Northwest **Power** and **Conservation** Council

May 9, 2017

MEMORANDUM

TO: **Power Committee Members**

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

SUBJECT: **Update on Adequacy Assessment for 2021-22**

BACKGROUND:

Presenter: John Fazio

Summary: The Pacific Northwest's power supply is expected to be adequate through 2020. However, with the retirement Boardman and Centralia-1 coal plants in 2021 and the retirement of the Colstrip 1 and 2 coal plants in 2022, concern has risen sharply about the adequacy of the power supply in those years. The briefing today summarizes preliminary results of the adequacy assessments for both years.

Last year's adequacy assessment for 2021 indicated that, without additional actions, the power supply in that year would be inadequate with a loss of load probability (LOLP) of 10 percent (higher than the 5 percent maximum set by the Council in 2011). However, a number of things have changed since that assessment.

Major changes since last year's assessment include:

- A continuing decline in the overall demand for electricity
- A significant change in Canadian hydroelectric operations, which results in higher US hydroelectric generation in summer months and lower generation in October and November
- Verification that market supplies from California will continue to be fairly robust

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- An assumption to allow for California market availability in October (last year's assessment assumed no market was available)
- Codes and standards should save about 100 average megawatts in 2022
- Seventh Power Plan expected energy efficiency savings for 2022 are over 300 average megawatts

The net effect of the changes summarized above lead to a preliminary adequacy assessment of about 6.5 percent for 2022. The decline in LOLP for 2021 is a direct result of the shift in Canadian hydroelectric operations and allowing October to have access to the California market. For 2022, the loss of Colstrip 1 and 2 coal plants is effectively offset by expected energy efficiency savings and savings from new codes and standards.

It should be strongly noted, however, that the LOLP for both years can change significantly if either demand or market conditions change. For example, the 2022 LOLP can range from a low of less than 2 percent to a high of over 20 percent depending on future conditions (although those cases would be extremely rare).

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.5.2 Complete Annual Adequacy Assessments

Background: 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 Council makes this assessment every year, investigating the adequacy of the power supply five years into the future.

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

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

Preview of the 2021-22 Adequacy Assessment

NW Power and Conservation Council
Power Committee Meeting
May 16, 2017

Assumptions for 2021 Study

- Daily Hybrid Load Forecast
- SW Imports
  - Spot Market 2500 MW all hours Nov-Apr
  - Purchase Ahead 3000 MW all hours
- IPP
  - 2,653 MW Nov-Apr (fully available)
  - 1000 MW May-Oct
- 2014 Rate Case Hydro Regulation for 2021
- Boardman and Centralia 1 retired (1,330 MW)

LOLP Summary

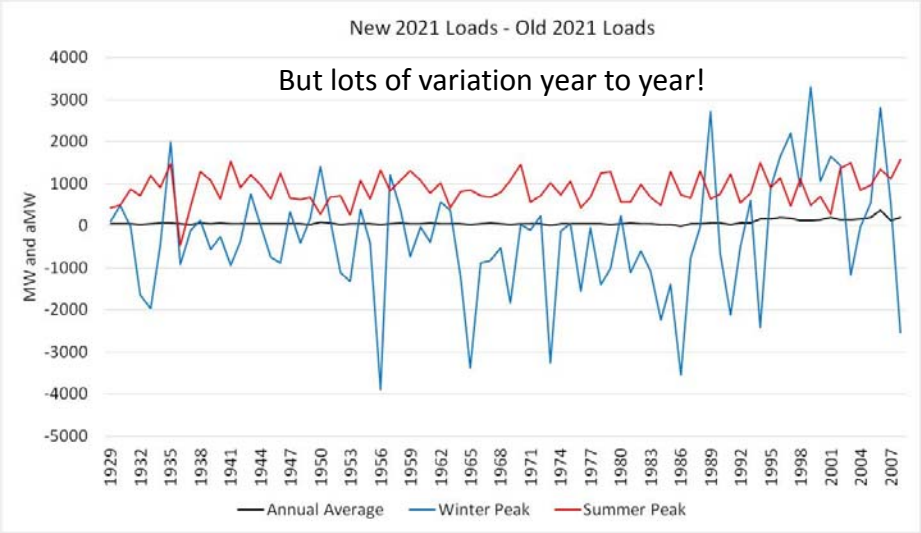
Year	LOLP	Notes
2021	**10%**	**Assessed in 2016**

Effects of updated Forecast for 2021

- **+74** aMW in annual average load
- **-300** MW in average winter peak
- **+870** MW in average summer peak

2021 Loads: 2017 vs. 2016 Forecast

(Avg. Annual +74 aMW, Avg. Winter Peak -300 MW, Avg. Summer Peak +870 MW)



Effect of new Load Forecast for 2021

Year	LOLP	Notes
2021	10%	Assessed in 2016
2021	**9%**	**Use new load forecast for 2021**

New Hydro Regulation

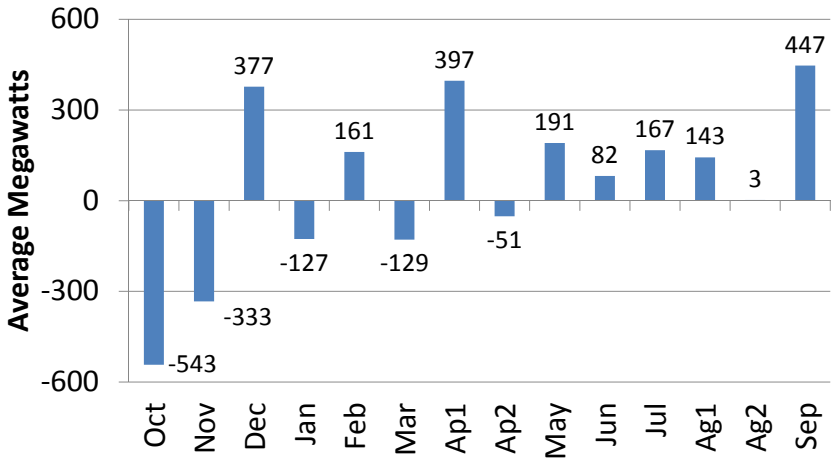
(2 changes)

1. Change in Canadian monthly outflows
   - Leads to different monthly inflows at US dams
   - October inflows are reduced significantly
   - Leads to lower hydro generation in October

2. Reduction in balancing reserves (INC/DEC)
   - Leads to an increase in sustained peaking capability in most months
   - Smaller effect overall than inflow change

Difference in Hydro Generation

(Due to Change in Canadian Outflows)



Effect of New Hydro Regulation

Year	LOLP	Notes
2021	10%	Assessed in 2016
2021	9%	Use new load forecast for 2021
2021	**10.2%**	**Add new hydro regulation**

Spot Market in October

- Use 50% of the winter spot market availability in October
- For this step, the October spot market is set to 1,250 MW

Effect of Spot Market in October

Year	LOLP	Notes
2021	10%	Assessed in 2016
2021	9%	Use new load forecast for 2021
2021	10.2%	Add new hydro regulation
2021	**5.9%**	**Add Oct spot market**

Moving from 2021 to 2022

- Already have new hydro regulation
- Two additional changes required:
  1. Resource retirements
     - Colstrip 1 and 2 retire (308 MW)
     - Pasco gas plant removed (44 MW)
  2. New load forecast for 2022

Effect of Removing Resources

Year	LOLP	Notes
2021	10%	Assessed in 2016
2021	9%	Use new load forecast for 2021
2021	10.2%	Add new hydro regulation
2021	5.9%	Add Oct spot market
2021	**8.2%**	**Remove Colstrip 1 and 2 (308 MW)**

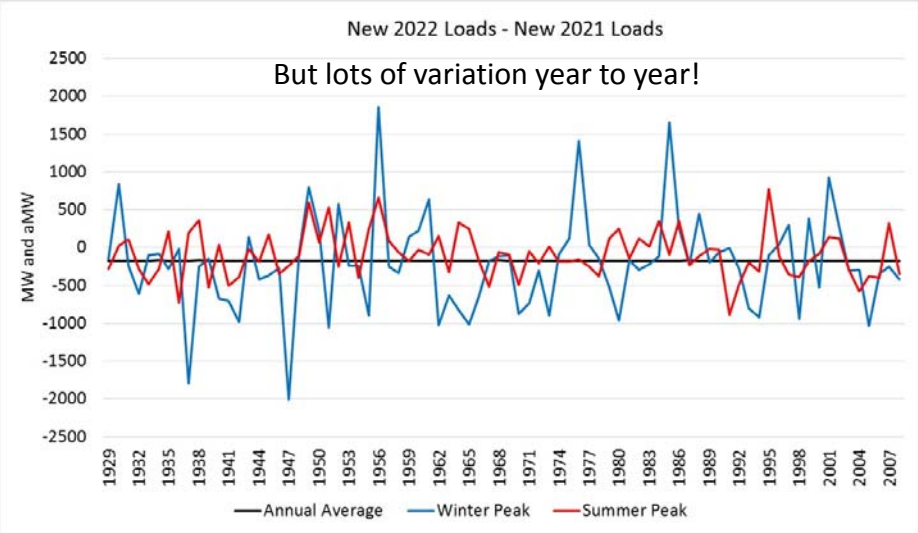
Changes in Load New 2021 to 2022

- **-175** aMW in annual average load
- **-219** MW in average winter peak
- **-89** MW in average summer peak

- EE and codes-and-standards savings already incorporated into 2022 loads above:
  - **317** aMW increase in EE energy savings
  - **100** aMW increase in codes and standards savings

2022 vs. New 2021 Avg. and Peak Loads

(Avg. Annual **-175** aMW, Avg. Winter Peak **-219** MW, Avg. Summer Peak **-89** MW)



Effect of Loads for 2022

Year	LOLP	Notes
2021	10%	Assessed in 2016
2021	9%	Use new load forecast for 2021
2021	10.2%	Add new hydro regulation
2021	5.9%	Add Oct spot market
2021	8.2%	Remove Colstrip 1 and 2 (308 MW)

2022	**6.3%**	**Replace 2021 with 2022 load forecast**

Spot Market Assumptions

- In 2014, Energy GPS report showed SW surplus to be greater than the S-to-N transfer capability in all months
- Using the AURORAxmp model, BPA reached the same conclusion (results on next slide)
- Data supports increasing import availability
- However, some members are apprehensive about relying more on the market
- Adding 50% of market to October was Okayed

Effect of Increasing Spot Market

Year	LOLP	Notes
2021	10%	Assessed in 2016
2021	9%	Use new load forecast for 2021
2021		Add new hydro regulation
2021	5.9%	Add Oct spot market
2021	8.2%	Remove Colstrip 1 and 2 (308 MW)

2022	6.3%	Replace 2021 with 2022 load forecast
2022	**5.3%**	**Increase spot market to 3000 MW**
2022	**4.8%**	**Increase spot market 3400 MW**
2022	**4.7%**	**Increase spot market 3675 MW**

2022 LOLP Heat Map (%)

Import ➡ / Load ⬇	3675	3400	3000	2500	2000	1500	0
+3.2%		15.8	16.5	18.4	20.7		
Med	4.7	4.8	5.3	6.3	7.5	9.9	20.7
-2.8%		1.5	1.9	2.4	3.1		

Expanded LOLP Heat Map

(Med-High and Med-Low values are linearly interpolated)

Winter Spot Market

Load	3400	3000	2500	2000
High	15.8	16.5	18.4	20.7
Med-High	10.3	10.9	12.4	14.1
Med	4.8	5.3	6.3	7.5
Med-Low	3.2	3.6	4.4	5.3
Low	1.5	1.9	2.4	3.1

Summary

- 2021 LOLP = 5.9%
  - New load forecast
  - New hydro regulation, including sustained peak
  - Add 1,240 MW spot market in October
  - 2021 without Colstrip 1 & 2 LOLP = 8.2%
- 2022 LOLP = 6.3%
  - Retire Colstrip 1 and 2 and Pasco (352 MW)
  - Downward trend in demand
  - 317 aMW of EE and 100 aMW codes & standards
- LOLP values can change significantly depending on future demand and availability of market availability. However, the LOLP is more sensitive to load variations than to SW market variations

RAAC Comments

- Many members felt the spot market assumptions may be conservative, but the RAAC lacked sufficient analyses to justify changing the reference assumption; however, some members felt the spot market assumptions were appropriate given the context in which they are used in the GENESYS model for the adequacy assessment.
- Many members felt the load forecast had some characteristics that raised concern, particularly the relationship between the forecast average load and the forecast peak load; the members felt these concerns could be handled through additional sensitivity studies.