Sixth Northwest Conservation & Electric Power Plan

Cost and Availability of Wind Integration on the Northwest Power System

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Generating Resource Advisory Committee Meeting
Portland, OR
December 18, 2008

Outline

- Wind Integration Costs – Modeling Assumptions
  - Current methodology
  - Proposed revision

- Long-term Flexibility Planning
  - Untapped flexibility in existing power system
  - First priority is to access and allocate existing flexibility
  - Next step is to incorporate consideration of resource flexibility into long-term capacity planning
Recap: Illustration of Reserving Capacity for Within-hour Balancing (400 MW CCCT)

Wind Integration Costs

- Reserving capacity for within-hour balancing is costly:
  - Generating capacity that would have been dispatched “without wind” ends up being withheld from the energy market; and/or
  - Generation that would not have been dispatched “without wind” ends up being committed into the energy market

- Wind integration costs are “opportunity costs”
  - Foregone benefits of operating the system without the need to reserve flexible capacity for within-hour balancing of wind generation
Wind Integration Costs (continued)

- Cost estimation requires a system impact study:
  - Comparison of variable system cost with and without the reservation of capacity for within-hour balancing due to wind generation
  - Study Case: With Reserved Capacity Due to Wind
  - Base Case: Without Reserved Capacity Due to Wind
  - The difference in system cost is Cost of Wind Integration

- Wind integration costs are sensitive to wholesale power market price assumptions

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Northwest Wind Integration Studies

- Adopted these end-points for modeling
Wind Integration Costs -- Current Modeling

Set the Lower End at 2005
~ 500 MW of Installed Wind
~ 2% System Penetration

Set the Upper End at 2024
~ 6,000 MW of Installed Wind
~ 17% System Penetration

Under Estimated Wind Penetration in 2009

- Straight-line Projection
- Interim Price Forecast
- Actual Under Construction
Reset the Lower End Point to $8.60/ MWh for 11% Wind Penetration in 2009

Reset the Wind Integration Cost Projection
Wind Integration Costs

Conclusions

• Continue to rely on Northwest Wind Integration Studies

• Retain integration cost of $10.90/MWh at the high-end of system penetration (17% in 2024)

• Use integration cost of $8.60/MWh at the low-end of system penetration (11% in 2009)

Increasing Power System Flexibility

Short-term vs. Long-term

• Significant untapped flexibility in the existing power system
  – Improve wind forecasting and scheduling
  – Change scheduling practices and procedures
  – Implement dynamic scheduling of wind generation
  – Improve automatic generation control (AGC)
  – Develop marketable ancillary services products
  – Establish wind ramping limits
  – Others…

• Short-term priority is to tap these sources of flexibility
Considering Flexibility in Long-term Resource Planning

• How much flexible capacity will Balancing Authorities need to set aside for within-hour regulation and load following?
  – How much is attributable to load growth?
  – How much is attributable to increased wind generation?

• How much flexible capacity for within-hour regulation and load following will be available from the existing (more efficient) system?
  – Which resources are currently used for within-hour balancing?
  – Are there other existing resources that could be used?
  – How will constraints on hydro system operations impact the availability of capacity for within-hour balancing?

Considering Flexibility in Long-term Resource Planning (Continued)

• How much flexibility will resources added to meet utility energy and peak load requirements provide?
  – Flexibility (i.e., ramping measured in MW/min.) is a resource attribute
  – Utilities should consider flexibility concurrent with their evaluation of resources alternatives in Integrated Resource Planning
Putting the Pieces Together

1. If the flexibility of the existing system is tapped in the short-run, and flexibility is considered when utilities add resources to meet their load obligations in the long-run, …
2. Then in most cases, the regions utilities should be able to avoid adding physical capacity solely for the purpose of augmenting system flexibility.
3. That is, flexibility can be added to the system as the region adds capacity to meet peak demand.

Conclusions

- **Draft Flexibility Augmentation Action Item for the 6th Power Plan:** The Council will work with Bonneville, utilities, and regulatory boards and commissions, to develop long-term planning methodologies for power system flexibility