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A Resource Adequacy Standard For the Northwest

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A Resource Adequacy Standard for the Northwest

The Pacific Northwest Resource Adequacy Forum¹ (Forum) has developed a regional resource adequacy standard to be used both as an early warning system and for guidance in long-term resource planning. The Forum submits this standard to the Northwest Power and Conservation Council (Council) to adopt for its own planning process and recommends that other entities in the region incorporate the intent of this standard into their planning efforts. The Forum understands that the assumptions made in this standard apply only to regional resource development and that individual utilities may choose different levels of reliance on specific types of resources. The Forum also recommends that this regional standard be provided to the Western Electricity Coordinating Council (WECC) for consideration in its assessment of West-wide resource adequacy.

The term “standard” in this context does not mean mandatory compliance nor does it imply an enforcement mechanism. Rather, it is meant to be a gauge used to assess whether the Northwest power supply is adequate in a physical sense, that is, in terms of “keeping the lights on.” It can be thought of as the minimum threshold for resource acquisition. However, the Forum encourages utility planners to think beyond this minimum and consider strategies that also protect against potentially bad economic outcomes. The Forum recommends that the Council’s Regional Power Plan be used to assess the region’s resource adequacy with respect to economic considerations. A description of how the physical and economic standards will be used is provided in the previously adopted implementation plan (Appendix B).

The regional standard is based on an analytical assessment of the likelihood of failure to provide electricity service. More precisely, the region’s resources should be sufficient to limit the likelihood of a significant curtailment² to no more than 5 percent of future years. Based on that assessment, a simple and more transparent adequacy standard has been developed for the Northwest power supply. The standard includes a metric (something that can be measured) and a target (an acceptable value for that metric) for both energy (annual) and capacity (hourly) capabilities of the system. Historically, Northwest resource planning has been aimed at securing adequate resources for annual or energy needs of the region. However, given recent increases in summer-time loads and decreases in the capability of the hydroelectric system, capacity needs have also become a focus for new resource acquisition.

The Forum believes that the definitions of the energy and capacity metrics and the values for the targets (Appendix A) presented in this paper are appropriate. The Forum understands however, that as new information becomes available, underlying assumptions for the regional adequacy standard will require that metrics or targets be updated. The Forum’s intent is for this process to be dynamic and recommends that an assessment of the region’s resource adequacy be made at least once per year and that the methodology behind the standard be reviewed whenever changes in the system deem it to be necessary. The adequacy assessments should be for three and five years out, to give planners time to take appropriate actions, if necessary.

¹ The Pacific Northwest Resource Adequacy Forum was created in response to action items ADQ-1 and ADQ-2 in the Council’s 5th Power Plan (see www.nwccouncil.org).

² See Appendix A.

The Pacific Northwest Regional Energy Standard

The **energy metric** for the Pacific Northwest³ is defined to be the *average annual load/resource balance*, which is the *available*⁴ *average annual energy* minus the *average annual firm load* in units of energy (average megawatts⁵), where:

- The *available average annual energy*⁶ is defined as the sum of:
 - **Non-hydro** resource generation, including renewable resources, accounting for maintenance and forced-outage rates and limited by fuel-supply constraints and/or environmental constraints
 - **Uncommitted Independent Power Producer (IPP)** resource generation, accounting for maintenance and forced-outage rates and limited by fuel-supply constraints and/or environmental constraints, and assuming
 - full capability from October through May and
 - the fraction of IPP capability available to Northwest utilities from June through September
 - **Firm hydroelectric** generation, based on critical water⁷ conditions
 - **Planning adjustment energy**⁸, which is derived from the currently used 5 percent LOLP guideline⁹
- The *average annual firm load* is based on normal temperature conditions and is adjusted for firm out-of-region energy sales and purchases and for conservation savings.

The **energy target** for the Pacific Northwest is zero, that is, on an annual basis; resources (as defined above) should at least match the expected annual load. When the energy target is achieved, the resulting loss-of-load probability should be 5 percent.

³ The Pacific Northwest is defined to be the geographical area referenced in the 1980 Northwest Power Act, which includes the states of Oregon, Washington, Idaho and the western part of Montana.

⁴ The term “available” does not mean “expected” in this context.

⁵ One average megawatt is equivalent to 8,760 megawatt-hours of energy.

⁶ This refers to resources that are committed to serve regional load, whether or not they are physically located in the region.

⁷ For the region, under current operating constraints (including actions listed in NOAA Fisheries’ biological opinion), the critical water year is defined by the hydrologic conditions from August 1936 through July 1937.

⁸ The value used for “planning adjustment” energy is derived from the Genesys model and should be reassessed at least once a year or whenever new resource information is available. This factor represents an adjustment to be made to the load/resource balance so that when the balance is zero, the associated loss-of-load-probability (LOLP) will be 5 percent. The amount of planning adjustment energy depends on assessments of the availability of out-of-region resources and non-firm hydro energy that the region believes is prudent to plan on for energy adequacy. See Appendix A for specific assumptions.

⁹ The Resource Adequacy Forum is also reviewing the 5 percent LOLP guideline. Any change to this guideline could translate into a different “planning-adjustment” energy value.

The Pacific Northwest Regional Capacity Standard

The capacity metric for the Pacific Northwest is defined to be the *planning reserve margin* (PRM), which is the surplus *generating capability* over the *expected peak load* averaged over the *sustained-peak period*, for summer and winter periods, in units of percent, where:

- The *sustained-peak period* is defined to be the highest 6 hours per day over 3 consecutive days (18 hours in total).
- The *generating capability* is defined as the sum of the sustained-peaking capability from:
 - **Non-hydro** resources, including renewable resources, accounting for maintenance and limited by fuel-supply constraints and/or environmental constraints
 - **Uncommitted Independent Power Producer (IPP)** resources, accounting for maintenance and limited by fuel-supply constraints and/or environmental constraints, and assuming
 - full capability from October through May and
 - the fraction of IPP capability available to Northwest utilities from June through September
 - **Firm hydroelectric** sustained-peaking capability, based on critical water¹⁰ conditions and assuming that no extraordinary actions are taken to increase peaking capability
 - **Out-of-region** capacity for both winter and summer, which is reviewed annually
 - **Incremental hydroelectric** sustained-peaking capability, which is an additional amount available in water conditions better than critical.¹¹
- The *expected peak load* is defined as the average load over the *sustained-peak period*, based on normal temperature conditions and is adjusted for firm out-of-region sales and purchases and for conservation savings.

The PRM targets are derived from the currently used 5 percent LOLP guideline.¹² The PRM is the excess of defined resources over expected loads that yields a 5 percent LOLP. The PRM targets can be thought of as providing components to cover:¹³

- Operating reserve requirements,
- Long-term loss of a resource, and
- Load increases arising from adverse temperature.

¹⁰ For the region, under current operating constraints (including actions listed in NOAA Fisheries' biological opinion), the critical water year is defined by the hydrologic conditions from August 1936 through July 1937.

¹¹ This amount will be defined by an analysis of hydroelectric sustained peaking capability.

¹² The PRM targets are derived from the Genesys model and should be reassessed at least once a year or whenever new resource information is available.

¹³ These components are not strictly additive and attempting to define a PRM target using this method may not lead to a result consistent with the loss-of-load probability analysis.

Appendix A

Current Adequacy Targets and Assumptions

Current Adequacy Targets

- **Energy:**
 - Average annual load/resource balance is zero
- **Capacity:**
 - Winter planning reserve margin is 23 percent
 - Summer planning reserve margin is 24 percent

Resource Assumptions

- **Non-hydro resources:**
 - Capacity will reflect seasonal adjustments.
- **Wind:**
 - To be updated when the wind subcommittee completes its analysis of historic wind data
 - Energy standard: expected average annual generation (currently 30 percent of nameplate)
 - Capacity standard: 15 percent of nameplate
- **Uncommitted Independent Power Producer (IPP) resources:**
 - To be updated annually or when new information is available
 - full capability from October through May and
 - 1,000 megawatts from June through September
- **Out-of-region market**
 - To be updated annually or when new information is available
 - 3,000 megawatts per hour from October through May
 - None available from June through September
- **Incremental hydroelectric sustained-peaking capability:**
 - To be updated annually or when new information is available
 - 2,000 megawatts from October through May
 - 1,000 megawatts from June through September
- **Energy Planning Adjustment:**
 - 1,300 average megawatts derived from the LOLP analysis

Loss-of-load Probability Assumptions

- Significant Curtailment for Energy: 28,800 megawatt-hours of total curtailment over the December through March period or the energy equivalent of the loss of 1,200 megawatt-hours over a 24-hour period.
- Significant Curtailment for Capacity: 3,000 megawatts in any hour of the winter or summer period

Appendix B Pacific Northwest Resource Adequacy Forum

Description of Proposed Resource Adequacy Implementation Approach

INTRODUCTION

Steering Committee Principles

The Steering Committee set out four principles early in its deliberation. The last three of the four dealt with application of regional resource adequacy metrics and targets to individual utilities:

- We should develop mechanisms to assess whether regional resource adequacy metrics and targets are met.
 - One mechanism is a reporting process to get data from individual load serving entities for regional assessments.
 - This allows region-wide transparency and allows individual utilities to assess themselves with respect to their position in the Region.
- There should be some mechanism reasonably to assure that the regional metrics and targets will be met going forward.
- Don't trample on the jurisdiction of states or prerogatives of individual utilities in planning and acquiring resources to meet load.

Successful implementation of the proposed approach assumes that the Pacific Northwest Resource Adequacy Forum (Forum) has reached agreement on both energy and capacity metrics and targets that are deemed to satisfy an acceptable loss-of-load probability target on a regional basis.

PROPOSED APPROACH

The Steering Committee believes that the following approach will reasonably assure that the resource adequacy standards will be met. The Steering Committee recommends that the Council adopt this approach as advice to the Region.

Regional Awareness of Resource Adequacy Framework: There are a number of national, west-wide, regional and state efforts currently underway, which have thrust resource adequacy into the limelight. The Energy Policy Act of 2005 mandates the Electric Reliability Organization (ERO), established by the act to implement mandatory reliability standards for the bulk-power system under the purview of the Federal Energy Regulatory Commission (FERC), “to conduct periodic assessments of the reliability and adequacy of the bulk-power system in North America.” The North American Electric Reliability Council (NERC), the ERO designee apparent, is in the process of developing a standard for resource adequacy assessments. FERC said in its final rule on implementation of the ERO provisions of the legislation that it intends to require the ERO to make recommendations where entities are found to have inadequate resources following the assessments.

In the West, the Western Electricity Coordinating Council (WECC) is developing guidelines to recommend appropriate methodologies for assessing resource adequacy. Although the NERC and WECC efforts act as drivers, momentum is also building within the region for a regional resource adequacy standard through the Forum and the resurgence of Integrated Resource Plans (IRPs). In fact, the state of Washington recently passed legislation requiring all large electric utilities, both public and private, to prepare IRPs. Utilities, state regulators and the elected boards of public utilities are all explicitly examining strategies for planning resources to meet load. The efforts described above, the active participation by the utility and state regulatory communities in the Forum and the adoption of an energy metric and target for the region by the Council all serve to elevate the electricity industry's awareness of the regional standard, which is the first step to achieving resource adequacy.

Reporting: Utilities, other than those that have chosen in advance to put their entire load on Bonneville, would report their load and resource forecasts annually to some regional entity. Bonneville would report for all the utilities that have chosen it as their ongoing resource supplier for load growth. Currently the utilities with responsibility for procuring resources to meet their load obligation report their forecasted loads and resources to PNUCC. This approach proposes to continue using PNUCC and its Northwest Regional Forecast (NRF) as the vehicles for reporting. Aside from possible refinements in data definitions and development of protocols for any new data, this reporting process would involve little change from current practice, except for those utilities that are newly assuming independent resource procurement responsibility. The NRF currently uses a five-year planning horizon, which would be maintained for this purpose. Reporting is central to the proposed implementation process and relies on full participation by the utilities, their regulators and local boards, and Bonneville. Bonneville contracts would not require that its customer utilities develop resources to meet adequacy standards, but they would require that utilities who do not rely on Bonneville to meet their load growth to report their load and resource data for this assessment.

Assessment: The results of this reporting would be used in an assessment, in which the regional totals would be checked against the regional energy and capacity metrics and targets. This assessment would be done in the first instance by PNUCC. The assessments for the planning years, five and three years out, would be of most consequence for the region. The results of these “bottoms-up” assessments could then be compared with the Council's “top-down” regional assessments in order to validate the assessments, or, in the case of discrepancies, either inform quality control checks of the data to further refine the assessments in the future or highlight differences in assumptions. Some differences in assumptions e.g., about capacity factors of wind generation, might provoke additional research, while others could be the result of policy or regulatory decisions.

At this stage, the results of the assessment(s) would be depicted on an aggregated basis, as is currently done in the NRF. Utilities would be able to compare their resource strategies for meeting load obligations to the regional resource adequacy situation and adjust their plans accordingly. The regional assessment(s) would include the “planning adjustment” (market purchases plus hydro flexibility) and the regional uncontracted IPP generation in the regional totals, as described in the energy metric and target adopted by the Council.

Highlighting how much the region is relying on the external spot market or on uncommitted regional IPP generation, compared to the amounts included in the currently proposed standard

would provide a kind of warning signal to the region about potential upcoming adequacy problems.

Indicators of Resource Adequacy Levels: The section below describes in more detail a “green light, yellow light, red light” approach to regional adequacy assessment and describes actions to be taken with each outcome.

The description refers both to a physical standard, the target adopted by the Council, and to an economic standard, a metric that provides more resources than simply enough to avoid loss of load. The Council’s economic target developed in the Fifth Power Plan provides one such metric. Developed by analyzing the exposure of the Northwest power system to a large variety of risks, including the risk of high market prices, such as were experienced in 2000-01, this target would give the region approximately an additional 3,000 MW of resources, above the level that would be developed pursuant to the target adopted in the adequacy standard.

An alternative economic standard could be when the region as a whole begins to show reliance on the extra-regional spot market and the uncontracted IPP generation within the region.

The approach is summarized in the following table:

How When	Economic Standard		Physical Standard	
	Pass	Fail	Pass	Fail
5 th Year Out	Green	Yellow	Green	Yellow
3 rd Year Out	Green	Yellow	Green	RED

A green light would trigger an acknowledgement that the region is on track. The yellow and red lights would be used to trigger different regional actions. Since the yellow light would indicate a kind of early warning, a regional report could be issued by the Council. It would be presented at a Council meeting and public comment would be taken. This report would emphasize that the region is potentially entering a more serious situation and encourage utilities with load service responsibilities to take action. This report would not single out individual utilities. The Council could also convene a regional meeting to discuss the results of the assessment.

For the red light, additional actions would be taken. A regional discussion would be started to understand the reasons for being in the situation triggering a red light, to determine whether sufficient actions are being taken to remedy the forecast inadequacy, and to identify additional measures needed, if any. A regional conference would be held to begin that discussion. The goal of these discussions would be to ensure that sufficient actions will be taken to avoid an actual inadequacy. If the discussions are successful, then the Council would publicly announce its conclusion that sufficient actions are being taken to address the “red light” and would monitor progress on these actions.

In the event that the Council concludes that these discussions did not succeed in providing sufficient assurance of avoiding inadequacy, further steps could be taken. One of those steps, for example, would be for the Council to report that the initial problem is not being adequately

addressed. A second possible response would be for the Council to communicate directly with individual utilities, local boards or state commissions for those utilities that appeared to be disproportionately relying on uncommitted purchases. This action would ensure both that these key decision makers were aware of the potential problems and that the Council fully understood the reasons for the utilities' being in such a circumstance. The Council could also consider publicly announcing which utilities are relying disproportionately on uncommitted purchases. With these options the Council would have sufficient recourse to follow up on regional inadequacy if it were to persist.

Economic Incentives for Meeting Adequacy Standards: Because of the variation in water conditions the Northwest experiences, prospective (planning) inadequacy will not necessarily turn into inadequacy in actual operations. However, should the region be inadequate on a near-term planning basis (too short a timeline for construction of new resources), utilities that are short, for whatever reason, would face the market price and any environmental mitigation consequences of their actions. This will provide a strong natural incentive to develop adequate resources.

Though Bonneville contracts will not require its customers to meet adequacy standards, they will reinforce this economic incentive. The Regional Dialogue discussions are not complete and Bonneville has not yet issued a final decision. Assuming, however, that discussions continue along the path they are currently on, the following is one set of probable outcomes. Bonneville expects to negotiate contracts with its public agency customers that will provide that customers either make an election to (1) purchase load-following power products from BPA or (2) take fixed amounts of power that do not follow load. Once a customer's load is forecasted to exceed their entitlement to power at the Tier 1 rate on a three year out basis, the customer needs to decide whether to procure their own resources to meet its load growth, or to contract for power from Bonneville at the Tier 2 rate. Contracting for Tier 2 power from Bonneville would potentially include a three-year notice requirement. This requirement would make it clear that Bonneville will not provide an assured "backstop" for utilities which fail to develop their own resources. The contracts would also include affirmation by the customers that they understand the resource adequacy standards and that Bonneville would not provide short-term backup service. The details of this relationship (amounts of power to be provided by Bonneville, etc.) will have to be worked out in the contract discussions between Bonneville and its power customers.

It is also important to remember that, just as conditions could turn out in an operating year to be better than expected, they could also turn out to be worse. The planning metrics and targets are established based on a five percent LOLP, which means that they are not intended to protect against all possible outcomes. There will be some circumstances in which, even if utilities meet the planning criteria, they could face high market prices or even potential load curtailments.

Conclusion: The Steering Committee believes that the above-described approach, though voluntary and not regulatory, will provide reasonable assurance that the regional resource adequacy standards will be met. The Committee urges the Council to adopt this approach as a commitment to take the actions described for the Council, and as the Council's advice to other parties to take the actions described for them.

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