critical levels.

Independent Owned Generating Resources, presented in *Table 11*, details IPPs located in the region. Power from these resources may be available to the Northwest from the market, during high need hours, or it may have been already sold to a higher bidder outside the Northwest.

Non-firm imports depend on several factors including availability of out-of-region resources, availability of transmission, and market friction. The 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 low water (8%) during peak hours for the monthly peak calculations. Most months the water supply for the hydro system is not at critical levels. During a median water month, the region will have more water available for energy and peak needs.

Climate Change

More utilities and organizations are incorporating the impacts of a changing climate into their long-range planning. Two areas where climate change may impact utility planning is the influence of temperatures on loads and water supply for hydrogeneration. As more utilities account for changing temperature trends in their forecasting models the impact on utility loads becomes incorporated into the *Northwest Regional*

Forecast. Increasing temperatures in the summer can result in higher summer load (due to air conditioning, for example) and moderately warmer temperatures in the winter can reduce winter load (reduced need for heating loads), on average across the region. The differences in geography for utilities across the Northwest means individual utilities can have varying degrees of climate change effects.

The *2023 Forecast* does not explicitly include the impact of climate change on hydroelectric generation. It is only included to the extent that it is included in a hydro-project owner/sponsor's submittal of its peak capability for the project. The report's hydroelectric data for the bulk of the hydro data rely on the historical river flows.

Table 12. Utilities Included in the Northwest Regional Forecast

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

Definitions

Annual Energy

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

Average Megawatts

(aMW) 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.

Batteries

Batteries are some of the newest technologies being added to the regional picture. They are reported as part of the Small Thermal and Miscellaneous resources at this time. See storage definition.

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 Resource

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 confirmed to meet Northwest load, but not delivering power as of December 31, 2022.

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.

Emerging Technologies

A term used to describe future resource technologies such as advanced nuclear, offshore wind, renewable hydrogen, and long-duration storage.

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 90 years (August 1928 to July 2018). 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 ownership by a sponsoring utility is 50 percent or less. These include PURPA-qualified facilities (QFs) and non-qualified facilities of independent power producers.

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 as referred to in Table 10.

Peak Load

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

Planned Future 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

Include 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 but does not include distributed solar generation.

Storage

Storage resources (i.e., batteries, pumped hydro, liquid air) store energy for release at a later time. They can help shift energy from low value to high value hours. Due to efficiency losses, they are a net consumer of energy. They are usually defined by their maximum discharge rate in MW, and their total storage capacity in MWh.

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 utility-scale wind powered projects.

Western Energy Imbalance Market (WEIM)

A real-time energy market launched in 2014, operated by the California Independent System Operator.

Western Resource Adequacy Program (WRAP)

A regional reliability and compliance program in the West. It delivers a region-wide approach for assessing and addressing resource adequacy.