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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.

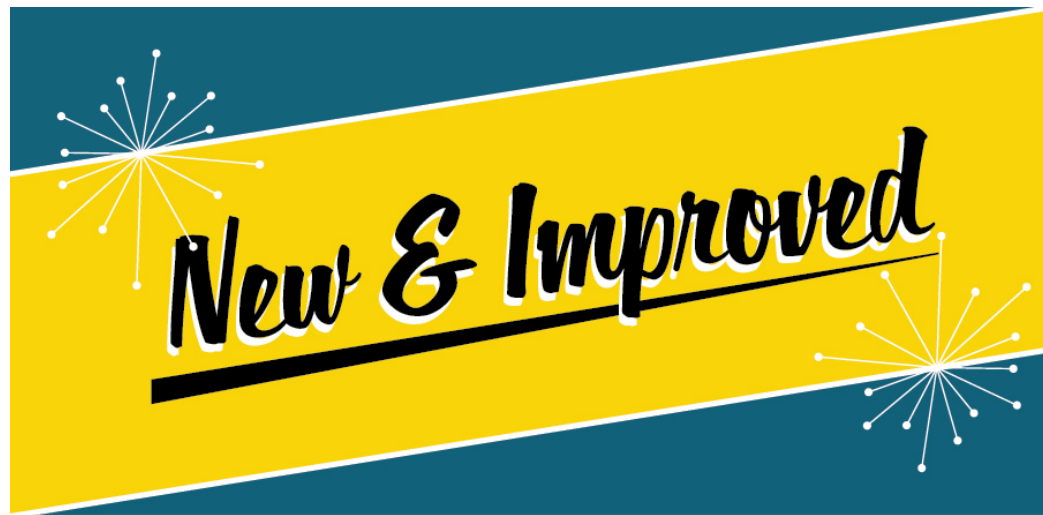
The results above assume that the region will continue to acquire energy efficiency savings as targeted in the Council's Sixth Power Plan, which amount to about 1,700 average megawatts through 2020. While no other resource acquisitions are required to maintain adequacy through 2020, the region will likely 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.

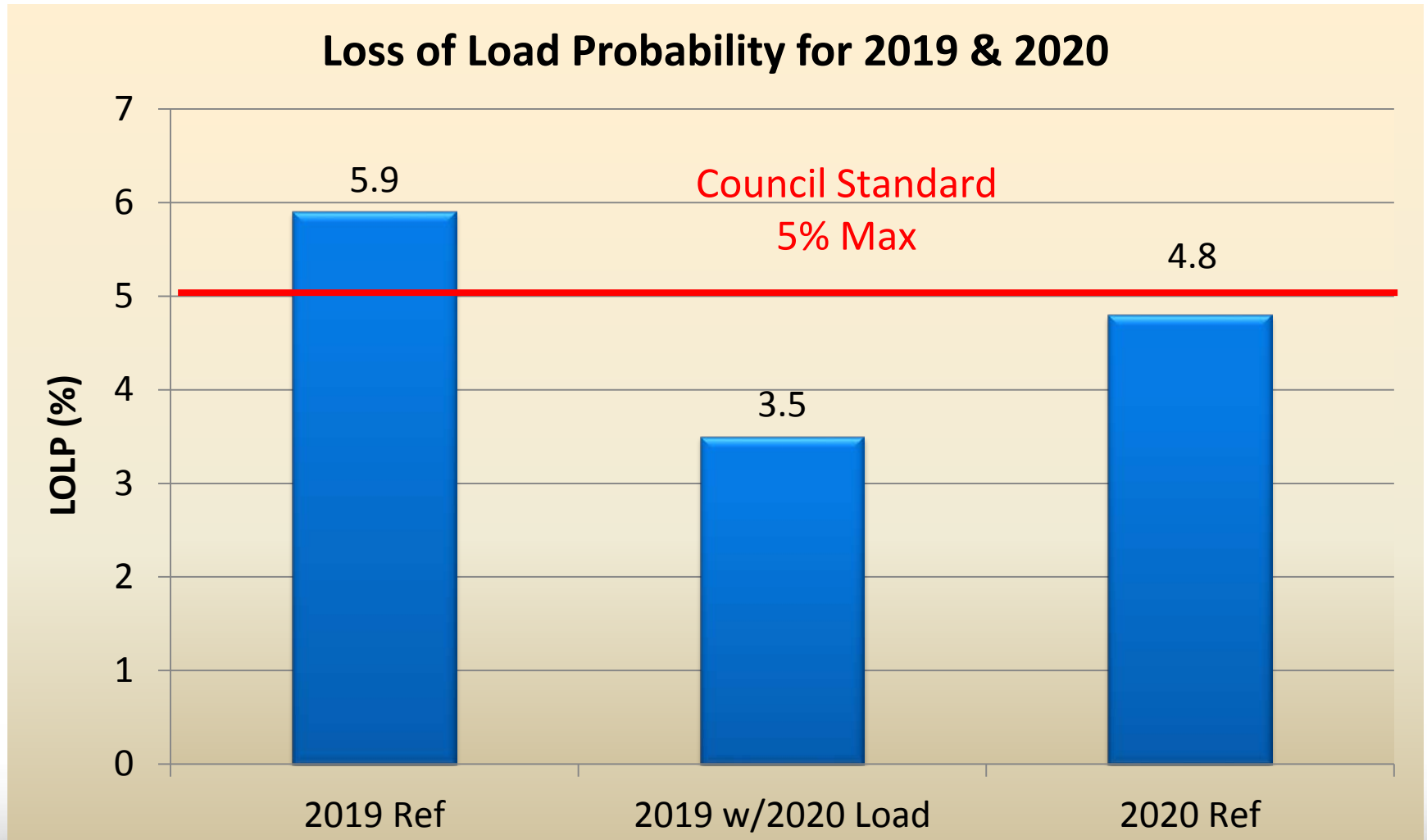
This analysis only counts existing resources and those that are sited and licensed. Northwest utilities, as reported in the Pacific Northwest Utilities Conference Committee's 2015 Northwest Regional Forecast show a combined 900 megawatts of planned generating capacity over the next 10 years. But as conditions 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

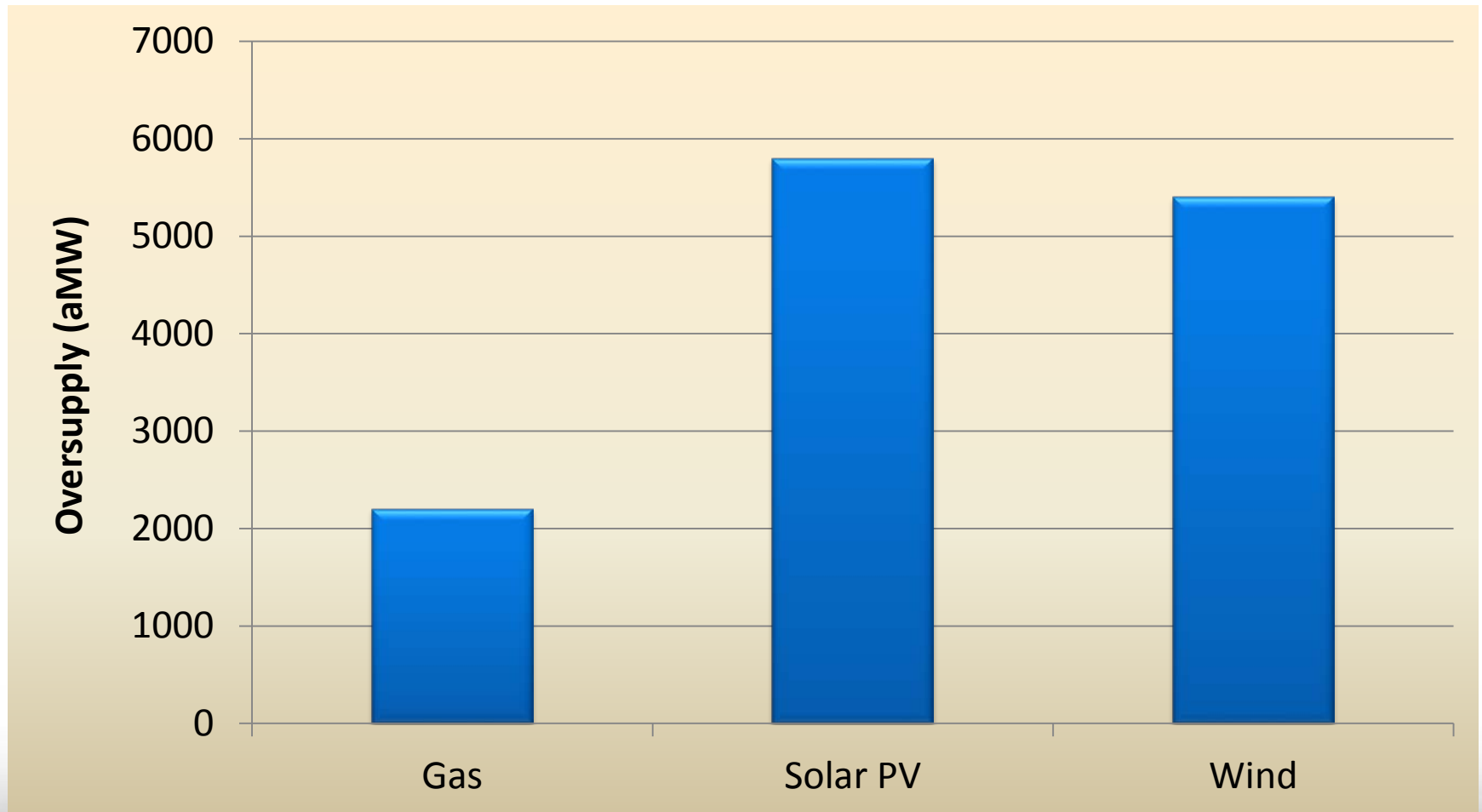
¹Generic means results of coal retirement over entire operating year.

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**