2013
Integrated Resource Plan
Conservation Voltage Reduction Project Update
Resource Adequacy Workshop
Portfolio Case Development Comment Update

August 2, 2012
Agenda

• Conservation Voltage Reduction Project Update
• Resource Adequacy Workshop
  – Planning Reserve Margin
  – Load and Resource Balance
• Lunch Break (1/2 hour) 11:30 PT / 12:30 MT
• Portfolio Case Development Comment Update
CONSERVATION VOLTAGE REDUCTION PROJECT UPDATE
CVR In a Nutshell

- First flatten voltage profile, then lower it
- Reduced energy use from some customers
- Δ Energy = Factor x Δ Voltage

Example:
- Factor in Yakima ≈ 0.4
- Take a 20,000 MWh/year circuit at 122 average volts
- Lower the average volts to 121 and expect 19,934 MWh/year
Washington CVR Pilot

- 2011: Tier 1 study completed (19 circuits)
  - Minimal improvements recommended
    - Phase balance, adjust regulator settings
  - Identified four pilot circuits
    - Estimating 225 MWh/circuit/year savings (0.7%)
    - Estimating $60k/circuit for improvements, M&V

- 2012: Tier 2 study due Q3 (25 circuits)
- 2013: projects not yet scoped
Predicted Savings

• $\Delta$ Energy = Factor $\times$ $\Delta$ Voltage

Measurement accuracy: some control (choice) ($\pm 0.65\%$ from actual watt-hour value)

This puts us near the “feasible” boundary for measure/verify, even assuming that Simplified Protocol voltage calculations and factors are 100% accurate
Measurement & Verification (M&V)

- Two pilot meter poles shown
- Data downloaded daily
- 15-minute average end-of-line voltage is not linear with loading (Simplified Protocol assumes it is linear)

![Graph showing MVA vs. End-of-Line A Phase Voltage for Pilot Circuit 1 (4/30/12 to 5/15/12)]

\[ R^2 = 0.32 \]
Lessons Learned

• Study concludes our existing practices are very good
  – Many circuits are not viable due to low voltage settings, low energy usage, etc.

• Complex analysis is still required for accurate ΔE prediction

• Accurate M&V appears infeasible for circuits with small ΔE

• System improvements are a small fraction of the total project costs
Our 2011 IRP Commitments

• Presented WA findings to OR, UT, WY, ID commission staffs early this year
• 40% of circuits in major states (780) to be screened in 2012 (on schedule)
• 60% of circuits in major states (1,167) to be screened in 2013 (on schedule)
• 2013 IRP to include CVR plan that takes into account all findings
Going Forward

- File WA energy savings for 2012
- Complete WA Tier 2 study
- High level screening in OR, UT, WY, ID
- Prioritize any future projects
- Collaborate on RTF protocol revisions
  - Especially for measurement and verification alternatives
Resource Adequacy Workshop

Planning Reserve Margin
Load and Resource Balance
Workshop Objectives

• Provide background and history on the Planning Reserve Margin (PRM) as a reference point for discussions
• Establish a PRM selection framework that will be accepted by all state commissions in future IRP acknowledgment proceedings
What are Planning Reserves?

- Generating *capacity* needed to cover both short and long-term uncertainty in loads and resources

<table>
<thead>
<tr>
<th>Timescale of Uncertainty</th>
<th>Load Uncertainty</th>
<th>Resource Uncertainty</th>
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<tbody>
<tr>
<td>Short-term</td>
<td>Minute-to-minute variability and forecast accuracy (regulating/following reserves)</td>
<td>Minute-to-minute variability and forecast accuracy (regulating/following reserves)</td>
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<tr>
<td>(Sub-hourly to Hourly)</td>
<td>(regulating/following reserves)</td>
<td>Contingency events (contingency reserves, spin and non-spin)</td>
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<tr>
<td></td>
<td>Forecast accuracy (economic conditions &amp; load growth, new customer loads)</td>
<td>Availability (unplanned outages)</td>
</tr>
<tr>
<td></td>
<td>Weather (extreme weather events)</td>
<td></td>
</tr>
<tr>
<td>Long-term</td>
<td>Forecast accuracy (economic conditions &amp; load growth, new customer loads)</td>
<td>New resources (acquisition lead time)</td>
</tr>
<tr>
<td>(Monthly to Annually)</td>
<td>(regulating/following reserves)</td>
<td>Existing resources (regulatory uncertainty)</td>
</tr>
<tr>
<td></td>
<td>Weather (extreme weather events)</td>
<td>Markets (market depth, regulatory uncertainty, transmission)</td>
</tr>
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</table>
Planning Reserves in the Context of an IRP

• Planning reserves formula:

\[
\text{Reserves} = (\text{Obligation} - \text{Firm Purchases} - \text{Class 1 DSM} - \text{Firm Interruptible Load}) \times \text{PRM} + \text{Non-owned reserves}
\]

“Non-owned reserves” are reserves held for resources owned by other parties located in a PacifiCorp Balancing Authority Area

• PRM percentage established to provide sufficient reserve capacity for managing load and resource uncertainty
  – Applied as an incremental \textit{capacity} obligation at time of system coincident peak
  – At a minimum, planning reserves must cover short-term uncertainty captured in reliability requirements (contingency, regulation)
  – Stakeholder disagreement regarding the value of reserves beyond minimum levels
PRM History in the IRP

- Prior to the 2007 IRP Update, PacifiCorp used a 15% PRM.

- For the 2008 IRP, PacifiCorp used a 12% PRM, but continued to evaluate resource needs at the 15% PRM level.

- In its 2008 IRP acknowledgment order, the Utah Commission stated that "we are concerned that a 12% planning reserve margin leaves little room for load forecast error", and recommended analysis, such as a LOLP study, to support this PRM level.

- 2011 IRP assumed a 13% PRM based on a LOLP study using a 1 day in 10 year reliability standard.
  - Oregon Commission and industrial customer groups not convinced that a 13% PRM is optimal.
Resources Used to Satisfy Incremental Planning Reserves (12% vs. 13% PRM)

- Based on a sensitivity test with the 2011 IRP preferred portfolio, increasing the PRM from 12% to 13% increased the annual capacity requirement by 74 MW on an average annual basis for 2012-2016

- Coincident peak load over this same period averages 11,279 megawatts before accounting for energy efficiency reductions

- Incremental load control and energy efficiency programs cover approximately 45 MW of the 74 MW of incremental obligation with a 13% PRM, and the remaining 29 MW need is met with firm market purchases

- The difference in obligation between the two PRM levels was not met with new thermal resources
PRM Level Benchmarking

- PRMs adopted by a representative set of utilities and electric reliability organizations

- 2011 study conducted for the NRRI stated that PRMs in the range of 12-18 percent was typical for “medium-to-large” systems (greater than 10,000 MW of load) ¹/

<table>
<thead>
<tr>
<th>Organization</th>
<th>Target Capacity Planning Reserve Margin (%)</th>
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<tbody>
<tr>
<td>Florida Power &amp; Light</td>
<td>20.0</td>
</tr>
<tr>
<td>Midwest ISO</td>
<td>17.4</td>
</tr>
<tr>
<td>Duke Energy Carolinas / Progress Energy Carolinas</td>
<td>17.0</td>
</tr>
<tr>
<td>Northern States Power</td>
<td>16.3</td>
</tr>
<tr>
<td>Public Service Company of Colorado</td>
<td>16.3</td>
</tr>
<tr>
<td>Louisville Gas and Electric Company (LG&amp;E) and Kentucky Utilities Company’s (KU)</td>
<td>16.0</td>
</tr>
<tr>
<td>California Load Serving Entities (regulatory requirement per D.04-01-050)</td>
<td>15-17</td>
</tr>
<tr>
<td>Tennessee Valley Authority</td>
<td>15.0</td>
</tr>
<tr>
<td>Avista Corporation</td>
<td>15.0</td>
</tr>
<tr>
<td>Southern Company / Georgia Power</td>
<td>15.0</td>
</tr>
<tr>
<td>San Diego Gas &amp; Electric</td>
<td>15.0</td>
</tr>
<tr>
<td>Nevada Power / Sierra Pacific</td>
<td>15.0</td>
</tr>
<tr>
<td>WECC</td>
<td>14.2</td>
</tr>
<tr>
<td>ERCOT</td>
<td>13.8</td>
</tr>
<tr>
<td>PacifiCorp</td>
<td>13.0</td>
</tr>
<tr>
<td>Public Service Company of New Mexico</td>
<td>13.0</td>
</tr>
<tr>
<td>Portland General Electric (2009 IRP)</td>
<td>12.0</td>
</tr>
<tr>
<td>Idaho Power</td>
<td>10.0</td>
</tr>
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WECC PRM Building Block Guideline

- Building block approach evaluates different types of resource planning uncertainty that load serving entities face.
- The WECC approach relies on four elements: contingency reserves, regulating reserves, reserves for additional forced outages and reserves for 1 in 10 weather events (90\(^{th}\) percentile).
WECC PRM Building Block Guideline

- PRMs by WECC sub-region (from November 2011 Power Supply Assessment report)

<table>
<thead>
<tr>
<th>Sub-Region</th>
<th>Zones Included in Sub-Region</th>
<th>Summer Margin</th>
<th>Winter Margin</th>
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</thead>
<tbody>
<tr>
<td>Canada</td>
<td>British Columbia, Alberta</td>
<td>12.4%</td>
<td>14.0%</td>
</tr>
<tr>
<td>Northwest</td>
<td>Pacific Northwest, Montana</td>
<td>17.9%</td>
<td>19.9%</td>
</tr>
<tr>
<td>Basin</td>
<td>Idaho, Northern Nevada, Utah</td>
<td>12.6%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Rockies</td>
<td>Colorado, Wyoming</td>
<td>14.7%</td>
<td>15.7%</td>
</tr>
<tr>
<td>Desert Southwest</td>
<td>Arizona, New Mexico, Southern Nevada</td>
<td>13.5%</td>
<td>14.0%</td>
</tr>
<tr>
<td>Northern California</td>
<td>Northern California, San Francisco, SMUD</td>
<td>14.7%</td>
<td>11.9%</td>
</tr>
<tr>
<td>Southern California</td>
<td>Southern California Edison, San Diego Gas &amp; Electric, LADWP, Imperial Irrigation District</td>
<td>15.1%</td>
<td>11.0%</td>
</tr>
<tr>
<td>Mexico</td>
<td>Comisión Federal de Electricidad (CFE)</td>
<td>11.9%</td>
<td>10.7%</td>
</tr>
<tr>
<td>WECC Total</td>
<td></td>
<td>14.6%</td>
<td>14.6%</td>
</tr>
</tbody>
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Proposed Planning Reserve Margin Selection Framework

• Refresh LOLP study (2014 test year) with two enhancements:
  – Use System Optimizer to determine portfolios using incrementally higher PRM values (10% base to 18%)
    • Model will be restricted to select simple-cycle and dispatchable load control resources to meet higher PRM values
  – Incorporation of NWPP reserve sharing in the model
• Simulate SO portfolios with Planning and Risk model
• Tools to inform PRM selection
  – To show reliability/cost impact relationship for the PaR runs, plot incremental Energy Not Served (ENS) at each PRM level against incremental portfolio PVRR (also consider plotting ENS hours, upper tail ENS hours)
  – Develop a PacifiCorp PRM based on the WECC building block guideline
• In the absence of general agreement on a PRM level, PacifiCorp will apply a 1 day in 10 years criterion to the LOLP study results to select a PRM
LOAD AND RESOURCE BALANCE
The second workshop should address the development of the company’s load and resource balances for both capacity and energy and the appropriate capacity planning reserve margin. The workshop should also address the development of an IRP action plan that identifies the contribution of each planned resource to the company’s capacity and energy balances. In PacifiCorp’s IRP it is often difficult to identify the contribution of each planned resource to the energy balance. Our overall concern is that it is difficult to identify how the planned resource actions are matched to meeting the capacity and energy needs of the company. We encourage PacifiCorp to continue to work with Staff and other parties to make improvements to its IRP in these key areas.

- Comments on how the Company conveys energy balances
- Comments on how the Company might improve energy balance reporting in the IRP
2011 IRP Energy Load & Resource Balance before New Resources

Figure 5.6 – System Average Monthly and Annual Energy Positions
Portland General Electric: Energy L&R Reporting Example

- Detailed one-year average megawatt “snapshot”

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<tbody>
<tr>
<td>PGE Load Before EE Savings (^1)</td>
<td>2,815</td>
<td>2,735</td>
<td>(79)</td>
</tr>
<tr>
<td>Remove 5-year Opt-Outs</td>
<td>(28)</td>
<td>(130)</td>
<td>(101)</td>
</tr>
<tr>
<td>Existing PGE &amp; Contract Resources</td>
<td>(1,834)</td>
<td>(1,836)</td>
<td>(2)</td>
</tr>
<tr>
<td>PGE Resource Target</td>
<td>952</td>
<td>770</td>
<td>(182)</td>
</tr>
</tbody>
</table>

**Resource Actions**

*Thermal:*
- CCCT: 406
- Combined Heat & Power: 2

*Renewable:
- ETO Energy Savings Target\(^2\): 247
- Existing Contract Renewal: 66
- 2015 RPS Compliance: 122

*To Hedge Load Variability\(^3\):*
- Short and Mid-Term Market Purchases: 100

*Total Incremental Resources:*
- 943
- 808 (135)

*Energy (Deficit)/Surplus:*
- (9)
- 38

*Total Resource Actions:*
- 952
- 770
Expand Representation of the Preferred Resource Portfolio on an Energy Basis?

• Sample Preferred Portfolio Energy Area Chart

- Shows energy in excess of obligation and reserves (sales)
PORTFOLIO CASE DEVELOPMENT
COMMENT UPDATE
Comments Received to Date

- Inventory of stakeholder comments on portfolio development provided as separate hand-out
- One party provided an alternate set of core cases; another proposed a BART compliance flexibility sensitivity study
- No other detailed proposals for stakeholder-defined core cases received
- The Company requests that proposals be provided by August 31, 2012