



LR 83 White Paper Topic 4

“The process for planning, constructing, operating, and financing generation and transmission facilities in the state and region and changes that may be required.”

Planning

The 7,800 megawatts (MW) of wind generation is equivalent to approximately 87% of the generation capacity now available to Nebraska while increasing the energy production available to Nebraska by about 68% (compared to current approximate 9,000 megawatts (MW) and 40,000 gigawatt-hours). With forecasted growth rates of approximately 2% per year, the addition of 7,800 MW of wind over the next 20 years will result in a significant surplus of energy production. This will require significantly reducing the output of existing generating plants or locating and contracting with export markets outside Nebraska.

Current state statutes require that prior to construction of any generation facility, including a wind generation project, the owner must obtain approval from the Power Review Board (PRB). There is an option available for proposed generation of 80 MW or less under the federal Public Utility Regulatory Policies Act (PURPA) that, if exercised by the generation owner, would preempt PRB approval. However, wind projects over 80 MW are not eligible for the PURPA option and must obtain PRB approval.

During the 2009 session of the Nebraska Unicameral, LB 561 was passed and signed by the Governor providing a second exception to the traditional “least cost” standard. LB 561 allows Nebraska’s electric utilities to gain PRB approval of renewable energy projects up to 10% of the utility’s annual total energy sales, if the utility conducts at least one advertised public hearing on the project. The new law applies to public power and cooperative electric suppliers and to C-BED projects developed for one or more Nebraska electric suppliers. This law eliminates PRB review of cost issues up to the specified threshold.

Additional discussion of the PRB’s role in approving generation can be found in the Topic 2 white paper also submitted by the Nebraska Power Association (NPA).

The planning for significant new generation also requires transmission planning and determination of cost recovery. The planning process for interconnecting wind generation to the transmission system is established through the Federal Energy Regulatory Commission’s Large Generator Interconnection Procedures and it is regulated through mandatory compliance with the North American Electric Reliability Corporation (NERC) Planning and Operating Standards.

These NERC Standards establish the requirements for maintaining the reliability of each of the North American interconnected transmission systems. Any new proposed wind generation interconnection must not degrade the reliability or operating flexibility of the existing power system and it must comply with all NERC and regional reliability criteria.

The transmission planning process must also accommodate coordinated joint studies and plans with other affected interconnected systems. These planning processes are very robust as the reliability of the interconnected transmission grid cannot be compromised and it is considered an issue of national security.

With respect to adding 7,800 MW of new wind power in the state of Nebraska, the SPP generator interconnection procedures and NERC Standards must still be adhered to in order to maintain the integrity of the transmission system. The fundamental transmission planning process must still be followed, but the scope would need to be expanded significantly to include all of the numerous other external systems impacted by the interconnection and export delivery of much of the 7,800 MW of wind generation into other states and regions. Extensive transmission facility additions would be required to interconnect this magnitude of wind in Nebraska and additional transmission facilities would be required in neighboring states and the region to facilitate the delivery of this wind generation to major load centers and export markets. In addition to the development of new high-voltage interstate transmission facilities, additional lower voltage transmission systems within Nebraska would need to be constructed to support the high-voltage network.

An expansive coordinated transmission plan is critical to integrating this amount of new wind generation and still maintaining the reliability of the interconnected transmission network. This planning process must include representation from all impacted transmission owners, planning authorities, and regional transmission organizations. For example, the planning and cost allocation procedures applicable to the development of Nebraska's extra high voltage transmission system would be an intricate part of the Southwest Power Pool (SPP) transmission planning process.

Nebraska utilities are SPP members and cannot independently plan transmission. Members of SPP cannot enter into specific agreements to recover the costs for transmission facilities. Rather, members are required to use the SPP planning process and the rates, terms, and conditions of operation under the SPP tariff. The standard formula provides that all or part of the cost of the transmission upgrades will be blended with SPP's existing transmission system costs and recovered in rates that are the same for all load. A portion would be paid by all members of SPP and a portion would be paid by loads in the zone in which the load is located.

However, in the case of wind generation it is also possible that the customer/owner would be “directly assigned” some of the cost. If SPP deems that all or part of the facilities be handled as direct assignment facilities, the customer would sign an agreement with SPP agreeing to pay for those facilities separately. This direct assignment charge would be over and above the standard average transmission rate. It is the SPP tariff studies group that develops the criteria and performs studies of the generation requests to make this determination.

SPP is considering some new tariff language that relates specifically to wind generation transmission upgrades. The language has yet to be approved. The current proposal is as follows:

“If the wind generation upgrade qualifies as a Base Plan Upgrade and is a designated resource (which it probably would be) and the load and the resource are in the same zone then 33% is paid for by all users of the SPP system and 67% will be paid through the zonal rate based on MW mile impact. For wind generation where the resource and load are not in the same zone, then 67% of the cost of the upgrade will be included in the region-wide rate and 33% will be directly assigned to the customer/owner.”

Constructing

The lead time to construct a transmission line is on the order of four years whereas a wind plant can be constructed in about one year. In either case, if there are massive expansion programs going on across the region, the availability of equipment, materials and labor can become problematic.

Topography, land use and proximity to population centers are all determining factors in constructing wind resources. Much of Nebraska’s best wind is located in areas fairly remote from population and load centers. So collector and transmission systems will be needed to deliver the power to Nebraska load centers. Beyond that, much of the export will need to be delivered several states away over new and upgraded systems in those states.

At the wind farm, the individual turbines now are typically 3 MW each, which computes to approximately 2,600 turbines to achieve development of 7,800 MW of wind. The last wind farm installation contained 27 turbines for 80 MW. One picture of the 7,800 MW concept would then be 97 new wind farms each with 27 turbines.

The turbines are usually placed out in the open on ridge lines to maximize the wind effectiveness and require connecting rights-of-way for road and cable to each turbine. The wind generation is collected and brought to the wind plant substation and then connected to a nearby transmission line.

Construction and operation requires a certain class of roads in order to deliver the very large turbine parts and cranes for assembly and repair. Routine maintenance crews need to be stationed nearby.

Land use dedicated to the wind farms producing 7,800 MW amounts to approximately 800,000 acres under lease and 42,000 acres disturbed.

Operating

The key problems with operating wind generation stem from its variability and uncertainty. Energy has to be generated on demand of the customers whereas production capability is usually scheduled a day ahead of time.

Because the wind speed cannot be well forecasted a day ahead, the rest of the system must adjust for these undesirable wind characteristics which are accentuated by the physical laws. Wind generation output varies generally by the cube of the wind speed. For example, it is expected that a day-ahead wind speed forecast error could lead to a day-ahead wind generation forecast error of up to 3,000 MW, being either high or low. The total range from minimum to maximum operating level for all the on-line coal plants dedicated to Nebraska is approximately 2,500 MW. These “problems” of system adjustment will need to be “exported” to larger generation and load areas, along with the surplus electric energy.

NPA is well along to completing a wind integration study with partial funding from the National Renewable Energy Laboratory (NREL), which is described at www.nepower.org/wind_study.asp. In this study, penetrations of 10%, 20%, and 40% measured by energy are being studied based in the 2018 time frame. At 40%, the amount of wind being represented is 4,727 MW. The study objectives include applying the best study practices for the assessment of wind's impact in the different time scales from immediate to longer time frames (i.e., regulation, load following, and unit commitment/scheduling) using high-quality wind speed and/or wind power data. The study uses detailed and voluminous wind speed calculations made by NREL for many specific locations across the state of Nebraska. Besides estimating these impacts, the study examines potential system changes to accommodate wind generation such as hydro flexibility, wind generation capacity value, hydro-pumped storage, other generation for backup and adjustment, and power market participation.

Financing

An estimate of the capital cost to construct 7,800 MW of wind generation, transmission, and substation facilities is roughly \$20 billion in today's dollars. This assumes at least \$2,100/kW for installed turbines and \$500/kW for transmission facilities for in-state and out-of-state delivery. This would represent a per capita investment of over \$11,000, so it would likely need significant investment from outside of Nebraska.

Private Use - The Internal Revenue Service limits tax-exempt entities, including public power and cooperative utilities, from using tax-exempt funds to construct facilities for the sole and long-term use by taxable entities, which most electric utilities are, beyond a 10% share of the facility output. Public power could, however, use taxable bonds and still maintain its tax-exempt status. Other options for wind development would be for public power to construct with cash, sell the power to tax-exempt entities only, or allow that the construction be done by private developers.

Clean Renewable Energy Bonds (CREB) – Federal legislation was passed in 2005 to allow qualifying utilities, like public power, to invest in clean renewable projects and issue interest-free bonds. The legislation capped the amount allocated to this program at \$800 million per year, and was only available to finance very small projects. The American Recovery and Reinvestment Act of 2009 increased the volume cap to \$2.4 billion where public power will have access to \$800 million. The new CREB funding will be awarded on a pro-rata basis. However, new CREB financing is subject to labor standards of Chapter 31, Title 40 of the US Code which includes Davis-Bacon wage rules. Another disadvantage of new CREB financing is that bondholders will only receive a 70% interest subsidy requiring CREBs to offer a low interest rate to bondholders.

Federal Tax Credits – The Production Tax Credit (PTC) of approximately \$21/MWh for wind generation is only available to taxable entities, not including public power. The American Recovery and Reinvestment Act of 2009 extended the Investment Tax Credit (ITC) to wind projects. The ITC is only available to taxable entities and can be monetized within 60 days as a grant from the Department of Energy.

Federal Renewable Energy Production Incentive (REPI) – This program also provides approximately \$21/MWh to tax-exempt entities for producing qualifying renewable energy; however, total funding is limited to \$5 million per year. This means that it will only cover about 700 MW nationwide, assuming all is wind capacity operating at 40% on average. Annual REPI subsidies to Nebraska wind projects have been reduced to less than 1/3 of anticipated amounts, and are proposed to be zeroed out in President Obama's budget.

State Tax Credits – Provisions in the Community-Based Energy Development (C-BED) statutes offer a sales tax exemption on wind facility equipment to C-BEDs in Nebraska. Other states offer tax incentives and/or Renewable Energy Credit bonuses to encourage in state development, but Nebraska has no incentives or tax credits for its public power and cooperative utilities. This puts Nebraska at a disadvantage for wind energy development. Many states in the region are ahead of Nebraska in the development of wind resources, primarily due to the subsidies that have been provided.

Summary

The NPA believes all four elements of the process listed--planning, construction, operations, and financing--will need careful and significant changes in order for Nebraska to transition to the scenario under study.

Additional background information and detailed discussion from the NPA regarding wind energy development can be accessed at the NPA website www.nepower.org. Documents on this website include: "NPA Energy Policy Principles" at www.nepower.org/energy_policy_principles.pdf, "Renewable Energy Background and Outlook for Nebraska Electricity Consumers: A Reference Document by the NPA" at www.nepower.org/NPA%20Report.pdf, "Wind Power in Nebraska" (brochure) at www.nepower.org/windBrochure.pdf, among other documents.

Leaders of Nebraska's public power industry formed the Nebraska Power Association in 1980 to address industry-wide concerns and interests. This voluntary association represents all segments of the public power industry in Nebraska: municipalities, public power districts, public power and irrigation districts, rural public power districts and rural electric cooperatives engaged in generation, transmission or distribution of electric energy in the state.