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# Proposed Methodology to Develop PNW Capacity Metric and Target

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**PNW Resource Adequacy Steering Committee Meeting**

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## Purpose of Capacity Metric and Target

- If PNW is Energy-Constrained, why do we need Capacity Metric & Target?
- The key Question: Is there any situation for which PNW utilities would add generation or demand-side resources because Machine Capability rather than Energy is needed to address Peak Capacity Needs?
- Capacity needed to meet Cold Snap Loads might constitute such a Situation, Today or in Future
- Possibility of Need for Summer Capacity increases as Biological Opinion constrains Hydro Generation, Region shifts more to Thermal Generation and Summer Peak Loads Increase
- Technical Committee members suggested Capacity Assessment be performed for both summer and winter adverse weather situations

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# Steering Committee Decisions on Form of Capacity Metric & Target

**Capacity Metric:** the sustained peaking capability of the power supply available to meet regional load, reserve requirements and for export during the peak load month in winter/summer

**Capacity Target:** the sustained peaking capability of the power supply over the sustained peak load of highest load month should be at least z% > peak load

**Z % could consist of:**

- y % Load Forecast & Adverse Load Uncertainty
- x % Outage Uncertainty
- 5 - 7% Contingency Reserve



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# Proposed Approach for Sustained Peaking Capacity Analyses

- Use Regional Model to validate Results of a Spreadsheet Analysis, such as Avista Sustained Peaking Capacity Analysis
- The Proposed Approach is similar to the linkage of a probabilistic assessment (i.e. GENESYS LOLP Analysis) to an annual load resource balance, which is the methodology already approved by the Steering Committee for the Energy Metric and Target
- What should the Regional Model be?

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## Possible Contenders for Regional Capacity Validation Model

- NWPCC's GENESYS Model
  - Need to Calibrate Model to ensure Hourly Modeling approximates hourly Load Shapes and Resource Operations, especially in a cold snap
- Vista Model, e.g. BPA's Columbia Vista Model
  - Logic and Data mostly complete for Columbia River Basin Hydro Power Facilities
  - No Modeling of West-Side Hydro Power
  - New Model—related models still under development
- BPA's HOSS Model
  - Logic and Data Limited to FCRPS
- Others?



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## Possible Spreadsheet Approaches for Regional Sustained Peaking Capacity Analyses

- Option 1:
  - Request Development of Sustained Peaking Capacity Analyses from:
    - BPA—for its Public Customer & DSI Loads
    - IOUs for its Load Service Obligations
    - Publics—for its non-BPA supplied Loads
  - NWPCC/BPA Aggregates Analyses to Regional Evaluation
- Option 2:
  - Request Entities with Hydro Storage to perform Sustained Hydro Capacity Analyses
  - NWPCC staff and/or BPA staff to perform Regional Sustained Capacity Analysis consistent with Methodology developed by Technical Committee
  - Technical Committee raised confidentiality concerns
- Other Options

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# Steps in Defining Methodology for Sustained Peaking Capacity Analysis

- Define Cold Snap Assumptions:
  - Decide whether to use:
    - Historical Cold Snap **(e.g. February 1989),** which would require updating Historical Loads to current Level of Development
    - Council's February 1989 loads to be used in Assessment
    - Formulate Adverse Temperature Magnitude and Duration Assumptions to simulate realistic Cold Snap
  - Decide what Loads should be used—current or future Level of Development
  - Define hours per day and number of days for which Sustained Peaking Capacity is needed probably based on regional Load Shape and Duration of Cold Snap—> Technical Committee decided that various timeframes should be investigated to understand which timeframe is most critical for Region
  - Define Reasonable Assumptions for the Availability of Out-of-Region Surplus Capacity and In-Region IPP Generation to meet Peak Capacity Needs in HLHs or to replace Energy in LLH; this Assumption should be consistent with Assumptions of LOLP Study linked to Energy Metric and Target Assessments



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# Avista Sustained Peak Estimate—2005

**Sustained Peak Period L&R Calculation Comparison**
**2005**

| Peak Period Considered | 1 -Hour | 4 -Hour | 8 -Hour | 12 -Hour | 24 -Hour | 72 -Hour | 168 -Hour | 336 -Hour |
|---|---|---|---|---|---|---|---|---|
| Load | | | | | | | | |
| Peak Load | (1,619) | (1,598) | (1,579) | (1,542) | (1,450) | (1,377) | (1,369) | (1,175) |
| 10% Contingency | (162) | (160) | (158) | (154) | (145) | (138) | (137) | (117) |
| Load Subtotal | (1,781) | (1,758) | (1,736) | (1,696) | (1,595) | (1,515) | (1,506) | (1,292) |
| Hydro Capability | | | | | | | | |
| Hydro @ 90% CI | 208 | 208 | 208 | 326 | 326 | 326 | 326 | 326 |
| Hydro Storage | 959 | 871 | 825 | 550 | 275 | 211 | 154 | 77 |
| River Freeze Up | (60) | (60) | (60) | (60) | (60) | (60) | (60) | (60) |
| *Hydro Subtotal* | *1,107* | *1,019* | *973* | *816* | *541* | *477* | *419* | *342* |
| Thermal Capability | | | | | | | | |
| Coyote Springs II | 308 | 308 | 308 | 308 | 308 | 308 | 308 | 308 |
| Colstrip | 222 | 222 | 222 | 222 | 222 | 222 | 222 | 222 |
| Rathdrum | 184 | 184 | 184 | 184 | 184 | 184 | 184 | 184 |
| Northeast | 69 | 69 | 69 | 69 | 69 | 69 | 69 | 69 |
| Kettle Falls | 62 | 62 | 62 | 62 | 62 | 62 | 62 | 62 |
| Boulder Park | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 |
| Fuel Delivery System Freeze Up | (30) | (30) | (30) | (30) | (30) | (30) | (30) | (30) |
| *Thermal Subtotal* | *839* | *839* | *839* | *839* | *839* | *839* | *839* | *839* |
| Contracts | | | | | | | | |
| Net Contracts | *139* | *139* | *139* | *139* | *139* | *139* | *139* | *139* |
| PGE Adjustment | 0 | 0 | 0 | 25 | 38 | 46 | 105 | 105 |
| PPM Wind @ 25% of Capacity | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 000 MW Spot Purchases | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Contracts Subtotal* | *139* | *139* | *139* | *164* | *177* | *185* | *245* | *245* |
| Net Position | 304 | 240 | 215 | 123 | (38) | (14) | (3) | 134 |

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## Steps in Defining Methodology for Sustained Peaking Capacity Analysis

- Define how to calculate Sustained Hydro Peaking Capacity:
  - Decide on Water Condition, e.g. Critical, Adverse or Average Hydro, or perhaps Historical Water associated with Cold Snap
  - Technical Committee decided to use 1937 Hydro, i.e. Critical Hydro
  - Do Run-of-River Hydro Facilities have any Flexibility to Generate more in Sustained Peaking Hours and less in Light Load Hours? →For most ROR, use installed capacity and the capacity factor over the specified peaking duration; fish constraints on Mid-C's may require reverse load factoring
  - For Hydro Projects with Storage, is there Sufficient Storage to allow Generation at High Capacity during Sustained Peaking Hours over the defined Duration of the Cold Snap? Are there other Constraints, Environmental or Physical, that constrain Reservoir Releases? Individual hydro utilities to provide sustained hydro for various timeframes
  - Hydro Projects located in Tandem on River System, especially a long system like Columbia River, need to consider Lag Times between Reservoirs
  - Decide if Cold Snap Temperature Conditions reduce Hydro Capability due to Freeze-Up of Side Streams Flows, or other issues



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## Steps in Defining Methodology for Sustained Peaking Capacity Analysis

- Define Sustained Thermal Capacity during Cold Snap:
  - Look to Terry Morlan's natural gas group to decide the likelihood that sufficient natural gas supplies will be available for both direct use and electricity generation needs during a cold snap.
  - Decide on capacity increases available in cold snap Evaluate whether the likelihood of forced outages is greater in a cold snap than under normal operating conditions
  - Evaluate the likelihood that gas-fired, coal and/or nuclear power plants down for maintenance outages can come back in time to help meet cold snap needs; only include nuclear and coal plants if it maintenance outages in the winter are a possibility
  - Technical Committee decided that capacity increases for some gas-fired units is likely to be offset by capacity decreases in coal and possibly other plants due to extreme temperatures

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## Steps in Defining Methodology for Sustained Peaking Capacity Analysis

- Define Sustained Wind Capacity Available to meet Peak Loads:
  - Should Estimate be based on Historical Wind Conditions
  - Is there any Probabilistic Analysis, which indicates the likelihood sustained wind capacity is available?
  - How might wind diversity in the Region increase Sustained Wind Peaking Capacity
  - Technical Committee adopted assumption for now → wind peaking capacity should be zero for a single hour duration but then ramp up to 20 percent for a 50-hour duration
- Is within-Region Deliverability more of an Issue in a Cold Snap, i.e. are Load Pockets likely? What about Deliverability of Surplus Out-of-Region Winter Capacity? For now ignore



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## Steps in Defining Methodology for Sustained Peaking Capacity Analysis

- Perform Regional Assessment using agreed upon In-Region Market Resources and Out-of-Region Surpluses
- Compare the results of the Regional Sustained Peaking Capacity Assessment under a Cold Snap to the 1 in 2 Winter Peak Load Condition Assessment to estimate a Reasonable Adverse Load Component of the Target Reserve Planning Margin
- Validate the Results using a Regional Model
- Is there any Indication of the Need for more Machine Capability in the PNW Region, or is Energy still the Controlling Metric?