Northwest Power and Conservation Council

April 30, 2009

MEMORANDUM

TO: Council Members

FROM: Terry Morlan

SUBJECT: Discussion of Questions Raised by Council Members

Discussion at the April Council and Power Committee meetings raised a number of questions about the draft Sixth Power Plan analysis. These questions included the following:

- How are we addressing capacity and flexibility in the plan?
- How do levelized costs translate into estimates of retail electricity prices?
- How are we planning to address combined heat and power?
- How are transmission constraints included in the planning models?
- Are we accounting for the geographic diversity of wind?
- Can the regional conservation potential be divided into different responsibilities, e.g. utilities, Bonneville, NEEA, codes or appliance efficiency standards?

Staff has prepared a short response to each of these issues. They are attached to this memorandum. In addition, the first and second items are Power Committee agenda items and some additional information can be found in that packet.

If additional questions remain, as I expect they will, we will discuss them in the Council meeting.

Attachments

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Capacity and Flexibility in the Power Plan

Capacity

The Council's analysis deals with capacity in several ways, both in the data and in the models. The conservation data, typically presented as average energy amounts, are actually differentiated by amounts of energy in four different time blocks during the week, from the top 50 hours of the week (ten hours per day, five days per week) to the extreme off-peak hours. Beyond that, the conservation savings, because they are tied directly to energy uses, are generally assumed to follow the load shape, and the blocking may understate the peak contribution somewhat. This means that conservation plays an important role in offsetting system peak loads.

Wind generation, though it has an energy contribution of approximately 32 percent of its installed capacity, is assumed to contribute only five percent of its installed capacity to meeting peak loads.

The demand response resources, on the other hand, focus directly on meeting system capacity requirements.

The Regional Portfolio Model uses these resource data, and capacity amounts for other generation alternatives to analyze the optimal set of resources to meet the system's energy and capacity requirements in an way that aggregates hourly loads into on-peak and off-peak hours (for computational efficiency,) but also retains hourly distribution information for dispatching resources to meet loads and calculating the effect on system costs.

The other models used by the Council, Genesys and Aurora© deal in more detail with capacity issues, without the broad scope of risk analysis of the portfolio model. Genesys, in particular, with its detail on the hydro system, is used to examine specific scenarios for their ability to meet the Council's resource adequacy standards.

Flexibility

Flexibility is being addressed by examining the estimates of demand for flexibility embodied in utility assessments, such as Bonneville's Resource Assessment draft and various IOU assessments. The supply of flexibility is being examined by looking at the same studies, particularly as they focus on various utility hydro systems, which we are not in a position to independently assess. To this we add an estimate of the supply of flexibility from hydro projects not fully included in the currently available studies (e.g., the Mid-Columbia projects), using the findings from the available studies as the basis of these estimates. We are also looking at the ramping characteristics of the existing regional thermal plants to see what contribution they could make to the regional flexibility supply. Finally, we are examining the characteristics of any thermal plants added by the Portfolio Model to see what they add to system flexibility.

The supply of flexibility, adjusted as needed to account for contingency reserves, is being compared to the total amount needed that would be implied by the amount of existing wind generation and new wind generation added by renewable portfolio standards or the Portfolio model. The needed flexibility is estimated using the approximate ratios of needed flexibility to

installed wind capacity. Assumptions are being made regarding flexibility needed to integrate wind power destined for California utilities.

Any imbalances in this supply and demand for flexibility are being examined in the context of the action items that call out potential analyses and institutional and business practice changes that could help to meet the demand for flexibility, and will highlight the importance of the region's following up on those action items. The action plan has a number of specific items that the region will need to follow up on to completely address these issues.

Cost and Rates

Electricity rates are a measure of interest to some. However, we should be clear that the Council's charge in the Northwest Power Act relates to minimizing costs, not rates. We are to evaluate all direct costs of a measure over its entire life. Another way of looking at this is that we are attempting to minimize, not consumer electricity rates, but rather consumer electricity bills.

In order to compare the costs of different kinds of resources over their entire lives, some approach to comparing costs at different times in the future is required. This can be accomplished by using present values of costs, or its conceptual equivalent, levelized costs. The Council has typically used levelized costs because it is more similar in magnitude to measures people are used to considering and provides a good approach to comparing resources with different time profiles of costs.

The Council does estimate electricity rates for purposes of its demand forecasts. Electricity prices affect the demand for electricity and the effects of resource choices on demand needs to be reflected in the analysis. Even for this calculation of rates, it should be understood that the general trend in rates is most important. In general, costs will find their way into rates eventually, but utilities and their regulators and boards have significant discretion about how they recover costs in rates. For example, expensing conservation costs is a decision utilities have made even though the rate impacts may be somewhat higher in the near term. However, since conservation programs are usually ongoing enterprises, there are expenses incurred each year, not unlike a financed investment in a generating plant that is spread over 20 or 30 years.

Cogeneration Treatment in Plan

Cogeneration (also referred to as Combined Heat and Power or CHP) is the simultaneous production of electricity and useful thermal energy. CHP affords more efficient use of natural gas, biomass or biogas fuels, and reduction in fuel cost and CO_2 production per MWh generated. Historically, the principal use of CHP technology has been in industries needing large, continuous quantities of process thermal energy. In the Northwest, these include pulp and paper, lumber and wood products, food processing and petroleum refining. Conventional applications remain the most economic. Though largely developed, a few opportunities for installation or upgrade of CHP systems remain in these sectors. The emergence of compact CHP technology based on reciprocating engines, microturbines, and fuel cells is opening new applications with smaller thermal loads. However, the only small-scale application to have achieved significant penetration has been wastewater treatment plants, where digesters provide a steady thermal load.

Ideally, a supply curve of potential CHP applications would be available for testing in the Resource Portfolio Model. However, the extensive data needed to develop a CHP supply curve is not readily available. In lieu of a supply curve, staff is characterizing several representative CHP applications. These applications can be readily compared to the other resources in the portfolio based on their costs and other characteristics. This will provide a sense of where Bonneville and the region's utilities should focus CHP development efforts. Because cost-effective CHP development opportunities are thought to be limited in quantity, the composition and timing of the resource portfolio is not likely to be significantly distorted by absence of a full CHP supply curve. Most importantly, staff proposes to include actions in the plan to promote the development of cost-effective cogeneration. These will include a recommendation that Bonneville and the utilities to develop and implement effective methods for identifying and acquiring cost-effective CHP opportunities.

Role of Transmission in the Plan

While the Council's analysis does not incorporate full transmission system modeling, it does incorporate the key impacts of the regional transmission system and its constraints in the resource analysis process. It does this in several ways.

First, two of the models, Genesys and Aurora©, have limited representations of the most significant transmission constraints in the region (using a simple transportation model). Second, the analysis of new resources that could be delivered to load centers using the existing transmission system or new transmission that could be constructed at embedded cost rates (like Eastern Gorge wind and Bonneville's west of McNary upgrades) are analyzed using Bonneville's Point to Point transmission rate as a surrogate for a regional wheeling cost.

Third, for new resources that would require additional transmission capacity at incremental costs substantially above embedded cost rates, such as Montana or Wyoming wind resources, the cost that is used in the models includes the cost of the new transmission that would be required to deliver it to load centers. Credit for possible network benefits is provided in some cases where the new resources would produce counterflow in transmission segments currently proposed for network reinforcement, such as the Idaho Power Company Boardman to Hemmingway line.

Full transmission system analysis using detailed transmission system models is being done by a number of individual utilities, and in regional and WECC-wide analyses. These efforts complement the resource analysis that the Council and other entities do.

Geographic Diversity of Wind

The development of geographically-dispersed wind projects has the potential to reduce system integration costs by reducing the within-hour and hour-to-hour variability of net wind plant output. The effect was explored in the 2007 Avista wind integration study where the estimated integration cost of 100% Columbia Basin wind was compared to the cost of integrating a 50/50 mix of Columbia Basin and Montana wind, and to the cost of integrating an even more diversified mix of regional wind resources. The results for the 50/50 mix of Columbia Basin and Montana wind were inconclusive. Estimated integration costs were reduced about 10% at 10% wind penetration, but increased at lower (5%) and higher (20% and 30%) penetration. This may be due to the high volatility of Montana wind. Results for the more diversified mix were still

mixed, but more promising. While estimated integration costs were higher for low (5%) penetration, integration costs for higher levels of penetration were 39% to 59% of the cost of integrating undiversified Columbia Basin wind.

The Avista results suggest the complexity of this issue and the need for further assessment. However, even integration cost savings of 50 percent (roughly $5.00 per MWh) are modest compared to the cost of constructing transmission (roughly $50/MWh) for the purpose of diversifying the wind resource mix, and unlikely to significantly affect the recommended resource portfolio of the power plan. Because current information is inconclusive and the likely effect on the portfolio small, staff has not adjusted the integration costs of remote resources to account for diversity benefits. However, staff proposes inclusion of an action in the plan calling for further assessment of this issue. This action is currently included in the Northwest Wind Integration Action Plan and regional transmission organizations have indicated interest in leading an assessment of this issue, so we believe that there is good probability of further assessment within the near future.

Regional Conservation Target Allocation

The Act requires that the Council's Plan "set forth a general scheme for implementing conservation" [Section 4.(e)(2).]. Historically, the Council has fulfilled this obligation by setting forth regional goals for conservation acquisition. These "targets" establish the minimum annual savings goals the Council judges to be cost-effective and achievable by all parties in the region. The targets, along with other specific recommendations that support conservation's deployment are included in the Plan's Five Year Action Plan. During the process of developing the Sixth Plan, Bonneville, the region's utilities and some public interest groups have requested that the Council be more specific in its recommendations regarding "who" is responsible for developing what share of the Plan's overall conservation target.

With the exception of the Council's first plan,[1] individual or groups of entities have not been assigned the responsibility to develop specified amounts or types of conservation resources. There are two reasons the prior plans have not included such recommendations. First, and most importantly, the acquisition of nearly all conservation resources moves through several stages between the time an efficiency measure or practice is first deployed and the time it has fully saturated the market. For example, when an energy savings product is first introduced it typically is tested through small-scale pilot or demonstration programs. Once the product's savings, cost and consumer acceptance are demonstrated, it can be deployed through local utility programs or through a Northwest Energy Efficiency Alliance (NEEA) market transformation initiative. In some cases, a measure may even be adopted immediately into building codes or in federal appliance standards. The process of moving a conservation resource through these stages requires adaptive management so that adjustments can be made to the deployment strategy as the market for a product evolves. If the Council's Plan were to assign to NEEA, Bonneville or utilities the responsibility for developing specific conservation resources it is unlikely that this allocation would prove to be the most effective approach to conservation acquisition over time.

[1] The 1983 Plan contained specific savings targets for Bonneville, but not for other entities in the region. When this plan was adopted it was assumed that Bonneville would be the primary resource developer in the region, hence it was charged with the overall responsibility for conservation's acquisitions.

The second reason that prior plans have not assigned the responsibility for the acquisition of specific conservation resources individually to Bonneville, NEEA or utilities and system benefits charge administrators is that these entities all have comparable access to the mechanisms used to develop conservation and they control much of the rate-payer funding for these efforts. These entities have over a thirty-year history of operating conservation acquisition programs and adjusting these programs to maintain their effectiveness in concert with other mechanisms like state tax credits, the federal Energy Star program, LEED certification, local government and industry-specific sustainability programs, and standard-setting efforts.

NEEA is funded and governed by Bonneville, the region's utilities and the Energy Trust of Oregon. Therefore, these parties have the authority to allocate resources to local programs or to NEEA depending upon the combination of mechanisms that work most effectively to secure savings at any given time. In addition, NEEA is directly involved in improvements in state energy codes in the Northwest as well as in the federal appliance standards, or national marketing programs like Energy Star. Many of the region's utilities have been, and could continue to be, involved in both the legislative and administrative processes that improve the region's energy codes. In addition, the utilities can influence state and federal programs, such as tax credits, which can be used to promote some efficiency measures. NEEA, Bonneville and individual utilities all design and conduct pilot or demonstration programs. In fact, collectively, these entities are better positioned to carry out the adaptive management required to accelerate conservation development in the region than is the Council through prescriptions in a five-year action plan. Therefore, both practically and logically, it seems that these entities should have the primary responsibility for allocating their resources to most effectively achieve the region's conservation targets.