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November 6, 2008

MEMORANDUM

TO: Power Committee

FROM: Maury Galbraith

SUBJECT: Cost and Availability of Ancillary Services for Wind Integration

At the September Power Committee Meeting, staff presented an overview of how power system operators use ancillary services to balance loads and generation, deal with sudden outages, and maintain system frequency and stability. Staff explained how increased penetration of wind generation in the region's resource supply mix could result in an increased demand for regulation and load following services.

At last month's Power Committee, staff presented projections of the Bonneville Power Administration's future demand for regulation and load following services in its balancing area. Staff explained that these demand projections are based on assumptions regarding future trends in load growth, wind resource development, wind forecasting accuracy, and scheduling practices and procedures. Staff also reviewed recent work by Portland General Electric that indicated that existing thermal resources are capable of meeting some of the future demand for load following services.

At the November Power Committee Meeting, staff and the Power Committee will discuss: (1) modeling assumptions to be used in the Sixth Power Plan for the cost and availability of ancillary services for wind integration; and (2) potential wind integration action items to include in the Action Plan of the Sixth Power Plan.

Sixth Northwest Conservation & Electric Power Plan

Cost and Availability of Wind Integration on the Northwest Power System

Maury Galbraith

Northwest Power and Conservation Council

Power Committee Meeting

Couer d'Alene, ID

November 18, 2008

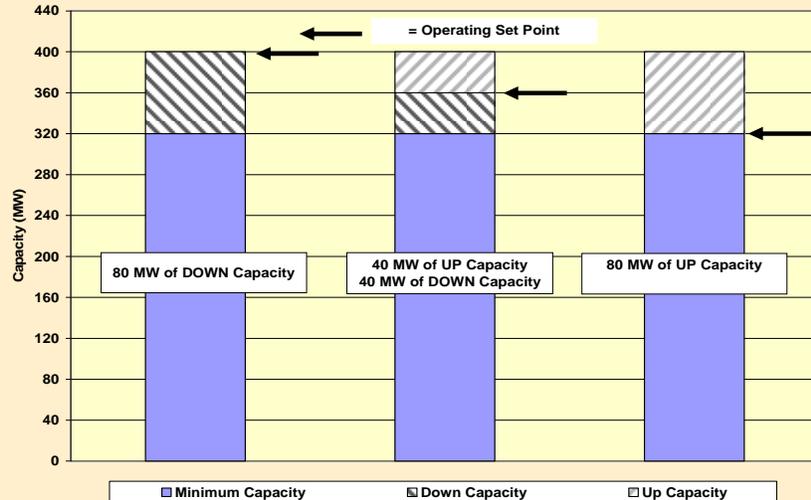


Outline

- 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)



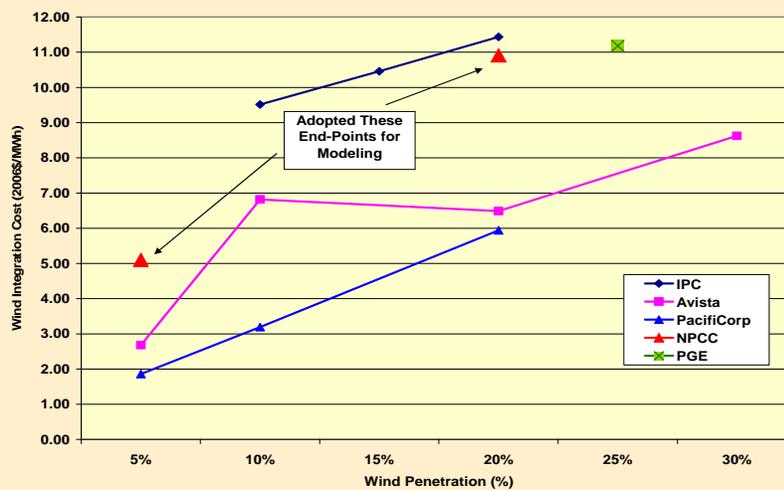
Wind Integration Costs

- 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

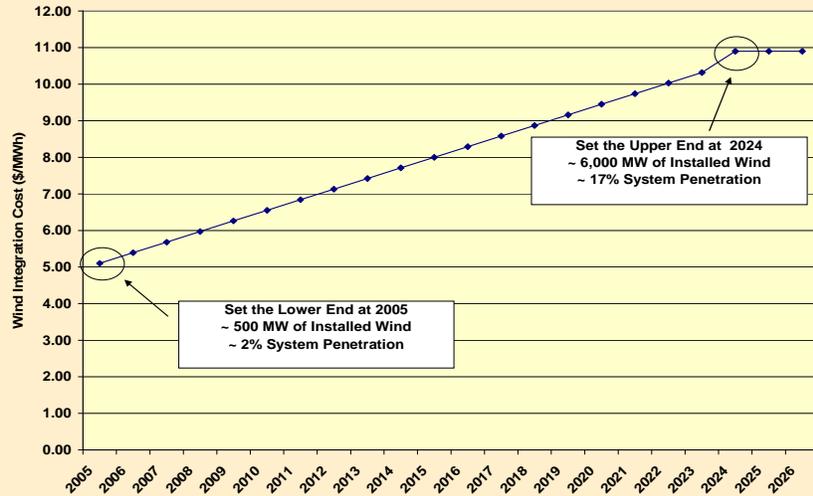
Wind Integration Costs (continued)

- 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 prices

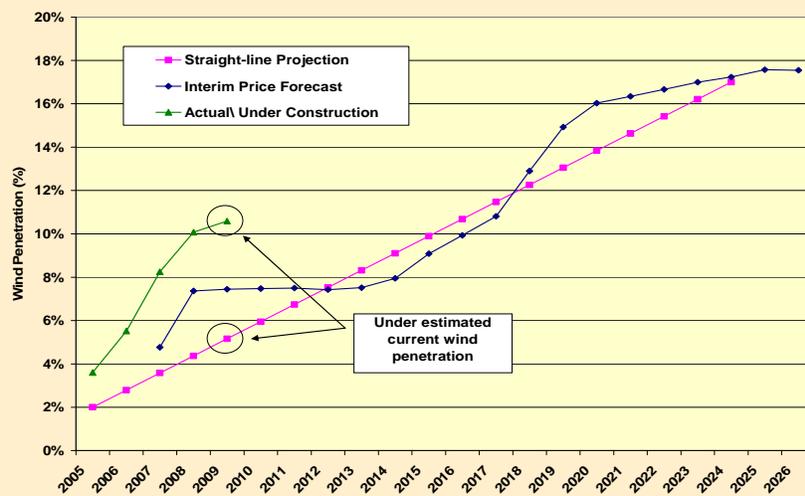
Northwest Wind Integration Studies



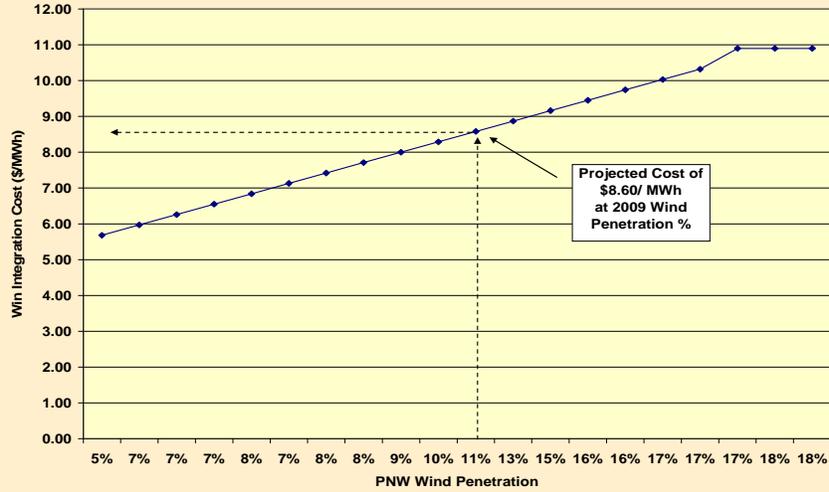
Wind Integration Costs -- Current Modeling



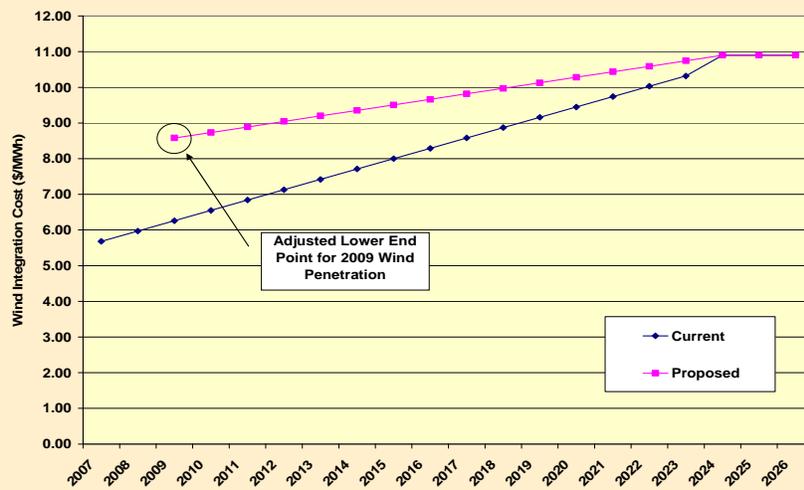
Under Estimated Wind Penetration in 2009



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)
- Seek comment from the Generating Resources Advisory Committee at the December meeting.

Increasing Power System Flexibility

Short-term vs. Long-term

- Significant untapped flexibility in the existing power system
 - Short-term priority is to access and allocate the existing flexibility
- BPA “Balancing Act” Fact Sheet (Nov. 2008)
 - Improve wind forecasting and scheduling
 - Change scheduling practices and procedures
 - Implement dynamic scheduling of wind generation
 - Establish wind ramping limits
 - Improve automatic generation control (AGC)
 - Increase geographic diversity of wind plants
 - Others...

Long-term Planning for System Flexibility

Do we need more system flexibility?

- 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 existing resources?
 - Which resources are currently used for within-hour balancing?
 - Are there other existing resources that could be used?
- What criteria should be used to determine when we need more system flexibility?
 - Economic standard or reliability standard or both?

Long-term Planning for System Flexibility

Is flexibility planning related to capacity planning?

- How do the different types of capacity relate to one another?
 - Capacity for meeting peak load
 - Capacity for contingency events
 - Capacity for within-hour balancing
- Should flexibility planning be incorporated into utility capacity planning?

Long-term Planning for System Flexibility

Conclusions

- 6th Power Plan Draft Action Item:
The Council will work with Bonneville, utilities, and regulatory boards and commissions, to develop long-term planning methodologies for power system flexibility
- Seek input from:
 - Generating Resources Advisory Committee
 - Wind Integration Forum
 - Others