August 2, 2016

MEMORANDUM

TO: **Power Committee**

FROM: **John Fazio, Senior Systems Analyst**

SUBJECT: **Briefing on Revised Power Supply Adequacy for 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's standard defines an adequate power supply to have no more than a 5 percent chance of a resource shortfall in the year being assessed. This metric is commonly referred to as the loss-of-load probability (LOLP) and any future power supply with an LOLP greater than 5 percent is deemed to be inadequate.

The Pacific Northwest's power supply is expected to be adequate through 2020, however, by 2021 – with the loss of the Boardman and Centralia-1 coal plants (1,330 MW nameplate) – the LOLP rises to about 10 percent and would lead to an inadequate supply without intermediate actions. These results assume that the region will continue to acquire energy efficiency savings as targeted in the Council's Seventh Power Plan, which amount to 1,400 average megawatts of savings through 2021.

Since the original assessment was completed, the announced retirement of Colstrip 1 and 2 coal plants was released. While the announcement stated that these projects would be closed no later than July of 2022, the Council felt it necessary to assess the adequacy of the power supply in 2021, should these plants close early. The combined winter peaking

capacity from these plants dedicated to serve regional loads is 307 megawatts. Removing this capability in the 2021 operating year increases the LOLP to 13.2 percent. Assuming medium load growth through 2021, needed replacement capacity to ensure adequacy is a little over 1,000 megawatts for the case without the Colstrip 1 and 2 closure. With the closure, the capacity need rises to a little over 1,300 MW.

Resource acquisitions needed to bring the 2021 power supply into compliance with the Council's standard will vary depending on the types of generating resources or demand reduction programs that are considered. Designing a resource strategy to ensure an adequate power supply for 2021 is more appropriately done using the strategy outlined in the Council's Seventh Power Plan. In all likelihood, some combination of new generation and load reduction programs will be used to bridge the gap.

Northwest utilities, as reported in the Pacific Northwest Utilities Conference Committee's 2016 Northwest Regional Forecast have identified about 550 megawatts of planned generating capacity for 2021. However, these planned resources are not sited and licensed and are therefore, not included in the 2021 adequacy assessment. It is important to note that demand response programs could play a vital role in maintaining power supply adequacy, as reported in the Council's Seventh Power Plan.

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: A.5. System Analysis: Complete Annual Adequacy Assessments

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 5 percent. The Council reassesses this every year, looking at the adequacy of the power supply five years out, as an early warning to ensure that adequacy is maintained.

More Info: For more information please go to the Resource Adequacy Advisory Committee webpage:

http://www.nwcouncil.org/energy/resource/home/

2021 POWER SUPPLY ADEQUACY ASSESSMENT

Executive Summary

The Pacific Northwest's power supply is expected to be adequate through 2020. However, with the planned retirements of four Northwest coal plants by July of 2022, the system will no longer meet the Council's adequacy standard and will have to acquire nearly 1,400 megawatts of new capacity in order to maintain that standard. This result assumes that the Council's energy efficiency targets, as identified in the Seventh Power Plan, will be achieved. Thus, it is imperative that cost-effective energy efficiency programs continue to be aggressively implemented. Beyond energy efficiency, Northwest utilities have steadily been working to develop replacement resource strategies and have reported about 550 megawatts of planned generating capacity by 2021. The additional need will be made up with the next most cost effective and implementable resources, which may include additional energy efficiency, demand response or new generating resources. The Council will reassess the adequacy of the power supply next year to keep tabs on the region's progress in maintaining an adequacy.

In 2011, the Northwest Power and Conservation Council adopted a regional power supply adequacy standard to "provide an early warning should resource development fail to keep pace with demand growth." The standard deems the power supply to be inadequate if the likelihood of a power supply shortfall (referred to as the loss-of-load probability or LOLP) is higher than 5 percent. The LOLP for the region's power supply is expected to stay under the 5 percent limit through 2020. In 2021, with the loss of 1,330 megawatts of capacity from the Boardman and Centralia 1 coal plants (slated to retire in December of 2020), the LOLP rises to 10 percent.[1] In this scenario, the region will need a little over 1,000 megawatts of new capacity to maintain adequacy. Should the Colstrip 1 and 2 coal plants (307 megawatts committed to serve regional demand) also retire before 2021, the LOLP grows to just over 13 percent and the region's adequacy need grows to about 1,400 megawatts of new capacity.

These results are based on a stochastic analysis that simulates the operation of the power supply over thousands of different combinations of river flow, wind generation, forced outages, and temperatures. Since last year's assessment, which resulted in an 8 percent LOLP for 2021, the region's load forecast has remained fairly flat and no new resources have been added to the

[1] Boardman and Centralia 1 coal plants are scheduled to retire in December 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.

mix. This year's assessment for 2021 has grown to 10 percent because the analysis included all regional balancing reserve requirements instead of only the federal system reserves.

The conclusions made above assume that future demand will stay on the Council's medium load forecast path and that only a fixed amount of imported generation from the Southwest is available. If demand growth were to increase rapidly and if the availability of imports were to drop, the LOLP could grow as high as 30 percent and the region's adequacy needs could grow to 2,600 megawatts or more. But these extreme cases are not very likely to occur.

Resource acquisition plans 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. 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 maintain an adequate, efficient, economical, and reliable power supply is beyond the scope of this analysis. Designing a resource strategy to ensure an adequate power supply for 2021 is more appropriately done using the strategy outlined in the Council's Seventh Power Plan.

Northwest utilities, as reported in the Pacific Northwest Utilities Conference Committee's 2016 Northwest Regional Forecast, show about 550 megawatts of planned generating capacity for 2021. However, these planned resources are not sited and licensed and are therefore not included in the 2021 adequacy assessment. As conditions change over the next few years, it is expected that utilities will revise their resource acquisition strategies to ensure that sufficient investments in new resources, which include energy efficiency and demand response, will be made to maintain an adequate supply.

Revised Power Supply Adequacy for the 2021 Operating Year

Power Committee Meeting
August 9, 2016
Polson, Montana

Today's Discussion

- Summary of Revised 2021 Assessment
- Review Council's Proposed 2021 Adequacy Assessment Executive Report
- Recommendation to full Council

Review: Council's Adequacy Standard

The likelihood of a power supply shortfall anytime during the year in question should not exceed 5 percent.

- Power system operation for 2021 is simulated thousands of times, each time selecting different combinations of river flows, wind generation, temperature and generator forced outages.
- Likelihood of a shortfall is equal to the number of simulations with shortfalls divided by total number of simulations
- Power supply is adequate if the above value is 5% or less

2021 Adequacy Assessment

Year		Status	Capacity Need
2016 to 2020		Adequate LOLP < 5%	None
2021 Case 1	Small net load growth No new sited & licensed resources Lose Boardman & Centralia (1,330 MW)	Inadequate LOLP = 10%	Need Load 1,040 MW – med 2,230 MW – high
2021 Case 2	Retirement of Colstrip 1 & 2 (307 MW of dedicated regional capacity)	Inadequate LOLP = 13%	Need Load 1,360 MW – med 2,560 MW – high

Resource Acquisition Activities

Item	Comments	Source
Planned Resources	550 MW	PNUCC 2016 NRF
Demand Response	600 – 2,700 MW potential Mostly untested acquisition	Seventh Power Plan
Coal Replacement Strategies	Internal utility discussions	Utilities
Additional Wind/Solar	Winter capacity shortage New wind will not help Solar will help minimally	Council studies

Effect of Load on LOLP

Case ➡ Loads ⬇	No Boardman No Centralia 1	No Boardman No Centralia 1 No Colstrip 1 & 2
High Load	24	31
Med Load	10	13.2
Low Load	4	5.1

Council Messages

- Inadequate status in 2021 was expected
- Loss of Colstrip increases capacity need
- Continued acquisition of EE imperative
- Combination of already planned resources + acquisition of DR could be sufficient
- If needed, region has time to acquire additional generating resources
- Council will assess again next year