Real Time Operations:
Synchronized Reserves
Operations Needs

• Synchronized Reserves must be:
  – Accurately calculated (unit level and in aggregate):
    • Emergency/Shortage vs Normal Operations
  – Dependable:
    • Respond when called to ensure DCS compliance and ACE recovery
  – Deliverable:
    • Not bottled by wide area IROLs or other system constraints
• Tier 2 calculated and assigned based on Gen Owner submitted parameters:
  – Tier 2 reserve for online units = (ramp rate X 10), capped at spin/eco max

• Tier 1 estimate is not based solely on Gen Owner submitted unit parameters:
  – Ramp rates clamped down (DGP)
  – Resource classes removed (hydro, energy storage, CC units without spin max < eco max)
  – Historic consistent poor performers made ineligible
  – Current OC 2018 work efforts
    • Lesser of spin vs eco max in SCED
    • Removal of spin ramp rates
Dependability

- As reported at the OC March 6th
  - 2017 Tier 1 response rate: 66%
  - 2017 Tier 2 response rate: 98%

- 2018 Tier 1 performance year to date:

<table>
<thead>
<tr>
<th>Date</th>
<th>Start Time</th>
<th>End Time</th>
<th>Duration</th>
<th>Region</th>
<th>Tier 1 Estimate (MW)</th>
<th>Tier 1 Response (MW)</th>
<th>Response Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/2018</td>
<td>2:41</td>
<td>2:48</td>
<td>0:07</td>
<td>RTO</td>
<td>1135</td>
<td>668</td>
<td>58.8%</td>
</tr>
<tr>
<td>1/3/2018</td>
<td>3:00</td>
<td>3:13</td>
<td>0:13</td>
<td>RTO</td>
<td>1896</td>
<td>509</td>
<td>26.8%</td>
</tr>
<tr>
<td>1/7/2018</td>
<td>14:15</td>
<td>14:24</td>
<td>0:09</td>
<td>RTO</td>
<td>2513</td>
<td>850</td>
<td>33.8%</td>
</tr>
<tr>
<td>4/12/2018</td>
<td>13:28</td>
<td>13:38</td>
<td>0:10</td>
<td>RTO</td>
<td>1063</td>
<td>591</td>
<td>55.6%</td>
</tr>
</tbody>
</table>
• Analysis of the Top 10 worst Tier 1 performers per event this year:

<table>
<thead>
<tr>
<th>Synch Reserve Event</th>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
<th>#5</th>
<th>#6</th>
<th>#7</th>
<th>#8</th>
<th>#9</th>
<th>#10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/1/2018</td>
<td>Unit A</td>
<td>Unit B</td>
<td>Unit C</td>
<td>Unit D</td>
<td>Unit E</td>
<td>Unit F</td>
<td>Unit G</td>
<td>Unit H</td>
<td>Unit I</td>
<td>Unit J</td>
</tr>
<tr>
<td>1/3/2018</td>
<td>Unit I</td>
<td>Unit K</td>
<td>Unit L</td>
<td>Unit M</td>
<td>Unit N</td>
<td>unit O</td>
<td>Unit P</td>
<td>Unit Q</td>
<td>Unit R</td>
<td>Unit S</td>
</tr>
<tr>
<td>1/7/2018</td>
<td>Unit T</td>
<td>Unit U</td>
<td>Unit V</td>
<td>Unit W</td>
<td>Unit X</td>
<td>Unit H</td>
<td>Unit Y</td>
<td>Unit Z</td>
<td>Unit AA</td>
<td>Unit BB</td>
</tr>
<tr>
<td>4/18/2018</td>
<td>Unit CC</td>
<td>Unit DD</td>
<td>Unit E</td>
<td>Unit EE</td>
<td>Unit FF</td>
<td>Unit GG</td>
<td>Unit HH</td>
<td>Unit D</td>
<td>Unit II</td>
<td>Unit JJ</td>
</tr>
</tbody>
</table>

- (24) Under-performer for this event only
- (4) Under-performer in 2 of the 4 events
- (1) Under-performer in 2 of the 4 events, but an over-performer in another event
- (8) Over-performer in 1 of the 4 events

- Tier 1 Unit specific over or under performance is **not consistent** from event to event
- No obligation to respond = no consistency in response
Deliverability

- **Dynamic Interface:**
  - Ensures IROLs will not be violated when assigning reserves.
- **Lack of ability to consider non-IROLs** (actual overloads, severe contingency overloads, etc.)