Briefing on 2022-23 Adequacy Analysis and Report

NW Power and Conservation Council
ETAC Meeting
May 24, 2018
Outline

• How does the Council assess resource adequacy?
  • GENESYS computer model
  • Loss of load probability

• 2023 Resource Adequacy Assessment
  • Coal retirements put region into inadequate range (LOLP > 5%)
  • Utilities are prepared – planned resources
  • Which months are most likely to see curtailments?
What is GENESYS

• A computer model that simulates the operation of the regional power system on an hourly basis

• For a single year (8760 hours)

• Thousands of times with different combinations of future unknowns\(^1\)
  • River flows
  • Temperatures
  • Wind generation
  • Forced outages

\(^1\)This is commonly referred to as a Monte-Carlo program.
Transmission in GENESYS

- NW region includes:
  - East (E)
  - West (W)
- Solid lines indicate transmission into and out of the region
- Not a power-flow analysis
- East/west transmission capability varies based on BPA data
- Southern interties have fixed transfer capability
- SW modeled as import market only
Simulated Hourly Dispatch
(typical January week)
Simulated Dispatch Order
(6am January weekday)

Simulated Order of Resource Dispatch (January)

- Market (out of region)
- Market (mixed gas and coal)
- Coal (higher heat rate)
- Gas - GT (higher heat rate)
- Coal (lower heat rate)
- Gas - GT (lower heat rate)
- Coal - Centralia (PSE)
- Gas - CCCT
- Hydro
- Nuclear
- Wind

6am demand

Megawatts

0 5000 10000 15000 20000 25000 30000
Assessing Resource Adequacy

- Run every combination of temperature and streamflow (80 times 88 = 7,040)

- Count only existing resources or those that are sited and licensed

- EE is built into the load forecast

- Count the number of simulations (games) that have at least one curtailment
Loss of Load Probability

7040 Simulations

Out of 7040 simulations, 352 had curtailment events (red bins)

Loss of Load Probability (LOLP) = 352/7040 = 5 percent
2023 Resource Adequacy Assessment

- **LOLP** Max for adequacy 5%
  - 2018-20 < 5%
  - 2021 6+%
  - 2022 7%
  - 2023 7%
  1330 MW retired: Boardman, Centralia 1
  479 MW retired: Colstrip 1 & 2, Pasco and N Valmy 1
  No major resource change

- **Need**
  ≈ 300 MW by **2021** (range 0 to 750 MW)
  300 to 400 MW by **2022** (range 0 to 750 MW)

- **Available**
  ≈800 MW of dispatchable + ≈400 MW of DR

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1 Capacity need is based on generic CT additions. Low-end need assumes low load and high SW imports and high-end need assumes high load and low SW imports.

2 Available dispatchable capacity for 2021 is taken from the 2018 PNUCC NRF. The 400 MW of demand response is the remaining part of the 600 MW of estimated availability for 2021 from the Council’s 7th power plan.
The “3000 MW import” case represents the maximum amount of market import capability from California. This is based on the Bonneville Power Administration’s recommendation to use 3400 MW as the maximum S-to-N transfer capability for the transmission interties and accounts for approximately 400 MW of space required for firm capacity imports.
2023 Estimated\(^1\) Capacity Need (MW)

<table>
<thead>
<tr>
<th>SW Import (MW)</th>
<th>1500</th>
<th>2000</th>
<th>2500</th>
<th>3000</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Load (+2%)</td>
<td>1650</td>
<td>1500</td>
<td>1100</td>
<td>600</td>
</tr>
<tr>
<td>Med Load</td>
<td>1400</td>
<td>1050</td>
<td>650</td>
<td>50</td>
</tr>
<tr>
<td>Low Load (-2%)</td>
<td>950</td>
<td>550</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

\(^1\)The amount of additional capacity needed in 2023 to maintain adequacy (i.e. an LOLP of 5%) is estimated by using a surrogate dispatchable resource, in this case a combined cycle combustion turbine. GENESYS studies were run for the “2500 MW import medium load” case and for the “1500 MW import high load” case to estimate nameplate capacity needed to get to 5% LOLP. Other values were estimated using linear interpolation and are rounded to the nearest 50 MW.
## Potentially Available Resources

### 2018 NRF Planned Resource Nameplate Capacity

<table>
<thead>
<tr>
<th></th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar</td>
<td>0</td>
<td>266</td>
<td>266</td>
</tr>
<tr>
<td>Hydro</td>
<td>28</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>Wind</td>
<td>540</td>
<td>540</td>
<td>540</td>
</tr>
<tr>
<td>Generic/Gas</td>
<td>809</td>
<td>809</td>
<td>809</td>
</tr>
<tr>
<td>Battery</td>
<td>39</td>
<td>39</td>
<td>89</td>
</tr>
<tr>
<td><strong>Total Nameplate</strong></td>
<td><strong>1416</strong></td>
<td><strong>1682</strong></td>
<td><strong>1732</strong></td>
</tr>
<tr>
<td>Firm Capacity(^1)</td>
<td>930</td>
<td>1000</td>
<td>1050</td>
</tr>
<tr>
<td>Demand Response(^2)</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
</tbody>
</table>

\(^1\)Firm capacity is the amount of capacity that can be counted on for planning reserve margin calculations. It is often referred to as the effective load carrying capability (ELCC). See the last 2 slides for more detail.

\(^2\)Available DR for 2021 is taken from the 7\(^{th}\) power plan.
2023 Monthly LOLP\(^1\)

![Bar chart showing LOLP values for each month]

<table>
<thead>
<tr>
<th>Month</th>
<th>LOLP (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct</td>
<td>0.2</td>
</tr>
<tr>
<td>Nov</td>
<td>0.1</td>
</tr>
<tr>
<td>Dec</td>
<td>2</td>
</tr>
<tr>
<td>Jan</td>
<td>3.3</td>
</tr>
<tr>
<td>Feb</td>
<td>1.5</td>
</tr>
<tr>
<td>Jun</td>
<td></td>
</tr>
<tr>
<td>Jul</td>
<td></td>
</tr>
<tr>
<td>Ag1</td>
<td></td>
</tr>
<tr>
<td>Ag2</td>
<td></td>
</tr>
<tr>
<td>Sep</td>
<td>0.1</td>
</tr>
</tbody>
</table>

\(^1\)Sum of monthly LOLP values is equal to or greater than the annual LOLP value because monthly curtailments are generally independent.