



REGIONAL RESOURCE ADEQUACY STUDIES

Contents

1. NPCC RESOURCE ADEQUACY ASSESSMENT

2. PNUCC NORTHWEST REGIONAL FORECAST

3. BPA 2014 PACIFIC NORTHWEST LOADS AND RESOURCE STUDY

*PSE utilized the results and data from three studies on regional load/resource balance in the preparation of the 2015 IRP. They include the **Pacific Northwest Power Supply Adequacy Assessment for 2020-21**, published May 6, 2015 by the Northwest Power and Conservation Council (NPCC); the **Northwest Regional Forecast of Power Loads and Resources 2016 through 2025**, published in April 2015 by the Pacific Northwest Utilities Conference Committee (PNUCC); and the **2014 Pacific Northwest Loads and Resources Study** published by the Bonneville Power Administration (BPA). The NPCC and PNUCC studies appear in the following pages. The BPA study can be accessed at <http://www.bpa.gov/power/pgp/whitebook/2014/>.*

Appendix G, Wholesale Market Risk, describes how PSE used the data and results from the studies in its analysis.

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April 28, 2015

MEMORANDUM

TO: Council Members

FROM: John Fazio, Senior Systems Analyst

SUBJECT: Resource Adequacy Assessment for 2020 and 2021

BACKGROUND:

Presenter: John Fazio

Summary In 2011, the Council adopted a methodology to assess the adequacy of the Northwest's power supply. The purpose of this assessment is to provide an early warning should resource development fail to keep pace with demand growth. The Council assesses resource adequacy every year, examining the ability of the power supply to meet regional demand five years out.

The Council's maximum threshold for loss-of-load probability (LOLP) is set at five percent. This means that the power system has a five percent chance of having a shortfall (not necessarily an outage) sometime during the year being examined. The last assessment, done for the 2019 operating year, indicated that the region was slightly in adequate with a LOLP of six percent. The current adequacy assessment for 2020 shows an LOLP of five percent, just at the Council's adequacy threshold.

Many changes have occurred since last year's assessment. First, the Council's load forecast was revised downward. Because of this, the 2020 annual average load is 310 average megawatts lower than the average load used for the 2019 assessment. This effect alone drops the 2020 LOLP to a little under four percent. However, assumptions regarding the region's generating capability have also changed. The biggest change is

the removal of the 250 megawatt Big Hanaford plant (an independent power producer). Also, the hydroelectric system's generation was modified to account for amendments to the biological opinion.

Of greater interest perhaps, is the adequacy assessment for 2021, when the Boardman and Centralia 1 coal plants are scheduled to retire (their total winter peaking capacity is on the order of 1,200 MW). These plants are scheduled to retire in December of 2020 but because the Council's operating year runs from October through September, they will be available for use for the first three months of that operating year. Based on this schedule, the LOLP for 2021 is 7.6 percent and the region would need to acquire about 1,000 megawatts of dispatchable generation to bring the LOLP back to the five percent standard.

The Council, however, is also interested in the more generic study that examines the adequacy of the power supply with these two coal plants out for the entire operating year. For that scenario, the LOLP rises to about eight percent and the region would need to acquire about 1,150 megawatts of new capacity. Of course, a more optimum resource strategy that provides an adequate, efficient, economic and reliable supply will be developed for the Council's Seventh Power Plan.

The Resource Adequacy Advisory Committee will be reviewing the summary adequacy report (attached) on May 1st and the committee's comments will be presented to the Council on May 6th.

Recommendation: Both the advisory committee members and Council staff are recommending that an action item be added to the Council's seventh plan to review both the metric (LOLP) and threshold (5 percent) of the Council's current adequacy standard. Part of the impetus for this recommendation is that the North American Electric Reliability Corporation (NERC) is using different metrics (which we also calculate) to measure adequacy. The recommendation is not necessarily to change the Council's standard but to review it in conjunction with what other regions are doing and with how this model is being used by the Council and by others.

Relevance Besides being an early warning to ensure that the regional power supply remains adequate, the Council's adequacy standard is converted into Adequacy Reserve Margins (for both energy and capacity) that are fed into the Regional Portfolio Model to ensure that resource strategies developed by that model will produce an adequate supply.

Workplan: 1.C. Co-chair and manage the Resource Adequacy Advisory Committee

Background: Since the late 1990s, the Council has worked to develop a more robust method of assessing the adequacy of the region's power supply. In 2011 it formally adopted the loss-of-load probability (LOLP) metric as the measure to assess adequacy and set its maximum threshold at five percent. The Council reassesses this every year, looking at the adequacy of the power supply five years out.

More Info: Summary information and updates are available at:
<http://www.nwcouncil.org/energy/resource/home>

DRAFT

Pacific Northwest Power Supply Adequacy Assessment for 2020-21

May 6, 2015

Executive Summary

The Pacific Northwest's power supply is expected to be close to adequate through 2020. The Council estimates that the likelihood of a power supply shortage in that year is just under the 5-percent standard set by the Council in 2011. By 2021, however, after the planned retirements of the Boardman and Centralia-1 coal plants (1,330 MW nameplate), the likelihood of a shortfall (also referred to as the Loss-of-load Probability or LOLP) rises to a little over 8 percent¹ and would lead to an inadequate supply without intermediate actions.

These results are based on a probabilistic analysis that examines the operation of the power supply over thousands of different combinations of river runoff volume, wind generation, forced outage and temperature for the 2020/21 operating years. However, in each case, the underlying demand was set to the Council's medium forecast and the availability of imports from the southwest was also set to a fixed value. If demand growth were to vary from the medium forecast or if the availability of imports were to change, the LOLP could drop as low as one percent or rise as high as 17 percent. The availability of imports depends not only on surplus generating capability in the southwest but also on the south-to-north transmission capacity. Currently, the limiting factor during winter months is the transmission capacity. Resource adequacy is assessed every year because the power supply is dynamic, in the sense that factors such as demand and import availability can change unexpectedly.

The results above assume that the region will continue to acquire energy efficiency savings as targeted in the Council's Sixth Power Plan, which amount to about 1,700 average megawatts through 2020. While no other resource acquisitions are required to maintain adequacy through 2020, the region will likely have to plan for additional resources before 2021 when the two coal plants are retired. Actions to bring the 2021 power supply into compliance with the Council's standard will vary depending on the types of new generating resources or demand reduction programs that are considered. For example, adding 1,150 megawatts of gas-fired generation would bring the LOLP back to 5 percent.

In all likelihood, some combination of new generation and load reduction programs will be used to bridge the gap. It should be noted that developing a strategy to provide the region with an adequate, efficient, economical and reliable power supply is beyond the scope of this analysis. Designing such a strategy is more appropriately done in the Council's Power Plan, which is due out later this year.

¹ Boardman and Centralia 1 coal plants are scheduled to retire in December of 2020. However, because the Council's operating year runs from October 2020 through September 2021, these two plants would be available for use during the first three months of the 2021 operating year. For this scenario, the LOLP is 7.6 percent. The Council must take into account the long term effects of these retirements and, therefore, uses the more generic study that has both plants out for the entire operating year.

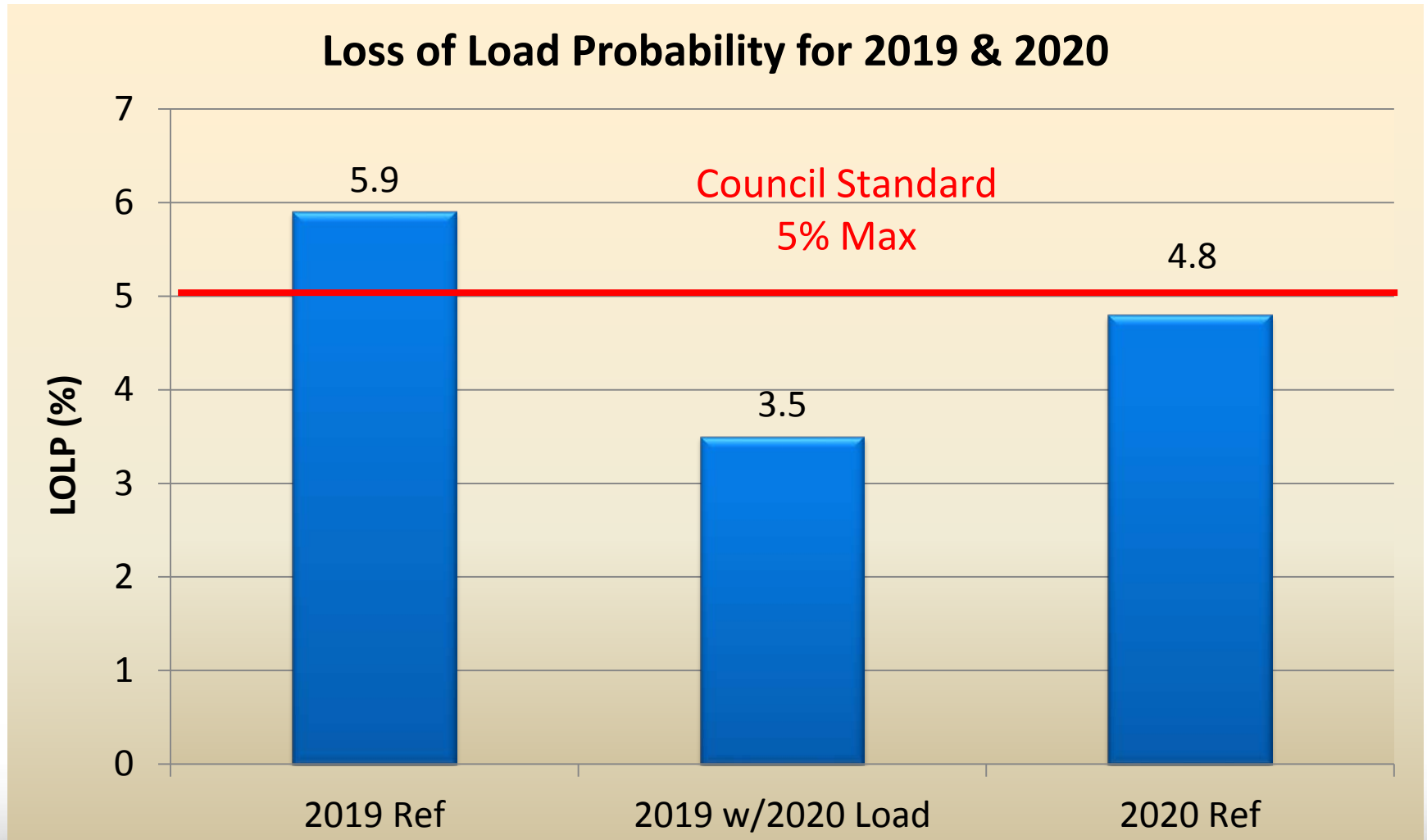
This analysis only counts existing resources and those that are sited and licensed. Northwest utilities, as reported in the Pacific Northwest Utilities Conference Committee's 2015 Northwest Regional Forecast show a combined 900 megawatts of planned generating capacity over the next 10 years. But as conditions change over the next few years, it is expected that utilities will amend their resource acquisition strategies to ensure that sufficient investments in new resources will be made to maintain an adequate supply.

2020-21 Final Resource Adequacy Assessment



NW Power and Conservation Council Meeting
Portland, Oregon
May 6, 2015

2020 Final Assessment



Final Results for 2020

Load Adjust>	Low		Med		High
Spot Import ¹	-2.5%	-1.5%	0%	+1.5%	+2.5%
0	10.1%	10.2%	13.3%	14.2%	17.5%
1500 MW	4.4%	5.0%	6.2%	7.3%	8.3%
2500 MW	3.2%	3.8%	4.8%	5.9%	6.9%
3400 MW	1.4%	1.9%	2.7%	3.4%	3.9%
4500 MW	0.2%	0.4%	0.7%	1.3%	1.7%

¹Winter spot-market availability (from the SW). South-to-North intertie transfer capability set to 3,400 max to also accommodate firm transfers. Based on historical calculations there is a 95% chance that transfer capability will be 3,400 MW or greater.

RAAC Recommendations

(for the 2020/21 assessment)

- **LOLP Table**
 - Add firm imports and intertie capacity
 - Add studies with different imports
- **Give indication of LOLP error**
 - Due to statistical effects (seed, games, etc.)
 - Roughly $\pm 0.5\%$ LOLP
- **Assessment good to go, with changes**

Final LOLP Results for 2020

Winter Imports (MW)		Load Variation				
Spot/Firm	S-to-N Cap	Low -2.5%	-1.5%	Med 0%	+1.5%	High +2.5%
0/425	3400	10.1%	10.2%	13.3%	14.2%	17.5%
1500/425	3400	4.4%	5.0%	6.2%	7.3%	8.3%
2500/425	3400	3.2%	3.8%	4.8%	5.9%	6.9%
2975/425	3400					
3400/425	3900	1.4%	1.9%	2.7%	3.4%	3.9%
4000/425	4500					

Effects of Coal Retirement 2021

- Resource changes 2020 to 2021
 - Boardman retires 600/522 MW
 - Centralia 1 retires 730/670 MW
 - Total loss of **1,330/1,192 MW**
(nameplate/winter capacity)
- Load change 2020 to 2021
 - 6th Plan EE savings (350 aMW)
 - Net load growth of **≈40 aMW (~0.18%)**

2021 Adequacy Assessment

- Plants retire on December 31, 2020
- 2021 operating year Oct 2020 – Sep 2021
- Operational for 1st three months
- LOLP = **7.6%**
- Needed capacity = **1,000 MW**

- Generic Study (with coal out all year)
- LOLP = **8.3%**
- Needed capacity = **1,150 MW**

Summary of 2021 Analysis (Generic Study¹)

	2013 Analysis	2014 Analysis	2015 Analysis
Changes in Loads and Resources	N/A	+660 MW Gen	-250MW Gen -310 aMW Load
5-year out LOLP	6.6%	5.9%	4.8%
MW needed	700 MW ²	400 MW	- 80 MW
2021 LOLP	15.3%	10.9%	8.3%
MW needed	2,000 MW	1,700 MW	1,150 MW
Net MW needed	1,300 MW	1,300 MW	1,230 MW

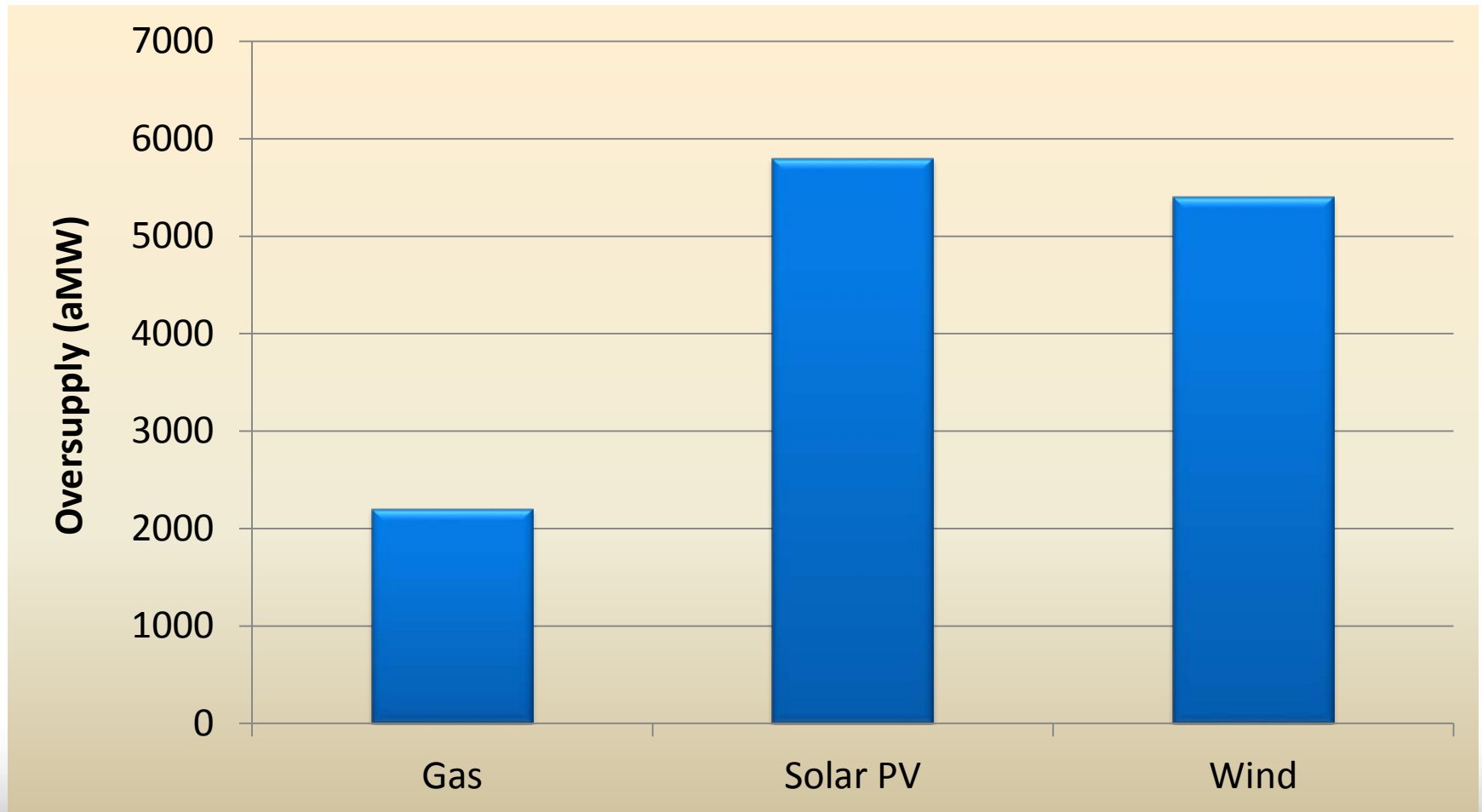
¹Generic means results of coal retirement over entire operating year.

²This is an updated estimate.

Coal Replacement Resources Needed to get to 5% LOLP

- Gas **1.15 GW**
- Solar PV **12.7 GW**
 - Current US installed 15.9 GW
 - Projected by 2021 for PNW \approx 450 MW
- Wind **10 GW**
 - Only achieved an LOLP of 6.9%
 - More wind did not help

Effects on June Oversupply (Expected Amount)



RAAC Recommendations

(for future assessments)

- **Add action item to review the LOLP metric**
- **Account for intertie outages**
- **Review load shapes in more detail**
- **Research “market friction”**
- **Research gas supply limitations**
- **Continue to work on 3-node analysis**
- **Review hydro dispatch, recommend changes, if needed**

Northwest Regional Forecast of Power Loads and Resources

2016 through 2025

Three diagonal stripes in light gray, medium gray, and black run from the bottom-left to the top-right of the page.

PNWCC

April 2015

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

Electronic copies of this report are available on the
PNUCC website
www.PNUCC.org

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Table of Contents

Executive Summary	1
Overview	6
Planning Area	6
Northwest Region Requirements and Resources	7
Annual Energy – <i>Table 1</i>	7
2014-15 Monthly Energy – <i>Table 2</i>	8
Winter Peak – <i>Table 3</i>	9
Summer Peak – <i>Table 4</i>	10
Northwest New and Existing Resources	11
Recently Acquired Resources – <i>Table 5</i>	11
Committed New Supply – <i>Table 6a</i>	12
Demand Side Management Programs – <i>Table 6b</i>	13
Planned Resources – <i>Table 7</i>	14
Northwest Utility Generating Resources – <i>Table 8a</i>	15
Independently Owned Generating Resources – <i>Table 8b</i>	28
Report Procedures	31
Load Estimates	31
Demand Side Management	32
Generating Resources	33
Contracts	35
Market Reliance Analysis	36
Utilities Included in Northwest Regional Forecast – <i>Table 9</i>	37
Definitions	38

2015 Northwest Regional Forecast

Executive Summary

The *Northwest Regional Forecast (Forecast)* projects Northwest electric utilities' expected loads and the power supply required to meet them through 2025. These load forecasts and resource plans have been made amidst future uncertainties. Weather and water conditions are always known to vary, while changing state and federal policies regarding carbon emissions and renewable portfolio standards will continue to add a significant amount of uncertainty to utility planning. If we throw in California's changing resource landscape, Northwest utilities have a real stew to consider.

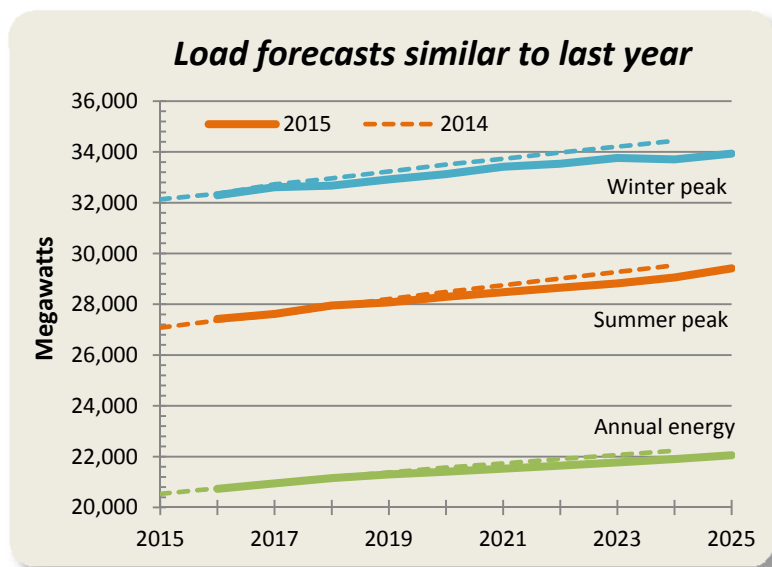
This annual single point forecast is the sum total of the utilities' integrated resource plans. It is a snapshot that gauges the need to acquire resources on a regional basis through multiple metrics. Annual and monthly energy, and winter and summer peak needs are all tallied, providing a valuable indicator of the region's power system and how it has changed compared to past *Forecasts*.

Included in PNUCC's forecasted loads are savings from expected conservation. The total resources include generating facilities, demand response and purchases that are on the books, as well as new power supplies that are coming online to keep utility customers' homes and businesses warm, lighted and humming.

Little Change in Projected Regional Loads

Similar to last year's *2014 Forecast*, regional loads (i.e. electric demand) are expected to grow, but at a modest pace. The ten year annual growth rates in this year's report are all well under one percent for regional loads. The winter peak load is projected to grow at 0.6%, annual average load at 0.7% and summer peak load with the steepest growth at 0.8%. The slight drop from last year is seen in the adjacent chart.

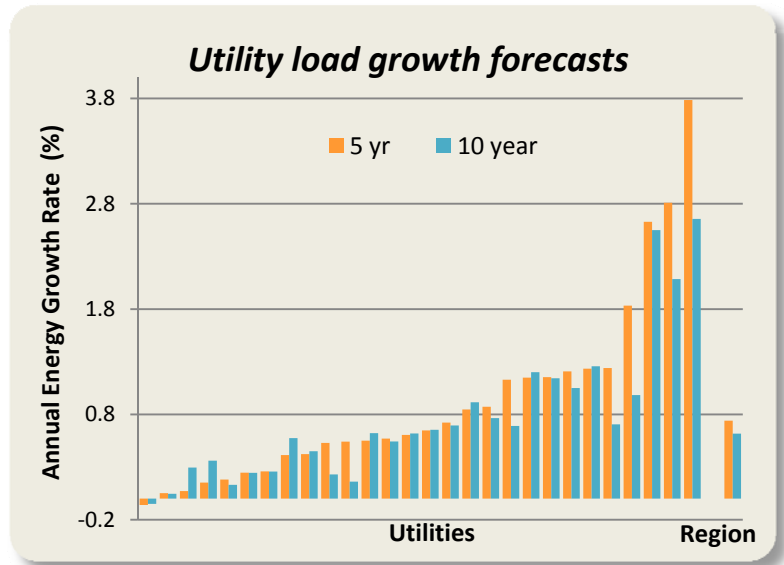
Successful conservation initiatives driven by utilities and others are having a dampening effect on load growth. In a related vein, recently implemented federal standards are making their way into utilities' load projections and contribute to the forecast of slower load growth.



One size doesn't necessarily fit all

The projected regional load is a tally of individual utilities' loads. Try as some might, sweeping generalizations cannot be made about the region's utilities when discussing load forecasts. Each utility has its own unique circumstances, and this year, there are substantial variations among their forecasts.

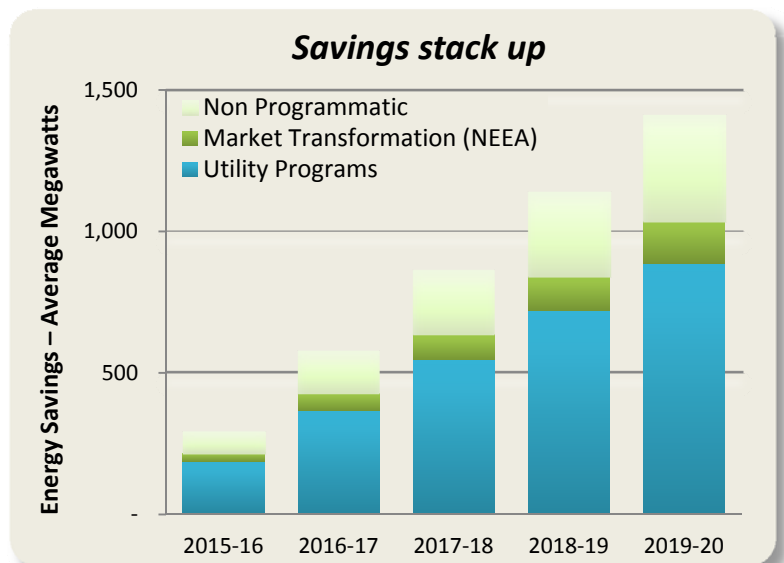
While the region overall paints a fairly flat forecast of loads, there are individual utilities projecting a definite bump in demand due to new large loads, such as server farms in smaller utility service areas. But these are select, anecdotal cases. In contrast there are utilities with large conservation programs and efficient new housing where loads are expected to grow slowly, even with increasing customer hookups. The growth rates of individual utilities range from slightly negative to 3.8 percent depending on the utility's situation.



Conservation Savings Continue to Accumulate

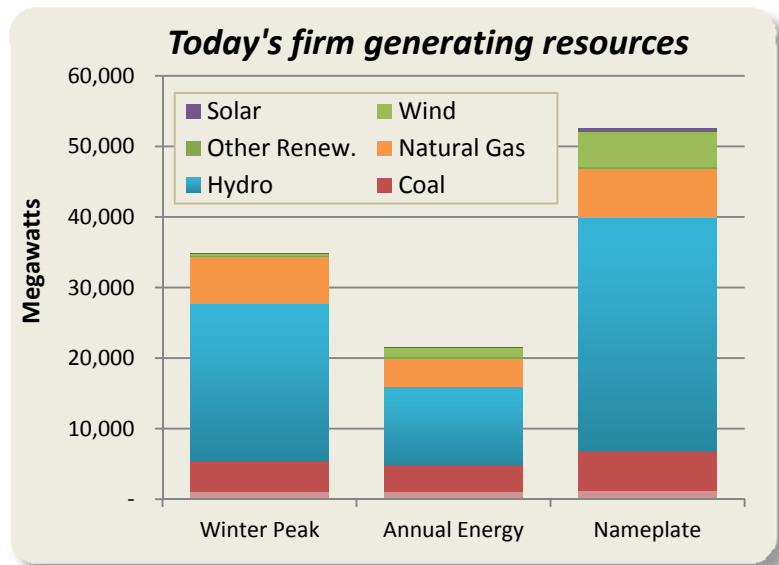
Northwest utilities have reported total savings from their programs that average over 200 MWa a year for the last five years. Looking ahead utilities expect similar success. Over the next five years utilities predict they will achieve cumulative annual energy savings of almost 900 MWa from their energy efficiency programs. When savings from market transformation efforts and non-programmatic activities are added in the stack grows significantly.

These programs will have an impact on peak needs as well. A ballpark estimate from utilities is that five years out their programs could reduce winter peak need by nearly 1,200 MW. The story here is that conservation is working – whether it is a utility sponsored program, changes in technology or consumers choosing more efficient options.



Hydro is Power Supply Foundation

While the region’s number and types of generating resources continues to grow, hydropower remains the big kid on the block no matter how you look at it. Out of the 33,200 MW of hydropower’s nameplate capability we count on 22,400 MW for winter peak and 11,200 MWa in our tabulations. These estimates are based on low water conditions for our planning purposes. Hydro is an invaluable resource for all aspects of our region’s power supply, from base load generation and meeting peak demand, to helping integrate variable energy resources such as solar and wind.

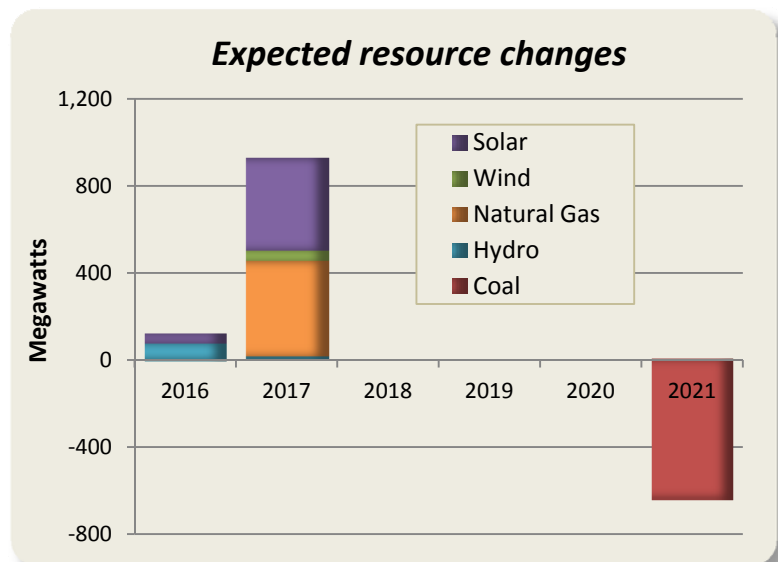


Power mix continues to evolve

In 2014, utilities added, in terms of nameplate rating, about 900 MW of resources, including wind, biomass and the 220 MW Port Westward 2 natural gas plant.

This coming year, another 440 MW natural gas-fired plant Carty Generating Station is coming online. In addition, there continues to be gains in hydro generation with generator replacements. And we will see more than 420 MW of solar power and 50 MW of wind come into the system via the Public Utility Regulatory Policy Act (PURPA).

Within the *Forecast* time frame, Boardman coal plant is scheduled for closure. It is yet to be determined how the power it supplies will be replaced.

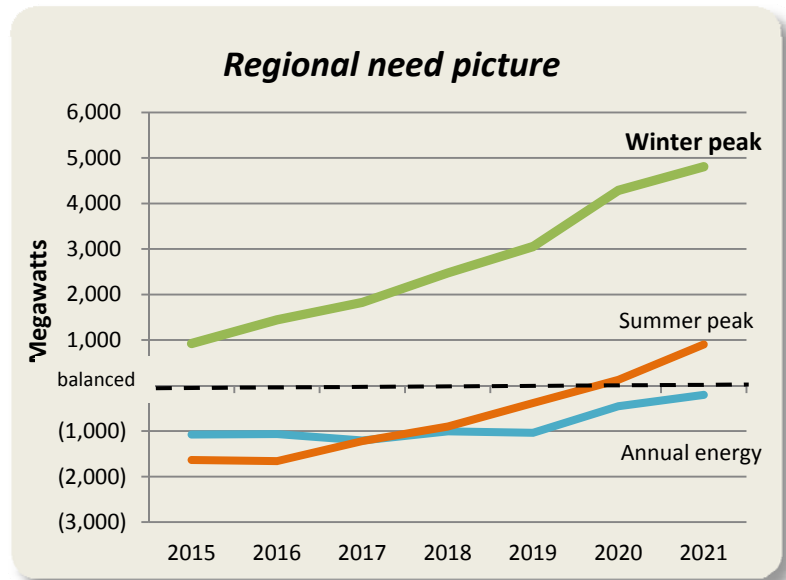


Winter Peak Need Draws Attention

Of the need for power metrics in this *Forecast* the winter peak need is the most noteworthy. The chart shows the bottom line comparison of requirements and resources for winter peak, summer peak and annual energy. The annual energy picture indicates a surplus through time. What the picture doesn't capture is the monthly shape that has both surplus and deficit seasons.

The regional summer peak is forecast to be surplus until 2020 and then crosses over to a need situation. The more eastern utilities are keeping a close watch on the summer situation already.

The regional winter peak picture starts with over a 900 MW need for power and grows if utilities take no action. This deficit is due mostly to growing winter peak requirements. Further out in time the scheduled closure of resources such as the Boardman coal plant by 2021 will add to this mounting need.



Gains made, more to do

While we have a close eye on winter loads and resources, it is worth noting that a look back over the last several years shows the gains that have been made to address the winter peak gap. Utilities' flattening forecasts of expected firm requirements are in part due to conservation and trimmed down commitments to selling power outside the region. Newly constructed and acquired resources along with demand response opportunities have contributed to the smaller winter peak need too. Back in 2007 the winter need in the first year of the *Forecast* was projected to be over 3,300 MW. Since that time it has tapered off to an expected 2,000 MW in 2011 and down to about 900 MW for the first year of this report.

Looking ahead, the gap is widening without utility action. Growing loads and the increasing planning margin to account for uncertainty through time, and the Boardman coal plant retirement are contributing to the projected need. Utilities are studying the need for generation to determine the best course of action to meet customers' needs. And they are factoring in the knowledge that the power market will shrink with the retirement of the two independently-owned Centralia coal units, one by 2021 and the other in 2025 for a total 1,340 MW loss.

Power Market Helps Fills the Gap

In addition to the single point comparison of requirements and resources discussed above, we examined the Northwest’s reliance on the spot market when uncertainty in resource performance and loads are brought into the picture.

The operation of the system in year 2021 was mimicked repeatedly with randomly chosen loads, water conditions, and resource outages. We tracked how much and how often the spot market power was needed used.

We found that the spot power market supplemented utility-owned resources most often in winter. The table below provides a summary. For example, during 10% of the replications of 2021 at least 4,500 MW of spot market power was purchased for at least 1 hour to keep the lights on during the winter. Spot market power was available from power generated by Northwest based independent power producers and power imported from other regions.

Market Reliance: Winter 2021

Odds of market purchases (% of simulations)	1 hour purchase (MW)
5%	6,500
10%	4,500
25%	1,500
50%	0

Overall, the study tells a story similar to the other *Forecast* data: as a region, the Northwest sees its greatest need for power in the winter, and cannot always meet this need using utility-owned resources alone.

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 resources, long-term firm contracts, expected savings from demand side management programs and other components of electric demand for the Northwest.

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

Northwest generating resources are shown by fuel type. Existing resources include those resources listed in Tables 5, 6a, 8a and 8b. Table 5, Recently Acquired Resources, highlights projects and supply that became available most recently. And Table 6a, Committed New Supply, lists those generating projects where construction has started, as well as contractual arrangements that have been made for providing power at a future time. Table 8a, Northwest 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 8b lists Northwest generating resources owned by independent power producers.

In addition, utilities have demand side management programs in place to reduce the need for generating resources. Table 6b, Demand Side Management Programs, provides a snapshot of utilities' expected savings from these programs for the next ten years. Table 7, 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 resources for each of the next 10 years. Expected firm load and exports make up the total firm regional requirements.

Annual Energy (MWa)	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24	2024-25
Firm Requirements										
Load ^{1/}	20,730	20,947	21,154	21,300	21,407	21,524	21,647	21,773	21,906	22,052
Exports	<u>559</u>	<u>537</u>	<u>509</u>	<u>484</u>	<u>477</u>	<u>472</u>	<u>468</u>	<u>463</u>	<u>459</u>	<u>450</u>
Total	21,289	21,484	21,663	21,785	21,884	21,996	22,114	22,236	22,365	22,502
Firm Resources										
Hydro	11,283	11,243	11,243	11,239	11,239	11,239	11,239	11,239	11,239	11,239
Small Therm & Misc.	-	-	-	-	-	-	-	-	-	-
Natural Gas	3,973	4,309	4,352	4,435	4,440	4,429	4,458	4,510	4,488	4,474
Renewables-Other	213	213	213	213	212	210	207	204	204	204
Solar	1	81	132	132	132	132	132	132	132	132
Wind	1,297	1,298	1,298	1,298	1,297	1,294	1,223	1,207	1,193	1,187
Cogeneration	62	49	49	49	35	28	11	9	9	9
Imports	798	785	784	786	789	792	795	797	800	757
Nuclear	1,075	916	1,075	916	1,075	916	1,075	916	1,075	916
Coal	<u>3,663</u>	<u>3,655</u>	<u>3,724</u>	<u>3,721</u>	<u>3,702</u>	<u>3,412</u>	<u>3,177</u>	<u>3,200</u>	<u>3,251</u>	<u>3,178</u>
Total	22,365	22,548	22,869	22,790	22,921	22,452	22,317	22,215	22,392	22,096
Surplus (Need)	1,076	1,064	1,207	1,005	1,037	455	203	(21)	27	(406)

^{1/} Loads net of conservation.

Table 2: Northwest Region Requirements and Resources 2015-16 Monthly Energy shows the sum of individual utilities' requirements and resources for monthly energy values for the 2015-16 operating year. Expected firm load and exports make up the total firm regional requirements.

Monthly Energy (MWa)	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Ave
Firm Requirements													
Load ^{1/}	20,202	18,866	18,973	21,171	23,664	23,423	22,418	20,748	19,658	19,118	19,659	20,978	20,730
Exports	<u>1,021</u>	<u>884</u>	<u>568</u>	<u>524</u>	<u>526</u>	<u>525</u>	<u>525</u>	<u>524</u>	<u>523</u>	<u>533</u>	<u>870</u>	<u>887</u>	<u>559</u>
Total	21,223	19,750	19,540	21,695	24,190	23,949	22,943	21,272	20,181	19,651	20,529	21,865	21,289
Firm Resources													
Hydro	11,933	8,625	9,739	11,184	13,262	10,210	8,855	10,168	9,884	11,878	16,035	13,364	11,283
Small Therm.& Misc.	-	-	-	-	-	-	-	-	-	-	-	-	-
Natural Gas	4,179	3,841	3,959	3,870	4,239	4,215	3,895	3,843	3,672	3,312	4,154	4,496	3,973
Renewables-Other	212	213	216	216	214	201	212	214	204	204	207	213	213
Solar	1	1	1	0	0	0	1	1	1	1	1	1	1
Wind	1,305	1,205	1,203	1,115	1,188	1,204	1,147	1,491	1,420	1,402	1,511	1,365	1,297
Cogeneration	60	56	65	66	71	71	67	72	62	52	45	60	62
Imports	651	617	648	893	1,098	979	907	849	740	714	728	759	798
Nuclear	1,075	1,075	1,075	1,075	1,075	1,075	1,075	1,075	1,075	1,075	1,075	1,075	1,075
Coal	<u>3,862</u>	<u>3,863</u>	<u>3,862</u>	<u>3,863</u>	<u>3,862</u>	<u>3,859</u>	<u>3,822</u>	<u>3,498</u>	<u>2,900</u>	<u>3,063</u>	<u>3,650</u>	<u>3,856</u>	<u>3,663</u>
Total	23,279	19,495	20,768	22,283	25,010	21,814	19,981	21,210	19,958	21,703	27,406	25,190	22,365
Surplus (Need)	2,056	(255)	1,228	589	821	(2,135)	(2,962)	(62)	(223)	2,052	6,877	3,325	1,076

^{1/} Loads net of conservation.

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.

Winter Peak (MW)	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Firm Requirements										
Load ^{1/}	32,292	32,609	32,670	32,917	33,128	33,416	33,534	33,758	33,703	33,934
Exports	1,379	1,350	1,332	1,326	1,325	1,325	1,325	1,325	1,325	1,325
Planning Margin ^{2/}	<u>3,875</u>	<u>4,239</u>	<u>4,574</u>	<u>4,937</u>	<u>5,300</u>	<u>5,681</u>	<u>6,036</u>	<u>6,414</u>	<u>6,741</u>	<u>6,787</u>
Total	37,546	38,198	38,576	39,181	39,753	40,422	40,895	41,498	41,769	42,046
Firm Resources										
Hydro	22,357	22,264	22,264	22,256	22,256	22,256	22,256	22,256	22,256	22,256
Demand Response	87	89	90	92	93	88	89	90	90	90
Small Therm & Misc.	3	3	3	3	3	3	3	3	3	3
Natural Gas	6,574	6,904	6,904	6,904	6,904	,904	6,904	6,904	6,904	6,904
Renewables-Other	243	243	243	243	242	239	233	233	233	233
Solar	1	1	1	1	1	1	1	1	1	1
Wind	222	222	222	222	222	222	203	205	204	201
Cogeneration	78	64	64	64	43	43	14	9	9	9
Imports	1,643	1,556	1,548	1,514	1,525	1,537	1,550	1,562	1,576	1,505
Nuclear	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120
Coal	<u>4,294</u>	<u>4,291</u>	<u>4,291</u>	<u>4,291</u>	<u>4,291</u>	<u>3,721</u>	<u>3,718</u>	<u>3,715</u>	<u>3,715</u>	<u>3,715</u>
Total	36,621	36,755	36,749	36,708	36,698	36,133	36,089	36,096	36,110	36,035
Surplus (Need)	(925)	(1,443)	(1,827)	(2,472)	(3,055)	(4,288)	(4,807)	(5,401)	(5,659)	(6,011)

^{1/} Loads net of conservation.

^{2/} Planning Margin accounts for forced outages, unanticipated load growth, load variation due to temperatures, and operating reserves.

Table 4: Northwest Region Requirements and Resources – Summer Peak

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

Summer Peak (MW)	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Firm Requirements										
Load ^{1/}	27,420	27,620	27,954	28,071	28,292	28,473	28,649	28,823	29,056	29,414
Exports	1,979	1,839	1,857	1,764	1,754	1,754	1,454	1,454	1,454	1,447
Planning Margin ^{2/}	<u>3,290</u>	<u>3,591</u>	<u>3,914</u>	<u>4,211</u>	<u>4,527</u>	<u>4,840</u>	<u>5,157</u>	<u>5,476</u>	<u>5,811</u>	<u>5,883</u>
Total	32,690	33,050	33,724	34,046	34,574	35,068	35,261	35,753	36,322	36,743
Firm Resources										
Hydro	20,976	20,883	20,883	20,875	20,875	20,875	20,875	20,875	20,875	20,875
Demand Response	394	405	407	408	410	405	405	406	406	406
Small Therm & Misc.	3	3	3	3	3	3	3	3	3	3
Natural Gas	5,928	6,358	6,358	6,358	6,358	6,358	6,358	6,358	6,358	6,358
Renewables-Other	246	244	245	245	245	243	241	235	235	235
Solar	1	1	234	234	234	234	234	234	234	234
Wind	224	224	224	224	224	223	223	205	205	203
Cogeneration	61	47	47	47	47	29	5	5	0	0
Imports	1,073	1,130	1,132	1,142	1,152	1,162	1,173	1,183	1,193	1,200
Nuclear	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120	1,120
Coal	<u>4,298</u>	<u>4,294</u>	<u>4,291</u>	<u>4,291</u>	<u>4,291</u>	<u>4,291</u>	<u>3,721</u>	<u>3,718</u>	<u>3,715</u>	<u>3,715</u>
Total	34,324	34,709	34,944	34,947	34,958	34,943	34,358	34,341	34,344	34,349
Surplus (Need)	1,634	1,659	1,220	901	385	(125)	(903)	(1,412)	(1,977)	(2,395)

^{1/} Loads net of conservation.

^{2/} Planning Margin accounts for forced outages, unanticipated load growth, load variation due to temperatures, and operating reserves.

Northwest New and Existing Resources

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

Project	Date	Fuel/ Tech	Name plate (MW)	Winter Peak (MW)	Summer Peak (MW)	Energy (MWa)	Utility
Black Canyon Bliss Dam	Nov-14	hydro	0	-	-	-	Idaho Power
Box Canyon Upgrade (Unit 1)	Dec-14	hydro	6	1	1		Pend Oreille County PUD
Clark Canyon Dam	Mar-14	hydro	8	0	1		Idaho Power
Coal Transition PPA	Dec-14	contract	380	380	380	380	Puget Sound Energy
Kerr Dam		hydro	247	211	211	179	NorthWestern Energy
Plum Creek NLSL Green Exception/Off-Site Renewable	Jul-14	biomass	6	6	6	6	Flathead Electric Cooperative
Port Westward 2	Dec-14	natural gas	220	220	220		Portland General Electric
Thompson Falls Dam 7 units		hydro	115	94	94	85	NorthWestern Energy
Tucannon River Wind	Dec-14	wind	267	13	13	102	Portland General Electric
W10 Generator Replacement	May-14	hydro	23	23	23	-	Grant County PUD
Total			1,271	949	950	752	

Table 6a: Committed New Supply lists contracts and generating projects where construction has started and that utilities are counting on to meet need. All supply listed in these tables are included in the regional analysis of power needs.

Project	Date	Fuel/ Tech	Name plate (MW)	Winter Peak (MW)	Summer Peak (MW)	Energy (MWa)	Utility
American Falls Solar	Jan-16	solar	20	0	11	5	Idaho Power
American Falls Solar II	Jan-16	solar	20	0	11	5	Idaho Power
Benson Creek Wind	Dec-16	wind	10	1	1	2	Idaho Power
Boise City	Jul-16	solar	40	0	21	12	Idaho Power
Calligan Creek	Jan-17	hydro	6	6	2	2	Snohomish PUD
Carty CCCT	Jun-16	natural gas	440	430	430	360	Portland General Electric
Clark Solar 1	Dec-16	solar	71	0	38	21	Idaho Power
Clark Solar 2	Dec-16	solar	20	0	11	6	Idaho Power
Clark Solar 3	Dec-16	solar	30	0	16	9	Idaho Power
Clark Solar 4	Dec-16	solar	20	0	11	6	Idaho Power
Durbin Creek Wind	Dec-16	wind	10	1	1	2	Idaho Power
Grand View Solar	Jul-16	solar	40	0	33	20	Idaho Power
Grove Solar	Dec-16	solar	10	0	5	2	Idaho Power
Hancock Creek	Nov-17	hydro	6	6	3	2	Snohomish PUD
Head of U Canal	May-15	hydro	1	0	1		Idaho Power
Hyline Solar	Dec-16	solar	10	0	5	2	Idaho Power
Jett Creek Wind	Dec-16	wind	10	1	1	2	Idaho Power
Little Wood River Ranch II	Jun-15	hydro	1	0	1		Idaho Power
Mountain Home Solar	Dec-16	solar	20	0	11	7	Idaho Power
Murphy Flat Power	Dec-16	solar	20	0	11	5	Idaho Power
Open Range Solar	Dec-16	solar	10	0	5	2	Idaho Power
Orchard Ranch Solar	Dec-16	solar	20	0	11	5	Idaho Power
Pocatello Solar I	Dec-16	solar	20	0	10	6	Idaho Power
Prospector Wind	Dec-16	wind	10	1	1	3	Idaho Power
Railroad Solar	Dec-16	solar	10	0	5	2	Idaho Power
Simco Solar	Dec-16	solar	20	0	11	5	Idaho Power
Solar	Dec-15	solar	8	0	1	2	PacifiCorp
Thunderegg Solar	Dec-16	solar	10	0	5	2	Idaho Power
Vale Solar	Dec-16	solar	10	0	5	2	Idaho Power
W09 Generator E Replacement	Jun-15	hydro	21	21	21		Grant County PUD
W09 Transformer E Replacement	Nov-14	hydro	23	23	23		Grant County PUD
W10 Transformer E Replacement	Nov-14	hydro	21	21	21		Grant County PUD
Willow Springs Wind Farm	Dec-16	wind	10	1	1	2	Idaho Power
Total			999	510	743	505	

Table 6b: Demand Side Management Programs is a snapshot of the regional utilities' efforts to manage demand. The majority of the reported conservation savings are from energy efficiency and distribution efficiency. Some utilities also include some savings from market transformation, fuel switching, fuel conversion or energy storage. This table also shows cumulative demand response programs reported by utilities.

	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20	2020-21	2021-22	2022-23	2023-24
Conservation										
Annual Energy (MWa)										
Incremental	187	181	178	174	166	179	163	156	146	146
Cumulative	187	369	547	721	888	1,067	1,230	1,386	1,532	1,678
Winter Peak (MW)										
Incremental	256	246	239	238	185	269	209	209	202	152
Cumulative	256	503	741	979	1,163	1,432	1,641	1,851	2,053	2,205
Demand Response (MW)										
Winter	87	89	90	92	93	88	89	90	90	90
Summer	394	405	407	408	410	405	405	406	406	406

Table 7: Planned Resources captures resources utilities have identified to meet their own needs. The table shows planned generating projects that are being counted on to meet the growing demand. This information is a compilation of what utilities have reported in their individual integrated resources plans. These resources are not included in the regional analysis of power needs.

Project	Schedule	Fuel/ Tech	Name plate (MW)	Winter Peak (MW)	Summer Peak (MW)	Energy (MWa)	Utility
Benson Creek Wind	Dec-16	wind	10	10	10		Idaho Power
Biomass	Dec-23	wood waste	44			40	Seattle City Light
Combined Heat &Power	Dec-18	CHP	4		4	4	PacifiCorp
Combined Heat & Power	Dec-22	CHP	3		3	3	PacifiCorp
Durbin Creek Wind	Dec-16	wind	10	10	10		Idaho Power
Gas peaker	Dec-17	natural gas	221	221	221		Puget Sound Energy
Gas peaker	Dec-19	natural gas	83	76	76		Avista Corp.
Gas peaker	Dec-23	natural gas	221	221	221		Puget Sound Energy
Gas peaker	Dec-23	natural gas	83	76	76		Avista Corp.
Gas peaker	Dec-24	natural gas	221	221	221		Puget Sound Energy
Landfill Gas	Dec-20	methane/ gas engine	9			8	Seattle City Light
Nine Mile 1 & 2	Dec-15	hydro		16	13		Avista Corp.
Prospector Wind	Dec-16	wind	10	10	10		Idaho Power
Shoshone Falls Upgrade	Jul-19	hydro	49	2	9		Idaho Power
Small Hydro	Jan-24	hydro	30				Snohomish Co. PUD
Solar	Dec-15	solar	8			2	PacifiCorp
W 06 Generator Replacement	Mar-16	hydro	9	9	9		Grant County PUD
W03 Generator Replacement	Dec-16	hydro	9	9	9		Grant County PUD
W04 Generator Replacement	Sep-17	hydro	9	9	9		Grant County PUD
W07 Transformer D Replacement	May-15	hydro	21	21	21		Grant County PUD
W08 Generator Replacement	Jul-18	hydro	9	9	9		Grant County PUD
W08 Transformer D Replacement	May-15	hydro	12	12	12		Grant County PUD
Wind	Dec-23	wind	63			20	Seattle City Light
Wind	Dec-24	wind	220			70	Seattle City Light
Wind	Dec-25	wind	31			10	Seattle City Light
Total			1,388	931	941	157	

Table 8a: Northwest Utility Generating Resources is a comprehensive list of utility-owned and utility contracted generating resources that make up those utilities electric power supply.

Project	Owner	NW Utility	Nameplate (MW)
HYDRO			33,128
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		Idaho Power	0
Arrowrock Dam	Clatskanie PUD/Irr Dist	Clatskanie PUD	18
B. Smith	PacifiCorp	PacifiCorp	0
Barber Dam	Enel North America	Idaho Power	4
Bell Mountain	PacifiCorp	PacifiCorp	1
Big Cliff	US Corps of Engineers	Federal System (BPA)	18
Big Sheep Creek	Everand Jensen	Avista Corp.	0
Birch Creek	Everand Jensen	Idaho Power	0
Birch Creek	PacifiCorp	PacifiCorp	3
Black Canyon Bliss Dam	PURPA	Idaho Power	0
Black Canyon	US Bureau of Reclamation	Federal System (BPA)	10
Black Canyon # 3	Big Wood Canal Co.	Idaho Power	0
Black Creek Hydro	Black Creek Hydro, Inc.	Puget Sound Energy	4
Blind Canyon	Blind Canyon Hydro	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
Boston Power		PacifiCorp	
Boundary	Seattle City Light	Seattle City Light	1,040
Box Canyon	Pend Oreille County PUD	Pend Oreille County PUD	70
Box Canyon-Idaho	Richard Kaster	Idaho Power	0
Briggs Creek	Richard Kaster	Idaho Power	1
Brownlee	Idaho Power	Idaho Power	585
Burnside Hydro		Other Public (BPA)	
Bypass	Bypass, Ltd.	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	J.D. McCollum	Idaho Power	0
Carmen-Smith	Eugene Water & Electric Board	Eugene Water & Electric Board	105
Cascade	US Bureau of Reclamation	Idaho Power	12

Project	Owner	NW Utility	Nameplate (MW)
CDM Hydro	PacifiCorp	PacifiCorp	6
Cedar Draw Creek	Crys. Sprgs. Hydro	Idaho Power	2
Cedar Falls, Newhalem	Seattle City Light	Seattle City Light	20
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
Clark Canyon Dam	PURPA	Idaho Power	8
Clear Lake	Idaho Power	Idaho Power	3
Clear Springs Trout	Clear Sprgs. Trout	Idaho Power	1
Clearwater #1	PacifiCorp	PacifiCorp	15
Clearwater #2	PacifiCorp	PacifiCorp	26
Cline Falls	COID	PacifiCorp	1
COID	PacifiCorp	PacifiCorp	7
Copco #1	PacifiCorp	PacifiCorp	20
Copco #2	PacifiCorp	PacifiCorp	27
Cougar	US Corps of Engineers	Federal System (BPA)	25
Cove Hydro		Other Public (BPA)	
Cowlitz Falls	Lewis County PUD	Federal System (BPA)	70
Crystal Springs	Crystal Springs Hydro	Idaho Power	2
Curry Cattle Company	Curry Cattle Co.	Idaho Power	0
Curtis Livestock	PacifiCorp	PacifiCorp	0
Cushman 1	Tacoma Power	Tacoma Power	43
Cushman 2	Tacoma Power	Tacoma Power	81
Deep Creek	Gordon Foster	Avista Corp.	0
Derr Creek	Jim White	Avista Corp.	0
Detroit	US Corps of Engineers	Federal System (BPA)	100
Dexter	US Corps of Engineers	Federal System (BPA)	15
Diablo Canyon	Seattle City Light	Seattle City Light	182
Dietrich Drop	Enel North America	Idaho Power	5
Dry Creek		PacifiCorp	4
D. Wiggins		PacifiCorp	
Dworshak	US Corps of Engineers	Federal System (BPA)	400
Dworshak/ Clearwater		Federal System (BPA)	
Eagle Point	PacifiCorp	PacifiCorp	3
East Side	PacifiCorp	PacifiCorp	3
Eight Mile Hydro	Eightmile Hydro Corporation	Idaho Power	0
Electron	Puget Sound Energy	Puget Sound Energy	23
Esquatzel Small Hydro	Green Energy Today, LLC	Franklin County PUD	1

Project	Owner	NW Utility	Nameplate (MW)
Fall Creek	PacifiCorp	PacifiCorp	3
Falls Creek		Other Public (BPA)	
Falls River	Marysville Hydro Partner	Idaho Power	9
Faraday	Portland General Electric	Portland General Electric	37
Fargo Drop Hydro	Riverside Investments, LLC	Idaho Power	1
Farmers Irrigation	PacifiCorp	PacifiCorp	3
Faulkner Ranch	Faulkner Brothers Hydro Inc.	Idaho Power	1
Fish Creek	PacifiCorp	PacifiCorp	11
Fisheries Development Co.	Fisheries Devel.	Idaho Power	0
Foster	US Corps of Engineers	Federal System (BPA)	20
Frontier Technologies	PacifiCorp	PacifiCorp	4
Galesville Dam	PacifiCorp	PacifiCorp	2
Gem State Hydro		Other Publics (BPA)	23
Geo-Bon No 2	Enel North America, Inc.	Idaho Power	1
Georgetown Power	PacifiCorp	PacifiCorp	0
Gorge	Seattle City Light	Seattle City Light	207
Grand Coulee	US Bureau of Reclamation	Federal System (BPA)	6,494
Green Peter	US Corps of Engineers	Federal System(BPA)	80
Green Springs	US Bureau of Reclamation	Federal System (BPA)	16
Hailey CSPP	City of Hailey	Idaho Power	0
Hancock Creek	Snohomish County PUD	Snohomish County PUD	6
Hazelton A	SE Hazelton ALP	Idaho Power	8
Hazelton B	Hazelton Power Co.	Idaho Power	8
Head of U Canal	PURPA	Idaho Power	1
Hells Canyon	Idaho Power	Idaho Power	392
Hills Creek	US Corps of Engineers	Federal System (BPA)	30
Hood Street Reservoir	Tacoma Power	Tacoma Power	1
Horseshoe Bend	Horseshoe Bend Hydro	Idaho Power	10
Hungry Horse	US Bureau of Reclamation	Federal System (BPA)	428
Hutchinson Creek	STS Hydro	Puget Sound Energy	1
Ice Harbor	US Corps of Engineers	Federal System(BPA)	603
Idaho Falls - City Plant		Federal System (BPA)	
Idaho Falls - Lower Plant		Federal System (BPA)	
Idaho Falls - Upper Plant		Federal System (BPA)	
Ingram Warm Springs	PacifiCorp	PacifiCorp	1
Iron Gate	PacifiCorp	PacifiCorp	18
Island Park		Fall River Rural Electric Cooperative	5
Jackson (Sultan)	Snohomish County PUD	Snohomish County PUD	112
James Boyd		PacifiCorp	
Jim Ford Creek	Ford Hydro	Avista Corp.	2

Project	Owner	NW Utility	Nameplate (MW)
Jim Knight	Big Wood Canal Co.	Idaho Power	0
John C. Boyle	PacifiCorp	PacifiCorp	90
John Day	US Corps of Engineers	Federal System (BPA)	2,160
John Day Creek	Dave Cereghino	Avista Corp.	1
John H Koyle	John H Koyle	Idaho Power	1
Joseph Hydro		PacifiCorp	
Kasel-Witherspoon	Kasel & Witherspoon	Idaho Power	1
Kerr	NorthWestern Corporation	NorthWestern Energy	194
Koma Kulshan	Koma Kulshan Associates	Puget Sound Energy	11
La Grande	Tacoma Power	Tacoma Power	64
Lacomb Irrigation	PacifiCorp	PacifiCorp	1
Lake Creek		Other Publics (BPA)	
Lake Oswego Corp.		Portland General Electric	1
Lateral No. 10	Lateral 10 Ventures	Idaho Power	2
Leaburg	Eugene Water & Electric Board	Eugene Water & Electric Board	16
Lemolo #1	PacifiCorp	PacifiCorp	32
Lemolo #2	PacifiCorp	PacifiCorp	33
Lemoyne	John Lemoyne	Idaho Power	0
Libby	US Corps of Engineers	Federal System(BPA)	525
Lilliwaup Falls		Other Public (BPA)	1
Little Falls	Avista Corp.	Avista Corp.	32
Little Goose	US Corps of Engineers	Federal System(BPA)	810
Little Wood	Little Wood Irr District	Idaho Power	3
Little Wood/Arkoosh	William Arkoosh	Idaho Power	1
Little Wood River Ranch II	PURPA	Idaho Power	1
Lloyd Fery	PacifiCorp	PacifiCorp	0
Long Lake	Avista Corp.	Avista Corp.	70
Lookout Point	US Corps of Engineers	Federal System (BPA)	120
Lost Creek	US Corps of Engineers	Federal System (BPA)	49
Lower Baker	Puget Sound Energy	Puget Sound Energy	115
Lower Granite	US Corps of Engineers	Federal System(BPA)	810
Lower Malad	Idaho Power	Idaho Power	14
Lower Monumental	US Corps of Engineers	Federal System(BPA)	810
Lower Salmon	Idaho Power	Idaho Power	60
Lowline #2	Enel North America, Inc.	Idaho Power	3
Lowline Canal	S. Forks	Idaho Power	3
Lowline Midway	Idaho Power	Idaho Power	8
Lucky Peak	US Corps of Engineers	Seattle City Light	113
Magic Reservoir	Magic Reservoir Hydro	Idaho Power	9
Main Canal Headworks	SEQCBID	Multiple Utilities	26

Project	Owner	NW Utility	Nameplate (MW)
Malad River	V. Ravenscroft	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)	
Merwin	PacifiCorp	PacifiCorp	136
Meyers Falls	Hydro Technology Systems	Avista Corp.	1
Middlefork Irrigation	PacifiCorp	PacifiCorp	3
Mile 28	Contractors Power Group Inc.	Idaho Power	2
Mill Creek (Cove)	City of Cove, OR	Idaho Power	1
Mill Creek		Other Publics (BPA)	1
Milner	Idaho Power	Idaho Power	59
Minidoka	US Bureau of Reclamation	Federal System (BPA)	28
Mink Creek	PacifiCorp	PacifiCorp	3
Mitchell Butte	Owyhee Irrigation District	Idaho Power	2
Monroe Street	Avista	Avista Corp.	15
Mora Drop	Riverside LLC	Idaho Power	2
Morse Creek		Port Angeles	1
Mossyrock	Tacoma Power	Tacoma Power	300
Mountain Energy	PacifiCorp	PacifiCorp	0
Mount Tabor	City of Portland	Portland General Electric	0
Moyie Springs		Other Publics (BPA)	
Mud Creek/S&S	H.K.Hydro	Idaho Power	1
Mud Creek/White	Mud Creek Hydro	Idaho Power	0
N-32 Canal (Marco Ranches)	Ranchers Irrig., Inc.	Idaho Power	1
Nicols Gap	PacifiCorp	PacifiCorp	1
Nicolson SunnyBar	PacifiCorp	PacifiCorp	0
Nine Mile	Avista Corp.	Avista Corp.	26
Nooksack	Puget Sound Hydro, LLC	Puget Sound Energy	3
North Fork	Portland General Electric	Portland General Electric	41
North Fork Sprague	PacifiCorp	PacifiCorp	1
Noxon Rapids	Avista Corp.	Avista Corp.	466
N.R. Rousch	PacifiCorp	PacifiCorp	0
Oak Grove	Portland General Electric	Portland General Electric	51
Odell Creek	PacifiCorp	PacifiCorp	0
O.J. Power	PacifiCorp	PacifiCorp	0
Opal Springs	PacifiCorp	PacifiCorp	5
Ormsby		PacifiCorp	
Owyhee Dam	Owyhee Irrigation District	Idaho Power	5
Oxbow	Idaho Power Company	Idaho Power	190
Packwood	Energy Northwest	Multiple Utilities	26

Project	Owner	NW Utility	Nameplate (MW)
Palisades	US Bureau of Reclamation	Federal System (BPA)	177
PEC Headworks	SEQCBID	Grant County PUD	7
Pelton	Portland General Electric	Multiple Utilities	110
Pelton Reregulation	Warm Springs Tribe	Portland General Electric	19
Phillips Ranch	Glen Phillips	Avista Corp.	0
Pigeon Cove	Pigeon Cove Power	Idaho Power	2
Portland Hydro-Project	City of Portland	Portland General Electric	36
Portneuf River		PacifiCorp	1
Post Falls	Avista Corp.	Avista Corp.	15
Potholes East Canal 66 Headworks	SEQCBID	Multiple Utilities	5
Powerdale	PacifiCorp	PacifiCorp	6
Preston City	PacifiCorp	PacifiCorp	0
Priest Rapids	Grant County PUD	Multiple Utilities	956
Pristine Springs	Pristine Springs, Inc	Idaho Power	0
Pristine Springs #3	Pristine Springs, Inc	Idaho Power	0
Prospect #1	PacifiCorp	PacifiCorp	4
Prospect #2	PacifiCorp	PacifiCorp	32
Prospect #3	PacifiCorp	PacifiCorp	7
Prospect #4	PacifiCorp	PacifiCorp	1
Quincy Chute	SEQCBID	Grant County PUD	9
R.D. Smith	SEQCBID	Multiple Utilities	6
Reeder Gulch		Other Publics (BPA)	0
Reynolds Irrigation	Reynolds Irr.	Idaho Power	0
Rim View	Rim View Trout Co.	Idaho Power	0
River Mill	Portland General Electric	Portland General Electric	19
Rock Creek No. 1	Rock Creek Joint	Idaho Power	2
Rock Creek No. 2	Enel North America	Idaho Power	2
Rocky Brook	Mason County PUD #3	Other Public (BPA)	2
Rock Island	Chelan County PUD	Multiple Utilities	629
Rocky Reach	Chelan County PUD	Multiple Utilities	1300
Ross	Seattle City Light	Seattle City Light	360
Round Butte	Portland General Electric	Multiple Utilities	247
Roza	US Bureau of Reclamation	Federal System (BPA)	13
Sagebrush	Big Wood Canal Co.	Idaho Power	0
Sahko	Sahko	Idaho Power	1
Santiam	PacifiCorp	PacifiCorp	0
Schaffner	Lemhi Hydro Co.	Idaho Power	1
Sheep Creek	Glen Phillips	Avista Corp.	2
Shingle Creek	Willis D Deveny	Idaho Power	0
Shoshone II	Shorock Hydro	Idaho Power	1

Project	Owner	NW Utility	Nameplate (MW)
Shoshone CSPP	Shorock Hydro, Inc.	Idaho Power	0
Shoshone Falls	Idaho Power	Idaho Power	13
Slide Creek	PacifiCorp	PacifiCorp	18
Smith Creek	Eugene Water & Electric Board	Eugene Water & Electric Board	38
Snake River Pottery	Snake River Pottery	Idaho Power	0
Snedigar Ranch	David Snedigar	Idaho Power	1
Snoqualmie Falls	Puget Sound Energy	Puget Sound Energy	54
Soda Creek		Other Publics (BPA)	
Soda Springs	PacifiCorp	PacifiCorp	11
South Fork Tolt	Seattle City Light	Seattle City Light	17
Spokane Upriver	City of Spokane	Avista Corp.	16
Stauffer Dry Creek		PacifiCorp	
Steffen Hydro		Snohomish County PUD	
Stone Creek	Eugene Water & Electric Board	Eugene Water & Electric Board	12
Strawberry Creek	South Idaho Public Agency	Other Publics (BPA)	
Summer Falls	SEQCBID	Multiple Utilities	92
Swan Falls	Idaho Power	Idaho Power	25
Swift 1	PacifiCorp	Multiple Utilities	219
Swift 2	Cowlitz County PUD	Multiple Utilities	0
Sygitowicz	Cascade Clean Energy	Puget Sound Energy	0
TGS/Briggs		PacifiCorp	
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
Tiber Dam	Tiber Montana, LLC	Idaho Power	8
Toketee	PacifiCorp	PacifiCorp	43
Trail Bridge	Eugene Water & Electric Board	Eugene Water & Electric Board	10
Trout Company	Branch Flower Co.	Idaho Power	0
Tunnel #1	Owyhee Irrig. Dist.	Idaho Power	7
Twin Falls	Idaho Power	Idaho Power	53
Twin Falls	Twin Falls Hydro Association LP	Puget Sound Energy	20
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
Wallowa Falls	PacifiCorp	PacifiCorp	1

Project	Owner	NW Utility	Nameplate (MW)
Wallerville	Eugene Water & Electric Board	Eugene Water & Electric Board	8
Wanapum	Grant County PUD	Multiple Utilities	934
Weeks Falls	So. Fork II Assoc. LP	Puget Sound Energy	5
Wells	Douglas County PUD	Multiple Utilities	774
West Side	PacifiCorp	PacifiCorp	1
White Water Ranch	White Water Ranch	Idaho Power	0
Wilson Lake Hydro	Wilson Pwr. Co.	Idaho Power	8
Woods Creek	Snohomish County PUD	Snohomish County PUD	1
Wynoochee	Tacoma Power	Tacoma Power	13
Yale	PacifiCorp	PacifiCorp	134
Yelm		Other Publics (BPA)	12
Yakima-Tieton	PacifiCorp	PacifiCorp	3
Young's Creek	Snohomish County PUD	Snohomish County PUD	8
COAL			5,496
Boardman	Portland General Electric	Multiple Utilities	642
Colstrip #1	PP&L Montana, LLC	Multiple Utilities	330
Colstrip #2	PP&L Montana, LLC	Multiple Utilities	330
Colstrip #3	PP&L Montana, LLC	Multiple Utilities	740
Colstrip #4	NorthWestern Energy	Multiple Utilities	805
Jim Bridger #1	PacifiCorp / Idaho Power	Multiple Utilities	540
Jim Bridger #2	PacifiCorp / Idaho Power	Multiple Utilities	540
Jim Bridger #3	PacifiCorp / Idaho Power	Multiple Utilities	540
Jim Bridger #4	PacifiCorp / IPC	Multiple Utilities	508
Valmy #1	NV Energy / Idaho Power	Multiple Utilities	254
Valmy #2	NV Energy / Idaho Power	Multiple Utilities	267
NUCLEAR			1,230
Columbia Generating Station	Energy Northwest	Federal System (BPA)	1,230

Project	Owner	NW Utility	Nameplate (MW)
NATURAL GAS			6,928
Alden Bailey	Clatskanie PUD	Clatskanie PUD	11
Beaver	Portland General Electric	Portland General Electric	516
Beaver 8	Portland General Electric	Portland General Electric	25
Bennett Mountain	Idaho Power	Idaho Power	173
Boulder Park	Avista Corp.	Avista Corp.	25
Carty	Portland General Electric	Portland General Electric	440
Chehalis Generating Facility	PacifiCorp	PacifiCorp	517
Coyote Springs I	Portland General Electric	Portland General Electric	266
Coyote Springs II	Avista Corp.	Avista Corp.	287
Danskin	Idaho Power	Idaho Power	92
Danskin 1	Idaho Power	Idaho Power	179
Dave Gates Generating Station	NorthWestern Energy	NorthWestern Energy	150
Encogen	Puget Sound Energy	Puget Sound Energy	159
Ferndale Cogen Station (Tenaska)	Puget Sound Energy	Puget Sound Energy	245
Frederickson Generation Station	EPCOR Power L.P./PSE	Multiple Utilities	258
Fredonia 1 & 2	Puget Sound Energy	Puget Sound Energy	208
Fredonia 3 & 4	Puget Sound Energy	Puget Sound Energy	108
Fredrickson 1 & 2	Puget Sound Energy	Puget Sound Energy	149
Goldendale Generating Station	Puget Sound Energy	Puget Sound Energy	261
Hermiston Generating Project	PacifiCorp/Hermiston Gen. Co.	PacifiCorp	469
Kettle Falls CT	Avista Corp.	Avista Corp.	7
Klamath Peaking Units 1-4	Iberdrola Renewables	Puget Sound Energy	100
Lancaster Power Project	Avista Corp.	Avista Corp.	270
Langley Gulch	Idaho Power	Idaho Power	319
Mint Farm Energy Center	Puget Sound Energy	Puget Sound Energy	305
Northeast A&B	Avista Corp.	Avista Corp.	62
Port Westward	Portland General Electric	Portland General Electric	415
Port Westward Unit 2	Portland General Electric	Portland General Electric	220
Rathdrum 1 & 2	Avista Corp.	Avista Corp.	167
River Road Generating Project	Clark Public Utilities	Clark Public Utilities	248
Rupert (Magic Valley)	Rupert Illinois Holdings	Idaho Power	10
Sumas Energy	Puget Sound Energy	Puget Sound Energy	121
Whitehorn #2 & 3	Puget Sound Energy	Puget Sound Energy	149

Project	Owner	NW Utility	Nameplate (MW)
COGENERATION			199
Billings Cogeneration	Billings Generation, Inc.	NorthWestern Energy	64
Hampton Lumber		Snohomish County PUD	5
International Paper Energy Center	Eugene Water & Electric Board	Eugene Water & Electric Board	26
James River - Camas	PacifiCorp	PacifiCorp	52
Simplot-Pocatello	PURPA	Idaho Power	12
Tasco-Nampa	Tasco	Idaho Power	2
Tasco-Twin Falls	Tasco	Idaho Power	3
Wauna (James River)	Western Generation Agency	Multiple Utilities	36
RENEWABLES-OTHER			346
Bettencourt B6	Cargill	Idaho Power	2
Bettencourt Dry Creek	Cargill	Idaho Power	2
Big Sky West Dairy	Dean Foods Co. & AgPower Partners LLC	Idaho Power	2
Bio Energy		Puget Sound Energy	1
Bio Fuels, WA		Puget Sound Energy	5
Biomass One	PacifiCorp	PacifiCorp	25
City of Spokane Waste to Energy	City of Spokane	Avista Corp.	26
Coffin Butte Resource Project	Power Resources Cooperative	PNGC Power	6
Cogen Company	Prairie Wood Products Co-Gen Co.	Oregon Trail Cooperative	8
Co-Gen II - DR Johnson Lumber	PacifiCorp	PacifiCorp	8
Columbia Ridge Landfill Gas	Waste Management	Seattle City Light	13
Convanta Marion	Portland General Electric	Portland General Electric	16
Double A Digester	PURPA-Andgar Corp	Idaho Power	5
Dry Creek Landfill	Dry Creek Landfill Inc.	PacifiCorp	3
Edaleen Dairy		Puget Sound Energy	1
Farm Power Tillamook	Tillamook	Tillamook	1
Fighting Creek	Kootenai Electric Co-op	Idaho Power	3
Flathead County Landfill	Flathead Electric Cooperative	Flathead Electric Cooperative	2
Four Mile Hill Geothermal	Calpine	Federal System (BPA)	50
Hidden Hollow Landfill	G2 Energy	Idaho Power	3
Hooley Digester	Tillamook PUD	Tillamook PUD	1
H. W. Hill Landfill	Allied Waste Companies	Multiple Utilities	11
Interfor Pacific-Gilchrist	Midstate Electric Cooperative	Midstate Electric Cooperative	
Kettle Falls	Avista Corp.	Avista Corp.	51
Lynden	Farm Power	Puget Sound Energy	1
Mill Creek (Cove)		Idaho Power	1
Neal Hot Springs	U.S Geothermal	Idaho Power	23

Project	Owner	NW Utility	Nameplate (MW)
Olympic View 1&2	Mason County PUD #3	Mason County PUD #3	5
Pine Products	PacifiCorp	PacifiCorp	6
Plum Creek NLSL	Plum Creek MDF	Flathead Electric Cooperative	6
Pocatello Wastewater	Idaho Power	Idaho Power	0
Portland Wastewater	City of Portland	Portland General Electric	2
Raft River 1	US Geothermal	Idaho Power	16
Rainier Biogas		Puget Sound Energy	1
Rexville	Farm Power	Puget Sound Energy	1
River Bend Landfill	McMinnville Water & Light	McMinnville Water & Light	0
Rock Creek Dairy	PURPA	Idaho Power	4
Seneca	Seneca Sustainable Energy, LLC	Eugene Water & Electric Board	20
Short Mountain		Emerald PUD	3
Skookumchuck		Puget Sound Energy	1
Smith Creek		Puget Sound Energy	0
Stimson Lumber	Stimson Lumber	Avista Corp.	7
Stoltze Biomass	F.H. Stoltze Land & Lumber	Flathead Electric Cooperative	3
Tamarack	Idaho Power	Idaho Power	5
Van Dyk		Puget Sound Energy	0
VanderHaak Dairy	VanderHaak Dairy, LLC	Puget Sound Energy	0
Whitefish Hydro	City of Whitefish	Flathead Electric Cooperative	0
SOLAR			445

Ashland Solar Project		Federal System (BPA)	0
American Falls Solar	PURPA	Idaho Power	20
American Falls Solar II	PURPA	Idaho Power	20
Bellevue Solar	EDF Renewable Energy	Portland General Electric	2
Boise City Solar	PURPA	Idaho Power	40
Clark Solar 1	PURPA	Idaho Power	71
Clark Solar 2	PURPA	Idaho Power	20
Clark Solar 3	PURPA	Idaho Power	20
Clark Solar 4	PURPA	Idaho Power	20
Finn Hill Solar (Lake Wash SD)		Puget Sound Energy	0
Grand View Solar	PURPA	Idaho Power	80
Grove Solar	PURPA	Idaho Power	10
Hyline Solar Center	PURPA	Idaho Power	10
Island Solar		Puget Sound Energy	0
King Estate Solar	Lane County Electric Cooperative	Lane County Electric Cooperative	0
Mountain Home Solar	PURPA	Idaho Power	20
Murphy Flat Power	PURPA	Idaho Power	20

Project	Owner	NW Utility	Nameplate (MW)
Open Range Solor Center	PURPA	Idaho Power	10
Orchard Ranch Solar	PURPA	Idaho Power	10
Pocatello Solar I	PURPA	Idaho Power	20
Railroad Solar Center	PURPA	Idaho Power	10
Simco Solar	PURPA	Idaho Power	20
Thunderegg Solar Center	PURPA	Idaho Power	10
Vale Air Solar Center	PURPA	Idaho Power	10
Wild Horse Solar Project	Puget Sound Energy	Puget Sound Energy	1
Yamhill Solar	EDF Renewable Energy	Portland General Electric	1

WIND			4,451
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3Bar-G Wind		Puget Sound Energy	1
Bennet Creek	Bennet Creek	Idaho Power	21
Benson Creek Wind	PURPA	Idaho Power	10
Big Top	Big Top LLC (QF)	PacifiCorp	2
Biglow Canyon - 1	Portland General Electric	Portland General Electric	125
Biglow Canyon - 2	Portland General Electric	Portland General Electric	150
Biglow Canyon - 3	Portland General Electric	Portland General Electric	174
Burley Butte Wind Farm	PURPA	Idaho Power	21
Butter Creek Power	Butter Creek Power LLC	PacifiCorp	5
Camp Reed Wind Park	PURPA	Idaho Power	23
Cassia Wind Farm	Cassia Wind Farm	Idaho Power	11
Coastal Energy	CCAP	Grays Harbor PUD	6
Cold Springs	PURPA	Idaho Power	23
Combine Hills I	Eurus Energy of America	PacifiCorp	41
Combine Hills II	Eurus Energy of America	Clark Public Utilities	63
Condon Wind	Goldman Sachs (75%), SeaWest NW (25%)	Federal System (BPA)	25
Desert Meadow Windfarm	PURPA	Idaho Power	23
Durbin Creek	PURPA	Idaho Power	10
Elkhorn Wind	Telocaset Wind Power Partners	Idaho Power	101
Foote Creek Rim 1	PacifiCorp & EWEB	Multiple Utilities	41
Foote Creek Rim 2	PPM Energy	Federal System (BPA)	2
Foote Creek Rim 4	PPM Energy	Federal System (BPA)	17
Fossil Gulch Wind	Idaho Power Company	Idaho Power	11
Four Corners Windfarm	Four Corners Windfarm LLC	PacifiCorp	10
Four Mile Canyon Windfarm	Four Mile Canyon Windfarm LLC	PacifiCorp	10
Golden Valley Wind Farm	PURPA	Idaho Power	12
Goodhoe Hills	PacifiCorp	PacifiCorp	94
Hammett Hill Windfarm	PURPA	Idaho Power	23

Project	Owner	NW Utility	Nameplate (MW)
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	Horseshoe Bend Wind Park LLC	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 I	PPM Energy	Federal System (BPA)	24
Klondike II	PPM Energy	Portland General Electric	75
Klondike III	PPM Energy	Multiple Utilities	221
Knudson Wind		Puget Sound Energy	0
Leaning Juniper 1	PPM Energy	PacifiCorp	101
Lime Wind Energy	PURPA	Idaho Power	3
Lower Snake River 1	Puget Sound Energy	Puget Sound Energy	342
Mainline Windfarm	PURPA	Idaho Power	23
Marengo	Renewable Energy America	PacifiCorp	140
Marengo II	PacifiCorp	PacifiCorp	70
Milner Dam Wind Farm	PURPA	Idaho Power	20
Moe Wind	Two Dot Wind	NorthWestern Energy	1
Nine Canyon	Energy Northwest	Multiple Utilities	96
Oregon Trail Windfarm	Oregon Trail Windfarm LLC	PacifiCorp	10
Oregon Trails Wind Farm	PURPA	Idaho Power	14
Pa Tu Wind Farm	Pa Tu Wind Farm, LLC	Portland General Electric	9
Pacific Canyon Windfarm	Pacific Canyon Windfarm LLC	PacifiCorp	8
Palouse Wind	Palouse Wind, LLC	Avista Corp.	105
Paynes Ferry Wind Park	PURPA	Idaho Power	21
Pilgrim Stage Station Wind Farm	PURPA	Idaho Power	11
Prospector Wind	PURPA	Idaho Power	10
Rockland Wind	PURPA	Idaho Power	80
Ryegrass Windfarm	PURPA	Idaho Power	23
Salmon Falls Wind Farm	PURPA	Idaho Power	22
Sand Ranch Windfarm	Sand Ranch Windfarm LLC	PacifiCorp	10
Sawtooth Wind	PURPA	Idaho Power	21
Sheep Valley Ranch	Two Dot Wind	NorthWestern Energy	1
Stateline Wind	NextEra	Multiple Utilities	300
Swauk Wind		Puget Sound Energy	4
Thousand Springs Wind Farm	PURPA	Idaho Power	12
Three Mile Canyon	Momentum RE	PacifiCorp	10
Tuana Gulch Wind Farm	PURPA	Idaho Power	11

Project	Owner	NW Utility	Nameplate (MW)
Tucannon	Portland General Electric	Portland General Electric	267
Two Ponds Windfarm	PURPA	Idaho Power	23
Vansycle Ridge	ESI Vansycle Partners	Portland General Electric	25
Wagon Trail Windfarm	Wagon Trail Windfarm LLC	PacifiCorp	3
Ward Butte Windfarm	Ward Butte Windfarm LLC	PacifiCorp	7
Wheat Field Wind Project	Wheat Field Wind LLC (Horizon Energy/EDP)	Snohomish County PUD	97
White Creek	White Creek Wind I LLC	Multiple Utilities	205
Wild Horse	Puget Sound Energy	Puget Sound Energy	273
Willow Springs Wind Farm	PURPA	Idaho Power	10
Wolverine Creek	Invenergy	PacifiCorp	65
Yahoo Creek Wind Park	PURPA	Idaho Power	21
SMALL THERMAL AND MISCELLANEOUS			3
Crystal Mountain	Puget Sound Energy	Puget Sound Energy	3

Table 8b: Independent Owned Generating Resources is a comprehensive list of independently owned electric power supply located in the region and serving utilities outside the region or available for utility-owned to purchase or contract with.

Project	Owner	Nameplate (MW)
COAL		1,340
Centralia #1	TransAlta	670
Centralia #2	TransAlta	670
NATURAL GAS		1,540
Grays Harbor (Satsop)	Invenergy	650
Hermiston Power Project	Hermiston Power Partners (Calpine)	689
Klamath Cogen Plant	Iberdrola Renewables	503
March Point 1	March Point Cogen	80
March Point 2	March Point Cogen	60
Pasco Generation Station		44
COGENERATION		103
Boise Cascade		9
Freres Lumber	Evergreen BioPower	10
Rough & Ready Lumber	Rough & Ready	1
Warm Springs Forest Products		8

Project	Owner	Nameplate (MW)
RENEWABLES-OTHER		26
Spokane MSW	City of Spokane	23
Treasure Valley		3
WIND		3,247
Big Horn	Iberdrola Renewables	199
Big Horn-Phase 2	Iberdrola Renewables	50
Cassia Gulch	John Deere	21
Glacier Wind - Phase 1	Naturener	107
Glacier Wind - Phase 2	Naturener	104
Goshen North	Ridgeline Energy	125
Juniper Canyon - Phase 1	Iberdrola Renewables	151
Kittitas Valley	Horizon	101
Klondike IIIa	Iberdrola Renewables	77
Lava Beds Wind		18
Leaning Juniper II-North	Iberdrola Renewables	90
Leaning Juniper II-South	Iberdrola Renewables	109
Linden Ranch	NW Wind Partners	50
Magic Wind Park		20
Martinsdale Colony North	Two Dot Wind	1
Martinsdale Colony South	Two Dot Wind	2
Notch Butte Wind		18
Pebble Springs Wind	Iberdrola Renewables	99
Rattlesnake Rd Wind (aka Arlington)	Horizon Wind	103
Shepards Flat Central	Caithness Energy	290
Shepards Flat North	Caithness Energy	265
Shepards Flat South	Caithness Energy	290
Stateline Wind	NextEra	300
Vancycle II (Stateline III)	NextEra	99
Vantage Wind	Invenergy	90
Willow Creek	Invenergy	72
Windy Flats	Cannon Power Group	262
Windy Point	Tuolumne Wind Project Authority	137
SMALL THERMAL AND MISCELLANEOUS		44
Colstrip Energy LP Coal	Colstrip Energy Limited Partnership	44

Report Procedures

This report provides an estimate of regional ‘need to acquire’ generating resources using annual energy (August through July), monthly energy, winter peak-hour and summer peak-hour metrics. 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 regional report reflects the summation of individual utilities’ forecasts. The larger utilities, in most cases, prepared their own projections. BPA provides much of the information for its smaller customers. Load (i.e. electricity demand), and resource information is included for the utilities listed in Table 9 at the end of this section. Procedures employed in preparing the regional load-resource comparisons of winter and summer peak and energy are described here. A list of definitions is included at the end of this section.

Load Estimate

Regional loads are the sum of loads estimated by the Northwest utilities and BPA for its federal agency customers, certain non-generating public utilities, and direct service industrial customers (DSI). Estimates are made for system peak and system energy loads. Load projections reflect network transmission and distribution losses, reductions in demand due to rising electricity prices, and the effects of appliance efficiency standards and energy building codes. Savings from demand-side management programs, such as energy efficiency, are also reflected in the regional load forecasts.

Energy Loads

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

Peak Loads

Northwest regional peak loads are provided for each month of the ten year forecast period. The tabulated loads for winter and summer peak are the highest estimated 60-minute clock-hour average demand for that month, assuming normal weather conditions. The regional firm peak load is the sum of the individual utility peak loads, and does not account for the fact that each utility may experience its peak load at a different hour than other Northwest utilities. Hence the regional peak

load is considered non-coincident. The federal system (BPA) firm peak load is adjusted to reflect a federal coincident peak among its many utility customers.

Federal System Transmission Losses

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

Planning Margin

In the derivation of regional requirements, a planning margin has been added to the load. This regional planning margin is equal to 12 percent of the total peak load for the first year of the planning horizon, increasing one percent per year to 20 percent and remaining at 20 percent thereafter. They are 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. An increasing reserve requirement reflects greater uncertainty about load levels and of achieving construction schedules in the future.

Demand-Side Management Programs

Savings from demand-side management efforts are reported in *Table 6b: Demand Side Management Programs*. These estimates are the savings for the ten year study period and include expected future energy savings from existing and new programs in the areas of energy efficiency, distribution efficiency, some market transformation, fuel conversion, fuel switching, energy storage and other efforts that reduce the demand for electricity. These estimates reflect savings from programs that utilities fund directly, or through a third-party, such as the Northwest Energy Efficiency Alliance and Energy Trust of Oregon.

Demand response activity is reported separately in *Table 6b*. The total load reduction reported is the cumulative sum of different utilities' agreements with their customers. Each program has its own characteristics and limitations.

Generating Resources

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

Hydro

Major hydro resource capabilities are estimated from a regional analysis using a computer model that simulates reservoir operation of past hydrologic conditions. The historical stream flow record used covers the 80-year period from August 1929 through July 2008.

Energy

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

Peak Capability

For this report the peak capability of the hydro system represents the maximum hourly generation available to meet peak demand during the period of heavy load.

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

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

Columbia River Treaty

Since 1961 the United States has had a treaty with Canada that outlines the operation of U.S. and Canadian storage projects to increase the total combined generation. Hydropower generation in this analysis reflects the firm power generated by coordinating operation of three Canadian reservoirs, Duncan, Arrow and Mica with the Libby reservoir 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 projects owners are obligated to return their share of the downstream power benefits owed to Canada. The delivery of the Entitlement is reflected in this analysis.

Downstream Fish Migration

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

Thermal and Other Renewable Resources

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

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

All existing generating plants, regardless of size, are included in amounts submitted by each utility that owns or is purchasing the generation. The energy capabilities of plants are computed on annual planning equivalent availability factors submitted by the sponsors of the projects. The factors include allowance for scheduled maintenance (including refueling), forced outages and other expected operating constraints. Some small fossil-fuel plants and combustion turbines are included as peaking resources and their reported energy capabilities are only the amounts necessary for peaking operations. Additional energy potentially may be available from these peaking resources for emergencies but is not included in the regional load/resource balance.

New and Future Resources

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

Recently Acquired Resources

The *Recently Acquired Resources* reported in Table 5 have been acquired in the past year and are serving Northwest utility loads as of December 31, 2014. They are reflected as part of the regional firm needs assessment.

Committed New Supply

Committed New Supply reported in Table 6a includes those projects under construction or committed resources and supply to meet Northwest load that are not delivering power as of December 31, 2014. In this report, resources being built by utilities or resources where their output is firmly committed to utilities are included in the regional load-resource analysis. Future savings from committed demand-side management programs are reported in Table 6b.

Planned Resources

Planned Resources presented in Table 7 include specific resources and/or blocks of resources identified in utilities' most current integrated resource plans. Projects specifically named in *Planned Resources* are not yet under construction as of December 31, 2014, but a firm commitment to construct or acquire the power has been made. These resources are not part of the regional analysis.

Contracts

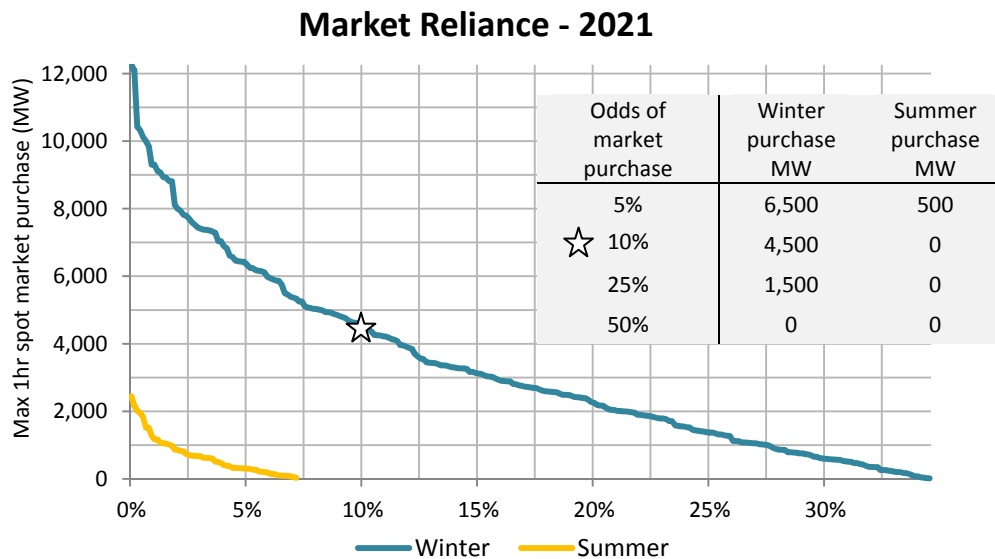
Imports and exports include firm arrangements for interchanges with systems outside the region, as well as with third-party developers/owners within the region. These arrangements comprise firm contracts with utilities to the East, the Pacific Southwest and Canada. Contracts to and from these areas are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

Market Reliance Analysis

This year's *Forecast* includes an analysis of the Northwest utilities' dependence on the short term/spot market power.¹ The study was conducted using the GENESYS model, which simulates the hourly operation of the Northwest power system given variations in loads due to weather and hydro generation from changing water supply. The assumptions for this analysis were derived from the Northwest Power and Conservation Council's Resource Adequacy Advisory Committee recent studies. Loads from the Council's study were adjusted to reflect the *Forecast's* 2021 regional load. The Boardman power plant was removed for the duration of the study as well.²

The analysis reflects all available utility-owned power plants operating to meet the hourly load before spot market purchases were made. The reliance on the spot market was established by tracking the hours and to what extent the power market was used.

Overall the study shows that the Northwest utilities may rely on power markets to maintain system adequacy, especially during winter months. The chart shows the results of the study on a distribution curve. For example, during 10% of the simulations of the year 2021 at least 4,500 MW of spot market power was purchased for one hour or more during the winter.³



¹ Market includes northwest Independent Power Producers and out-of-region imports.

² Note that Boardman is schedule to retire at the end of 2020.

³ Winter defined as Dec – Jan; summer defined as Jun – Aug.

Table 9: Utilities included in the Northwest Regional Forecast

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

Definitions

Annual Energy

Energy value in megawatts that represents the average of monthly values in a given year.

Average Megawatts

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

Biomass

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

Canadian Entitlement

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

Coal

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

Cogeneration

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

Combustion Turbines

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

Committed Resources

This includes under construction projects and long-term power supply agreements that are committed but not yet producing power to meet Northwest load at the time of publication. This generation is included in the resources for calculating the regional load/resource balance.

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 in times of system stress.

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.

Distribution Efficiency

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

Encroachment

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

Energy Efficiency

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

Energy Load

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

Energy Storage

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

Exports

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

Federal System (BPA)

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

Federal Columbia River Power System (FCRPS)

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

Firm Energy

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

Firm Load

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

Firm Losses

Losses incurred on the transmission system of the Northwest region.

Fuel Conversion

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

Fuel Switching

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

Historical Streamflow Record

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

Hydro Maintenance

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

Hydro Regulation

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

Imports

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

Independent Power Producers (IPPs)

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

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

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

Investor-Owned Utility (IOU)

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

Market Transformation

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

Megawatt (MW)

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

Nameplate Capacity

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

Natural Gas-Fired Resources

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

Non-Utility Generation

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

Nuclear Resources

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

Operating Year

Twelve-month period beginning on August 1 of any year and ending on July 31 of the following year. For example, operating year 2015 is August 1, 2014 through July 31, 2015.

Other Publics (BPA)

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

Peak Load

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

Planned Resources

Planned resources include generic, as well as specific projects, measures, and transactions that utilities have made some commitment to acquire and are in some stage of state site certification process. However, either not all licenses have been obtained, no commercial operation data has been specified, or the specifics of the transaction have not been finalized.

Planning Margin

A component of regional requirements that is included in the peak needs assessment to account for various planning uncertainties.

Private Utilities

Same as investor-owned utilities.

Publicly-Owned Utilities

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

PURPA

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

Renewables - Other

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

Requirements

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

Small Thermal & Miscellaneous Resources

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

Solar Resources

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

Thermal Resources

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

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

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

Wind Resources

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



BPA Study

The 2014 Pacific Northwest Loads and Resources Study published by the Bonneville Power Administration can be accessed at <http://www.bpa.gov/power/pgp/whitebook/2014/>.