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BEFORE THE

UNITED STATES SENATE
COMMITTEE ON ENERGY AND NATURAL RESOURCES

HEARING ON

CHALLENGES AND REGIONAL SOLUTIONS FOR DEVELOPING TRANSMISSION FOR RENEWABLE ELECTRICITY SOURCES

JUNE 17, 2008

Good morning, Mr. Chairman. My name is Stephen J. Wright and I am the Administrator of the Bonneville Power Administration (BPA). I appreciate the opportunity to relate BPA's experience to date in bringing renewable electricity to markets and how we are positioning the agency to integrate additional renewable resources into the Pacific Northwest electricity system. My testimony today will describe the success we've experienced in bringing a significant amount of new renewable energy into our transmission system this past decade to the present. I'll discuss some of our concerns that have arisen from that experience and how we and our regional partners have responded to those issues. I'll complete my remarks by describing how we will evaluate and respond to opportunities to bring more renewable electricity to our customers in a cost-effective manner.

INTRODUCTION AND BACKGROUND

BPA, founded in 1937, is a power marketing agency under the Department of Energy. We are headquartered in the Pacific Northwest where we operate about three-quarters of the high voltage transmission and market power from 31 Federal dams in the Columbia River Basin as well as the output of one nuclear plant. We supply about 34 percent of the Northwest's electricity, selling at wholesale and at cost.

Our customers include Northwest cooperatives, municipalities, public utility districts, Federal agencies, investor-owned utilities, direct-service industries, port districts, irrigation districts, and tribal utilities. Our service area covers Washington, Oregon, Idaho, western Montana, and small parts of eastern Montana, California, Nevada, Utah, and Wyoming. BPA is a self-financed agency that recovers its full costs and repayment obligations from its customer ratepayers through power and transmission rates. BPA receives no annual appropriations for its operations.

We sell transmission-related services to more than 200 utilities, power generators (including wind generators), and power marketers. Consistent with Federal Energy Regulatory Commission (FERC) rules, BPA has one open access tariff. It provides transmission services to all customer utilities, power generators and marketers under the same rates, terms, and conditions that it applies to its own Power Services business line

BPA'S AUTHORITIES TO BUILD AND FINANCE TRANSMISSION

BPA's statutory authorities include the authority to construct transmission lines to deliver power to customers in the Pacific Northwest. The capital costs to construct transmission lines to these sites are significant – typically $1-$3 million per mile. In addition, there are environmental and social impact mitigation considerations for siting new transmission lines.

BPA's statutory authorities give us access to capital for new transmission construction needs. In addition to a limited amount of borrowing from the U.S. Treasury[1], we have the authority to rely on capital of third parties.[2] BPA has successfully used third-party financing of facilities, through lease-purchase arrangements, to avoid depletion of our more limited Treasury borrowing authority, which is capped at outstanding indebtedness of $4.45 billion.[3] The President's Fiscal Year 2003 Budget supported the use of third-party financing for future investments in transmission system upgrades[4]. BPA also has authorities to acquire real and personal property and to acquire real property through eminent domain.[5]

BPA'S ACTIONS TO PROMOTE RENEWABLE ENERGY

BPA's authorities to acquire resources to meet the loads of Northwest utility customers require priority for cost-effective energy conservation measures and renewable resources.[6] Wind development has become a success story for developing new renewable generation.

Commercial-scale wind development on the BPA system began in 1998 with a 25 megawatt (MW) project in eastern Oregon. Over the next several years, development proceeded slowly, but steadily. By 2005, there were 428 MW of installed wind capacity on the BPA system. During the first phase of development, BPA purchased wind output to serve a portion of our customers' load and helped nurture the growth of regional wind development in several ways. In 2002, BPA recognized that the then-current FERC standard penalty for generators who failed to meet their hourly scheduled output was actually a significant barrier to cost-effective wind generation. This penalty was originally developed to provide an economic disincentive for dispatchable generation to choose to go offline. BPA determined that the variable nature of wind power generation resulted in an unwarranted penalty not likely to have the desired effect of causing operators to schedule generation more carefully and so decided to eliminate the penalty for wind generators. This change was subsequently adopted by FERC as a component of its Order 890 *pro forma* tariff.

In 2004, BPA developed a wind integration service that facilitated the purchase of wind energy by our public power customers by using the Federal hydroelectric system to offset the variations in wind power output. At the time, with a total of 428 MW of wind in a 9,000-MW control area, we did not experience large operational or cost issues associated with integrating the variable output of wind into our system.

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[1] Federal Columbia River Transmission System Act, 16 U.S.C. § 838k.
[2] See Federal Columbia River Transmission System Act, 16 U.S.C. § 838i(b)(5); see also Bonneville Project Act, 16 U.S.C. 832a(f).
[3] Federal Columbia River Transmission System Act, 16 U.S.C. § 838k(a); Continuing Appropriations for 1983, Act of December 21, 1982, Pub. L. 97-377, Title V, § 115, 96 Stat. 1830, 1912 (1982); Energy and Water Development Appropriation Act of 1984, Pub. L. 98-50, Title III, 97 Stat. 257 (1984); Consolidated Appropriations Resolution of 2003, Pub. L. 108-7, Title VII, § 701, 117 Stat. 423 (2003).
[4] Budget of the U.S. Government Fiscal Year 2003, Office of Management and Budget, at 133 (2002).
[5] Bonneville Project Act, 16 U.S.C. § 832a(e), (d).
[6] Pacific Northwest Electric Power Planning and Conservation Act, 16 U.S.C. § 839d

By 2005, things began to change. That year, the Northwest Power and Conservation Council (Council) released its 5th Northwest Power Plan. The 5th Power Plan called for up to 6,000 MW of wind development in the Pacific Northwest over the next 20 years. Around the same time, many utilities started aggressively marketing voluntary renewable energy options to customers interested in reducing greenhouse gas emissions, and several Northwest states enacted policies to encourage further the development and use of renewable energy by electric utilities in the region. Spurred by continued volatility in the power and natural gas markets, wind development began to increase rapidly.

Since 2005, wind development has increased rapidly in the BPA control area. Today, there are 1,425 MW of installed wind capacity directly connected to our grid. Less than three weeks ago, we recorded a new record single-hour wind output of 1,304 MW. That's a third again as much energy as it takes to power the City of Seattle. Wind development has proceeded so rapidly, in fact, that we have had to develop a new rate to recover the costs of providing the balancing services that are necessary to maintain reliability as generators' output increases or decreases.

Wind is a valuable resource, but it has characteristics that create an integration challenge from a cost and reliability perspective. Due to its intermittent nature, only part of the wind generation can be relied upon to meet peak electricity demand. Utilities must maintain adequate generation at the ready to meet peak loads if wind generation is unavailable. In addition, the output of wind generation can swing up and down in very short periods of time. See Figure 1. That means that the generation to balance the wind fleets must be maintained to safeguard system reliability.

Load and Wind on BPA System July 21 – 28, 2006
(Total Installed Wind of 730 MW)

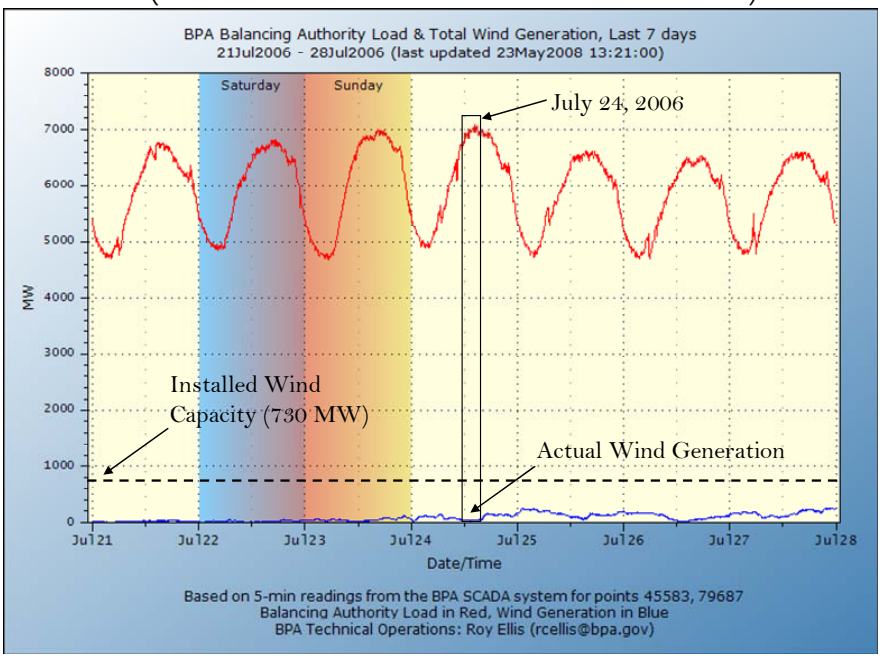

Figure 1. Actual wind conditions on a summer day in 2006 when BPA electricity demand was at peak levels.

Much of the wind development on the BPA system has been concentrated in one general region of our system – east of the Columbia Gorge. This raised the concern that the natural variability and uncertainty of wind generation, combined with its overall low capacity value (– in other words, its tendency not to generate at times of peak load) – would be exacerbated by highly concentrated geographical development. With many of the wind projects clustered in one part of our region, they would all tend to behave in the same general fashion, creating potentially large swings in our system operation. This potential presented itself at a time of declining flexibility of the Federal hydro system because of growing non-power constraints, such as the support of endangered salmon runs.

These issues of wind's geographic concentration, system capacity needs, and system reliability created challenges for BPA about the potential impacts of integrating large amounts of wind energy into the Northwest power system. Other regional utilities shared our concern.

As a result, in August 2006, BPA and the Council co-sponsored a regional initiative to develop a Northwest Wind Integration Action Plan. Central to the effort was an attempt to examine the technical feasibility of integrating substantial amounts of wind into the Pacific Northwest electricity system. We assembled a Steering Committee drawn from the leadership of 22 regional utility, regulatory, wind development, and environmental

organizations to guide the work of technical specialists from across the region who were assigned to address several key questions related to system operations, transmission expansion, and regional collaboration.

The Northwest Wind Integration Action Plan was released in March 2007 with the unanimous endorsement of the regional Steering Committee. The Action Plan concluded that the fundamental value of wind (and other intermittent resources) was to produce energy on an as-available basis to displace the output of dedicated, dispatchable firm resources such as natural gas and coal plants that would be necessary to maintain reliable electrical service. The Action Plan found no fundamental technical barriers to integrating 6,000 MW of wind in the Northwest, but did conclude that the costs of integration, per unit of wind, would increase as more wind comes onto the system. As a result, the Action Plan called for 16 specific actions to help the region meet its wind energy objectives in the most cost-effective fashion possible. First of all, the Action Plan called for greater collaboration among regional utilities to expand the availability of integration services and to spread the variability of wind energy across a broader generation base. Secondly, the Plan recommended increasing the geographic diversity of the region's wind resources through transmission construction and new transmission products such as conditional firm service. The Plan also encouraged the development of new flexibility and storage technologies to help manage wind variability and shape the energy into periods of peak demand. BPA and other regional organizations are now actively implementing these recommendations.

In a sign of real progress, BPA is joining several of the region's other utilities to participate in a cooperative effort to pool the diversity in their system operations known as the Area Control Error (ACE) Diversity Interchange Pilot Project. Experience gained from this collaborative effort may lead to other strategies for sharing flexibility resources among regional utilities and for helping dampen the rate of growth in wind integration costs.

We believe that we have established a sound regional consensus for the next steps to resolve technical challenges for effective integration and transmission of renewable energy. We next face issues of financing and building necessary transmission and managing the queue of service requests. We expect another 1,500 – 2,000 MW of wind to come online in the next two years, along with additional requests for transmission capacity, and, with that, continued challenges. We are committed to addressing these challenges head on.

Our immediate new initiative is known as the Network Open Season. By 2006, the number of new wind projects seeking service on the BPA transmission system had exploded to over 15,000 MW. While clearly some of this was speculative development, it became readily apparent that the prevailing method of planning and offering new transmission service would be inadequate. Network Open Season marks a major change from traditional practices associated with managing our transmission queue and financing new lines.

Under the Network Open Season, we are making contractual offers of transmission capacity to all of the entities seeking access on the BPA transmission network via our transmission queue if they sign precedent agreements committing them to take and pay for service at a specified time and under specified terms. Those who sign the agreements will be grouped into cluster studies to determine how much new transmission capacity will be needed to meet all the requests. Under the agreements, BPA has committed to provide the new transmission service if it can be offered at our embedded cost rate and all relevant environmental siting requirements can be met. BPA would secure the necessary funding, either through Treasury borrowing or from third parties. Unlike prior business models, the generation developers will not be asked for up-front financing for the transmission. Those entities that do not accept BPA's offer of new service by signing a transmission agreement will be removed from the queue. Customers can reapply for service, as BPA has committed to conduct a Network Open Season at least once a year.

The deadline for signing the first wave of these agreements was yesterday, June 16. There has been a tremendous regional response to our Network Open Season, and we are anticipating that a significant number of customers, including many wind developers and utilities seeking to purchase wind power, will have signed agreements allowing us to move forward confidently. By aggregating demand of those ready to take service, it is likely that BPA will then finance, using either Treasury borrowing or third party financing, and construct those transmission expansion projects that will be supported by the rates of the future path users.

In order to better utilize our existing transmission assets, BPA has developed a redispatch pilot that we are using to optimize generation dispatch to relieve transmission congestion. Also, BPA will offer a conditional firm transmission service product that will allow more efficient use of existing transmission capacity. These new techniques for managing congestion on BPA's transmission system will help support a more geographically diversified wind fleet in the Northwest.

A regional stakeholder Transmission Issues Policy Steering Committee has guided the development of our Network Open Season and congestion management efforts and we have been very pleased with the level of support we have received regionally as well as nationally.

CONCERNS FROM THE ENERGY INDUSTRY PERSPECTIVE

The general theme of regional collaboration that guided the development of the Northwest Wind Integration Action Plan and the design of the Network Open Season has now emerged more broadly among utilities in the Western United States.

In April, I joined the leaders of 15 Western electric utilities in signing a letter to Western state governors, regulators and other key policy makers to call for a collaborative approach to addressing the challenges of integrating renewable electricity into utility

portfolios. The group began its letter by stressing the inescapable fact that "our western electric grid is fully interconnected, and [that] changes in policy, resource additions and operations affect us all."

As the letter expressed, there is concern about the potential rate and reliability impacts of evolving public policy, particularly in the West. The group believes it is imperative to look at what can be done to achieve the various energy and environmental policy mandates implemented by our home states, while ensuring the reliability of our interconnected power grid at a reasonable cost. The letter also suggests some alternatives worthy of pursuit to help mitigate these concerns.

The group identified key issues that should be considered for meeting future energy needs in the lowest-cost, most reliable and environmentally sustainable manner. In pertinent part, the key issues identified by the group are:

- Renewable resources, especially in the West, often are located far from the urban centers that need the power and will require new transmission lines to deliver them to market. Coordination is needed among state, local and Federal agencies to expedite the current planning, permitting and approval process for building new electric transmission to provide access to renewable and conventional resources while ensuring grid reliability.

- Some renewable resources, such as wind and solar, are not available at certain times of the day – when the sun doesn't shine or the wind doesn't blow. Changes are needed in our transmission systems and the operation of conventional generating resources to accommodate the inherent voltage and frequency fluctuations of these intermittent renewable resources. Future technology advances in controlled demand response, electricity storage and better wind forecasting could help address these challenges. In the interim, the group believes that new natural gas–fired and other state-of-the-art resources must be developed as a bridge to the new technologies. They also believe this will require the development of adequate natural gas infrastructure.

- Maintaining the output and operating flexibility of existing power sources is vital to managing rates, ensuring grid reliability and adequate supply while utilities pursue increased renewable energy.

- Low carbon generation resources and optimal use of the interconnected grid are major elements in the effort to address climate change. Significant investment in the research and development of low carbon generation resources and interactive grid technologies is required to meet our policy objectives.

The industry leaders group reminded the policymakers that energy efficiency is still the most economic resource and urged them to work with us to maximize the benefits of energy efficiency, advanced metering technologies and other demand-side programs for

customers and our electrical system. With this reminder, they pledged to continue to work with the Western state leaders to resolve these issues.

POTENTIAL LONG-DISTANCE TRANSMISSION

It is important to remember that renewable electricity resources differ from coal, natural gas and uranium in that they generally cannot be transported, except by transmission wire. Solar energy must be generated where the sun shines. Wind energy must be generated where the wind blows. Geothermal energy exists where geothermal deposits exit. So we first must look for renewable resources that are closest to electricity load. Unfortunately, resource maps indicate that close-in attractive opportunities are limited. Another way to look at this is that large population centers generally have not developed where the wind is blowing hard much of the time.

But renewable sites can still be economical even if they are at some distance from load centers. For wind, there is an economic advantage for generation at a site located where the wind blows stronger and more continuously. In the Pacific Northwest, there are significant differences in the quality of wind throughout the region depending on the terrain and prevailing weather conditions. Since the fuel is free, energy cost at the generator is far lower at the higher quality sites.

Adding diversity to the resource mix can also improve the economics of integrating wind into the power system. A map of existing and proposed wind generating sites in the Pacific Northwest shows the high concentration of currently planned development sites east of the Columbia Gorge. Projects were clustered in this area initially because that is where existing transmission lines are located. Also, it was the highest quality wind that was close to load centers and the existing generation – literally in the center of the BPA system. Unfortunately, production in the Gorge is highly correlated – the projects ramp up and down together as the wind picks up and abates. This limits the capacity value relative to a more geographically diverse portfolio of wind resources.

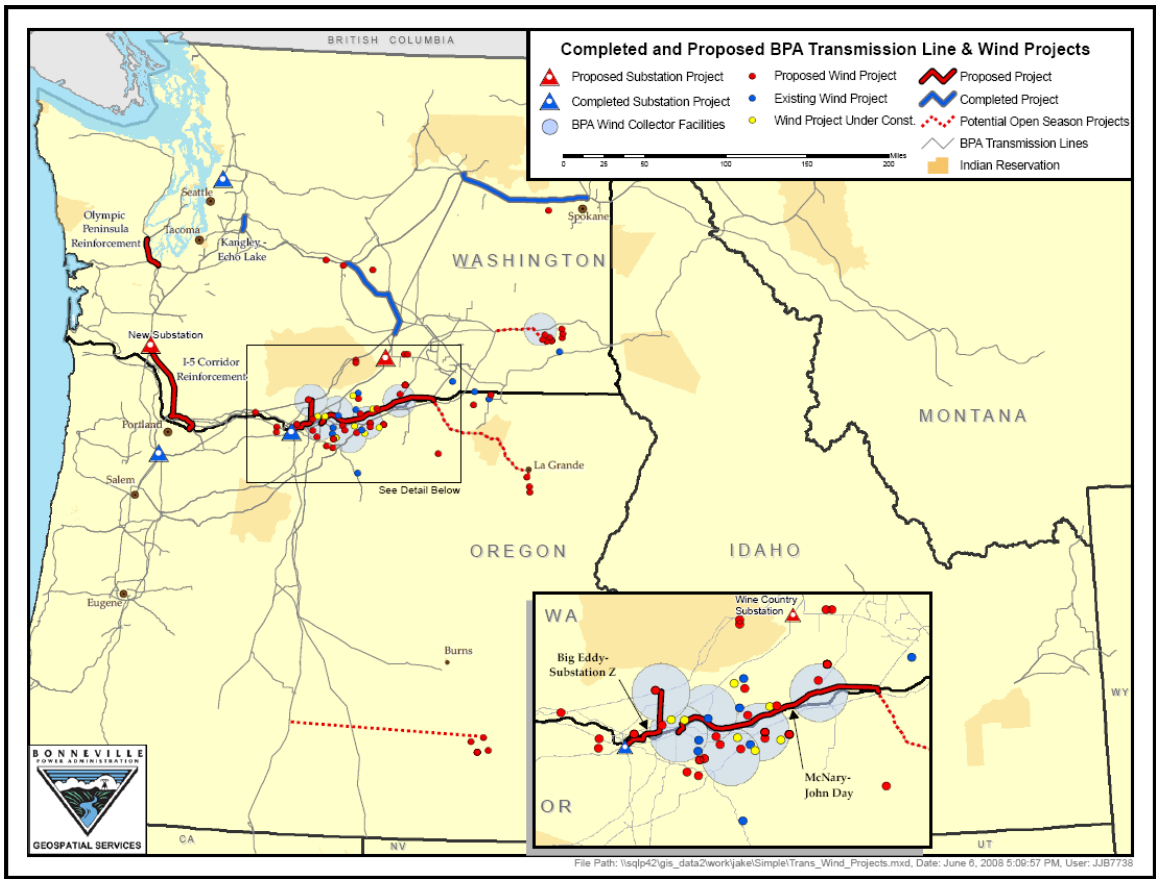

Figure 2. The concentration of wind projects the Pacific Northwest.

Sites that are at some distance from the Gorge would add value if the wind regime is different. Projects in one area may be increasing output while others fall off. Overall, the power system would see much more constant production which would be better able to meet consumer demands.

In addition, increasing the diversity of the renewable resource mix reduces the up and down challenges of wind. Geothermal plants generate at a near steady rate. Solar projects produce in a predictable manner during daylight hours. And ocean energy, when it becomes economically viable, is also fairly predictable throughout its daily cycle.

To take advantage of these opportunities, it may reduce costs and enhance reliability to build transmission facilities to the more remote regions of the Northwest or interregionally to capture their higher value and diversity.

The western energy leaders group collectively funded a reconnaissance study to consider the potential economic attractiveness of new high-voltage electric transmission to transport renewable electricity from renewables-rich zones to load centers. The fundamental question the study addressed is whether the differential in cost per kilowatt-hour produced from areas where the wind blows harder or the sun shines brighter is enough to offset the cost of new transmission. The study was intended to provide a

"coarse screen" analysis and was not meant to be dispositive about any particular project or whether to move forward. Yet, it provides interesting and thought-provoking insights.

It is unlikely that new transmission could be justified solely by the benefit associated with wind generation alone because of the likely low capacity factors. Other uses such as resource diversity sharing, storage and shaping may be necessary to make the full benefits of transmission investment cost-effective. There are a substantial number of transmission projects under consideration in the West that will be actively testing these assumptions underlying this initial, coarse analysis. Key issues will be the differentials in renewable resource costs across the West, the cost of new transmission, the availability of financing, and financing costs.

CONCLUSION

To conclude, Mr. Chairman, legislative and regulatory policy in the Western United States is creating an explosion of renewable resource development. Bringing these renewable resources onto our utility systems creates rate and reliability challenges. At BPA, we believe the region has worked well together to understand the multiple issues; develop analytical, technical, and financial tools to respond; and to design processes to identify and site economically justifiable transmission and generation. We are also expanding our scope to work collaboratively with utilities across the West, but much work remains to be done. I look forward to answering questions from the Committee.