Ten Lessons from the Northwest Wind Integration Action Plan

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NW Wind Integration Action Plan

- Wind energy development is experiencing dramatic growth in the US portion of the Pacific Northwest.
- In June 2006, the Northwest Power and Conservation Council and BPA co-sponsored the development of an Action Plan to manage the rapid growth of wind energy in a reliable, cost-effective manner.
- A Steering Committee and Technical Work Group drawn from Northwest utilities, regulatory agencies, wind developers, environmental advocates and reliability organizations prepared the report.
- The Action Plan was released in March, 2007.
- For copies of the report, visit www.nwcouncil.org and reference "NW Wind Integration Action Plan."

Key Questions

- What is the role of wind energy in a power supply portfolio and how does it impact system operations?
- Does the Pacific Northwest have the operational capability to integrate 6,000 MW of wind? If so, what are the estimated costs of integrating this amount of wind energy?
- What are the transmission requirements for developing 6,000 MW of wind?
- How will the costs of wind integration be recovered?
- How can we work together to help the Northwest meet its wind energy potential in the most cost-effective manner possible?

Lesson One

Wind is a variable *energy* resource that displaces fossil fuel consumption and reduces exposure to price volatility and carbon control costs. With or without wind energy, utilities will need other resources (both supply side and demand-side) to meet their peaking *capacity* requirements. Utilities don't build gas plants to "back up the wind." They purchase the output of wind projects to "back down" their dispatchable gas plants. Wind energy is a valuable component of a power supply portfolio, but, like other resources, it cannot provide reliable electrical service on its own.

Lesson Two

When wind energy is added to a utility system, its natural variability and uncertainty is combined with the natural variability and uncertainty of loads. This increases the need for flexible resources such as hydro, gas-fired power plants, or dispatchable loads to maintain utility system balance and reliability across several different timescales. The demand for this flexibility increases with the amount of wind in the system. This increasing demand for system flexibility is the major driver of wind integration costs.

Lesson Three

Initial studies by several Northwest Utilities did not identify any fundamental technical barriers to integrating 6,000 MW of wind energy into the Northwest Power System – it's a question of cost. Preliminary costs estimates are generally in line with results from around the world, but are undergoing additional revisions. The most current, officially released study results are posted on the Northwest Power Council's website at www.nwcouncil.org/energy/Wind and will be updated on a regular basis.

Lesson Four

Based on Northwest studies and others from around the world, the cost of wind integration is largely dependent on:

1. **The size of the control area from which such services are procured in relation to the amount of wind being integrated;**
2. **The geographic diversity of wind sites and resultant generating patterns;**
3. **The amount of flexibility available to the power system; and**
4. **Access to robust markets for control area services and storage and shaping products.**

Lesson Five

With increasing amounts of wind energy, there will likely be times when large, unexpected changes in wind output ("ramping events") coincide with periods of limited system flexibility. Initial analyses indicate that these will be low probability events, but in some instances, system operators will need to limit wind output for brief periods in order to help maintain system reliability. The Federal Energy Regulatory Commission now requires wind plants to help protect system reliability. Northwest utilities and developers are collaborating to implement this requirement in a mutually satisfactory and cost-effective manner.

Lesson Six

While firm transmission is necessary to secure the capacity value of a conventional generating plant, the economically optimal approach for a variable resource with limited capacity value like wind is to seek a mix of firm, nonfirm or conditional firm transmission that balances the marginal cost of transmission and the marginal value of delivered wind energy. Achieving this balance will require a combination of transmission expansion, new commercial practices and new regulatory policies. It may also require reallocation of risk and compensation between project owners and purchasing utilities to enable wind project financing.

Lesson Seven

For non-ISO/RTO Transmission Providers, current tariff and rate provisions may not be sufficient to ensure that the within-hour costs of wind integration (incremental regulation and "load following" capacity) are allocated to those entities creating the additional demand for system flexibility. BPA is working with regional stakeholders to prepare for a rate case to develop a new generation following rate that will be applied to wind generators and the loads they serve.

Lesson Eight

Coordination among utilities in the Northwest in order to realize the benefits of a variable and relatively low capacity factor renewable resource has a distinguished history in the Pacific Northwest. Both the Pacific Northwest Coordination Agreement and the Columbia River Treaty brought the benefits of hydro generation diversity and energy storage sharing to the region. Those benefits were used to help finance construction of the Pacific NW-SW transmission intertie. Regional coordination of wind resources can net similar savings and benefits.

Lesson Nine

The two most important examples of regional cooperation and around wind energy are greater control area coordination and development of robust bilateral markets for ancillary services. Several regional utilities have entered into a pilot project to share Area Control Error (ACE Diversity) and work is now underway to define standardized terms and conditions for bilateral contracts for day ahead and real time regulating reserves. These efforts can help reduce the amount of balancing capacity needed for wind integration and allow other, non-hydro sources of flexibility to provide valuable ancillary services during times of hydro constraints.

Lesson Ten

In a world of high wind penetration, planning for energy, capacity, and *flexibility* will be essential. As utilities look to their future capacity requirements through IRP, they will also need to ensure that their dispatchable resources (both supply and demand side) have the flexibility to manage the variability and uncertainty of wind and other renewable resources. The evolving power resource market will help facilitate this objective.

For More Information

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