MEMORANDUM

TO: Power Committee Members

FROM: John Fazio, Senior Systems Analyst

SUBJECT: 2019 Adequacy Assessment and the 6th Power Plan Strategy

BACKGROUND:

Presenter: John Fazio, NWPCC (jfazio@nwcouncil.org, 503-222-5161)

Summary: The 6th power plan resource strategy calls for little new thermal resource development in the early years. Between 2010 and 2019, the plan calls for a maximum of 400 megawatts of new gas-fired generation in the most extreme future. However, in most other futures, little or no gas-fired generation is needed. The 2019 resource adequacy assessment, however, shows a need for about 1,500 megawatts of new dispatchable generation through 2019 in order to maintain an adequate supply. This discrepancy has led some to ask whether the 6th Plan resource strategy provides for an adequate power supply.

This presentation reviews the differences between the computer models and input assumptions that the Council used to develop the 6th Plan’s twenty-year resource strategy and its most recent five-year adequacy assessment. Since both the time frame and goal of the Council’s plans and its resource adequacy assessments are different the models used for these two analyses have different capabilities and functions. For example, the Council’s resource portfolio model (RPM) compares the economic cost and risk of alternative resource plans in quarterly time steps while the Council resource adequacy assessment model (GENESYS) compares hourly loads with available resources, regardless of the cost to operate those resources.
Staff compared the 6th Plan’s resource strategy with the 2019 Resource Adequacy Assessment to ascertain the reason for the difference between their findings regarding the anticipated need for near term resource development. Staff found that the key factor behind the difference in conclusions regarding the need for additional thermal generation in the 2014-2019 timeframe is the assumption made in each model regarding the amount of power imports available from California. The 6th Plan’s resource strategy was built on the assumption that 6,000 megawatts of imports were available in every hour of every month. In contrast, the 2019 Resource Adequacy Assessment (RAA) assumed only 2,500 megawatts of power imports were availability during the peak winter hours and no power imports were availability during the peak summer hours. The RAA also assumed that 3,000 megawatts of power imports were available during off peak hours.

This difference in the assume limit on power imports from outside the region is the sole cause of the disparity in results between the findings from 6th Plan and the 2019 RAA. This difference also highlights a key policy questions that will need to be addressed during the development of the Council’s Seventh Plan. That is, how much should the region rely on imports from outside the region? The resource adequacy model (GENESYS) can be used to determine the frequency and magnitude of resource shortages. In the 2019 RAA, over half of the resource shortfalls are less than four hours in duration. Once the frequency and magnitude of these resource shortfalls are estimated, the resource portfolio model (RPM) can be used to quantify the tradeoff between the cost and risk of reliance on power imports versus regional generation development to determine whether it makes more sense to rely on the market or build new peaking units that would only run a few hours per year.

Relevance: The Council’s resource strategy serves as a blueprint for regional generating resource and energy efficiency resource acquisitions. The 2019 RAA, however, implies a different pace of generating resource development in the early years than the strategy put forth in the Council’s 6th Plan. This discrepancy must be resolved in order to send the correct message to the Bonneville Power Administration and other regional utilities as they develop their integrated resource plans.

Work Plan: B. Assess adequacy for 2019

Background: The 6th Power Plan resource strategy (released in 2010) included an aggressive acquisition of energy efficiency savings but also indicated that not all load growth could solely be offset with efficiency measures. The strategy showed little thermal resource need through the first 9 years of the plan (through 2019). The 2019 adequacy assessment (released in
May of 2014), on the other hand, indicated that about 1,500 megawatts of thermal resource additions would be needed between 2010 and 2019 in order to maintain an adequate supply. This presentation discusses why these two conclusions differ and what key policy question must be answered for the development of the 7th plan.

http://www.nwcouncil.org/media/6344/SixthPowerPlan_Ch10.pdf
2019 Adequacy Assessment and the 6th Power Plan Strategy

Are the Messages the Same?

Outline

1. Differences between GENESYS and RPM
2. Implied GENESYS build out to 2019
3. 6th plan build out to 2019
4. Why is there a difference?
5. Conclusions
Differences: Genesys vs. RPM

- **Genesys**
  - Assesses power supply adequacy for 1 year
  - For a specific resource mix
  - Hourly time step

- **RPM**
  - Calculates average cost and tail-end cost
  - For various resource plans over 20 years
  - Quarterly time step

<table>
<thead>
<tr>
<th>Item</th>
<th>GENESYS</th>
<th>RPM</th>
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<tbody>
<tr>
<td>Study Period</td>
<td>1 Year</td>
<td>20 Years</td>
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<tr>
<td>Simulation Time Step</td>
<td>Hourly</td>
<td>Quarterly</td>
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<tr>
<td>Hydro simulation</td>
<td>Project specific</td>
<td>Aggregate</td>
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<tr>
<td>Thermal</td>
<td>Project specific</td>
<td>Aggregate</td>
</tr>
<tr>
<td>Long-term load growth</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Resource expansion</td>
<td>No</td>
<td>Yes</td>
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<tr>
<td>Winter peak import limit</td>
<td>2,500 MW</td>
<td>6,000 MW</td>
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<tr>
<td>Winter off-peak limit</td>
<td>3,000 MW</td>
<td>6,000 MW</td>
</tr>
<tr>
<td>Summer on-peak</td>
<td>0 MW</td>
<td>6,000 MW</td>
</tr>
<tr>
<td>Summer off-peak</td>
<td>3,000 MW</td>
<td>6,000 MW</td>
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<tr>
<td>Generating Resources</td>
<td>Current Database</td>
<td>2009 Database</td>
</tr>
</tbody>
</table>

Most critical difference
### Uncertainties Modeled

<table>
<thead>
<tr>
<th>GENESYS</th>
<th>RPM</th>
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<tbody>
<tr>
<td>Hydro – Current BiOp, 80 water years</td>
<td>Hydro – 2008 BiOp, 70 water years</td>
</tr>
<tr>
<td>Wind – Hourly, temperature correlated</td>
<td>Wind – Fixed</td>
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<td>Forced Outages</td>
<td>Forced Outages</td>
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<tr>
<td>Temperature (load variation)</td>
<td>Long-term load growth</td>
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<td></td>
<td>Fuel prices</td>
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<td>Carbon tax</td>
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<td>Tax credits</td>
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<td></td>
<td>Construction costs/delays</td>
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<tr>
<td></td>
<td>Technology improvements</td>
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<tr>
<td></td>
<td>Aluminum prices</td>
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<tr>
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<td>Energy efficiency costs/delays</td>
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</tbody>
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### RPM vs. GENESYS Loads

1. Sample of 11 futures out of 750
2. Genesys load seems low because it includes EE savings while RPM loads do not
**Annual Efficiency Achievements and 6th Plan Targets in Genesys Load**

- **Graphical Data:**
  - **Y-axis:** Annual Savings (GW)
  - **X-axis:** Years (2005-2019)
  - **Legend:**
    - Target
    - Actual
  - **Trend:** Bar graph showing annual savings over the years, with target and actual values.

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**2019 Adequacy Assessment**

*(Peak Curtailment Probability Curve)*

- **Graphical Data:**
  - **Y-axis:** Curtailment (MW)
  - **X-axis:** Probability of Exceeding (%)
  - **Legend:**
    - With Standby
    - With no Standby
  - **Trend:** Curve showing curtailable load with standby vs. without standby, indicating LOLP values:
    - With Standby: LOLP = 5.9%
    - With no Standby: LOLP = 8.3%
Getting to a 5% LOLP

LOLP = 5.0% (with Standby)

LOLP = 5.9%

400 MW of Dispatchable Capacity Brings LOLP to 5%¹

¹A full scenario was run with 400 MW of add'l CT capacity to verify

Generating Resource Additions Actual and Planned

Changes 2010-16
Natural Gas Additions = 1,153 MW
Wind Additions = 4,221 MW
Other = 252 MW
Regional Resource Adequacy
Council Standard: LOLP Maximum is 5%

- 1,553 MW of New Gas-fired capacity from 2010-19

<table>
<thead>
<tr>
<th>Operating Year</th>
<th>Changes 2010-15</th>
<th>Changes 2016-19</th>
<th>+400 MW Leads to 5% LOLP</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>Load = 650 MWa</td>
<td>Load = 520 MWa</td>
<td></td>
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<tr>
<td></td>
<td>Gas = 493 MW</td>
<td>Gas = 660 MW</td>
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<td></td>
<td>+other changes</td>
<td>+other changes</td>
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<tr>
<td>2015</td>
<td>5%</td>
<td>6%</td>
<td>+400 MW</td>
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<tr>
<td>2019</td>
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- 1,550 MW (built or planned)
- 400 MW (new)
- 1,550 MW

Why the difference?

Why the difference?

- GENESYS
  - 2010-17: 1,150 MW (built or planned)
  - 2018-19: 400 MW (new)
  - 2010-19 Total: 1,550 MW

- RPM
  - Average build out 3 MW by 2019
  - Max build out 400 MW by 2019

1 Wind has little effect on LOLP
2 To get to a 5% LOLP by 2019
3 From the 6th plan L831g scenario
**Answer: Import Assumptions**

![Import Probability Curves](image)

- Sixth Plan annual average imports 2011-2019
- Est. GENESYS Imports

**Increasing Imports in Genesys Reduces the Need to Build**

![Graph showing LOLP vs. SW Import](image)

\[ y = 4E-07x^2 - 0.003x + 10.471 \]
\[ R^2 = 0.9957 \]

Increasing the Winter On-peak Import limit from 2,500 to 3,600 MW results in a 5% LOLP
**Conclusions**

1. GENESYS and RPM address different issues

2. **Key differences**
   a. Import assumptions (6,000 vs. 2,500 MW)
   b. Dispatch time step (Quarterly vs. Hourly)

3. **Key policy question for 7th plan:**
   Given that most curtailments are of short duration, is it better to rely on the market (with its inherent risks) or to invest in peaking resources (including DR)?