DRAFT - Revision 2

Options for a NW Resource Adequacy Standard

Pacific Northwest Resource Adequacy Forum
Steering Committee
October 26, 2005

Introduction

This paper summarizes the conclusions reached by the technical committee at its October 7th meeting. It also outlines issues yet to be resolved and offers suggestions for further work. Finally, it provides a matrix of potential options for a Pacific Northwest resource adequacy standard -- metrics and targets for both energy and capacity. But before we get on to those topics, it may be useful to review the initial suggestions of a WECC working group that looked at the issue last year. A WECC subcommittee will be taking up this question again early next year and will review the working group report at that time. The subcommittee has representatives from the Northwest, including BPA and the Council, who will help to ensure that any WECC guidelines are consistent with this development effort in the Northwest.

Suggested Guidelines for a Standard

The working group suggested guidelines for both energy and capacity metrics and targets. More specifically, it proposed definitions for the metrics and targets as follows:[1]

> ***Metrics***
>
> *RAWG recommends the initial assessment of the following two deterministic metrics (1) for WECC as a whole and (2) for each of the transmission bubbles, which are the initial geographical levels analyzed. It is expected that in any single WECC region or transmission bubble that one of these two metrics will provide the limiting constraint.*
>
> - *Capacity margin over the summer or winter peak load month, using 1:2 weather (expected weather patterns from 50 years of recorded peak events and any consensus on the impacts of climate change) and average economic/demographic projections.*
> - *Monthly, seasonal or annual energy load-resource balance, where the energy load-resource balance is defined as the maximum available energy minus the average energy demand for the month, season or year. The maximum available energy is defined as the sum of the maximum energy output from all thermal resources (accounting for maintenance and forced outage rates and limited by fuel supply constraints and/or environmental constraints) plus any hydroelectric*

[1] "Resource Adequacy Working Document, Progress on Developing Resource Adequacy Criteria," Western Electricity Coordinating Council's (WECC) Resource Adequacy Workgroup (RAWG), RAWG Chair recommended version, April 2005, p. 13-14, http://www.wecc.biz/documents/meetings/PCC/RS/RAWG/DraftRAWG_ChairShortWorkingDocument_040505.pdf

system energy based on an appropriate adverse water condition that properly reflects the uncertainties of occurrence (runoff volume) plus any assumption regarding available energy imports. The average energy demand is defined as the average demand for the month, season or year based on some yet to be determined adverse temperature condition.

Other metrics that could be used for resource adequacy assessments are such probabilistically determined metrics as loss-of-load probability (LOLP), loss-of-load expectation (LOLE) and expected unserved energy (EUE).

Because of the complexity of the models needed to perform these types of assessments, many NERC Regions use a probabilistic metric and target (such as an LOLP on one day in ten years) as the basis for a deterministic RA requirement (such as a planning reserve margin of 12%).

Guidelines/Benchmarks/Targets

Each of the two deterministic metrics described above should have a specific benchmark or target that is used to judge adequacy. Assessments for a transmission bubble that fall below a given benchmark are candidates for being identified as potentially inadequate within the constraints of the analysis and data used in the assessment.

While sophisticated analytic techniques such as LOLP, LOLE and EUE may be the basis for defining specific benchmarks, in the end, any benchmark is the result of a tradeoff between reliability and the cost that must be made by policy-makers if electricity consumers are not allowed to make their own choices in response to market prices.

- *Guideline/Target/Benchmark for summer and winter peak capacity metrics: XX% planning reserve margin.*
- *Guideline/Target/Benchmark for the energy metric: The monthly, seasonal or annual energy load-resource balance must be equal to or greater than zero.*

Summary of the Technical Committee October 7th Meeting

The technical committee tentatively agreed to the following:

1. Using a ***deterministic*** metric for the regional energy resource adequacy standard is appropriate, as long as it can be analytically correlated to a well-vetted and acceptable ***probabilistic*** metric (such as an LOLP).

2. The ***energy metric*** should be an annual energy load/resource balance.

3. The ***capacity metric*** should be the 50-hour sustained peaking capability of the system.

4. An ***energy target*** based on the critical water year is too conservative. Another level of adverse runoff condition (yet to be determined) is more appropriate.

5. An ***energy target*** based on average annual regional demand is appropriate. The effects of adverse weather conditions on demand and resources are explicitly modeled in the probabilistic assessment, which is then linked to the load/resource balance.

6. No agreement was reached as to whether an ***energy target*** should include any assumptions regarding out-of-region ***spot-market*** supplies. Some members had little confidence that any out-of-region supplies would be available during a power emergency. Others felt that southwestern supplies would likely be available during winter months and therefore should be included in the assessment. The Council's winter LOLP calculation assumes that 3,000 megawatts of surplus (uncontracted) out-of-region capacity is available. This translates into approximately 1,500 aMW of imported spot-market energy, on average. The summer LOLP assessment assumes no available out-of-region supplies.

   - The first question to be addressed is whether these assumptions for the stochastic adequacy assessment (LOLP) are reasonable. How much out-of-region surplus *capacity* can we reliably count on during winter and during summer? Because of the inherent differences in peak load seasons, the southwest should almost always have some surplus capacity during winter months (if they have planned properly).

   - The second question is how the assumption regarding out-of-region spot-market supplies will be incorporated into the deterministic load/resource balance metric. Historically, annual load/resource balance has been calculated assuming critical hydro, average loads and only ***firm*** out-of-region contract energy (imports and exports). The LOLP analysis has identified the relationship between out-of-region surplus capacity and load/resource balance (calculated in the historical fashion). To maintain a 5 percent winter LOLP, assuming 3,000 MW of surplus out-of-region capacity (or equivalently 1,500 aMW of surplus out-of-region energy) the load/resource balance should be ***minus*** 1,500 aMW. That is, the region should plan to a 1,500-aMW-deficit based on a load/resource balance calculation that assumes critical hydro, average loads and no out-of-region spot-market energy.

   - Planning to a deficit, however, may raise concerns to some. To avoid this, the region could assume a better-than-critical water condition in its calculation of the load/resource balance. For example, if we choose a water condition that provides 1,500 aMW more energy than critical water (approximately the 85th

percentile), then the planning target becomes 0 aMW. This is equivalent to using critical hydro and planning to a 1,500-aMW deficit.

- For those who would like to continue to use critical water but do not want to plan to a deficit, the alternative is to explicitly assume 1,500 aMW of imported energy in the load/resource balance calculation. In this case, the target also becomes 0 aMW.

- All three options listed above are equivalent. Each option yields the same level of adequacy for the power supply. The difference is in how the load/resource balance calculation is defined and in the corresponding target. Table 1 below summarizes these three options and two more alternatives.

7. A ***capacity target*** was not discussed. However, it was agreed that BPA's assessment of the regional power supply's sustained peaking capability would be used until a more permanent arrangement is determined.

8. For the ***capacity*** assessment, the sustained peaking capability of the system must be assessed every month. For the ***energy*** assessment, the annual load/resource balance will be used, although it may be necessary to do a winter and summer energy assessment. (For further discussion of why an annual load/resource balance is appropriate, see the section regarding "Other Issues").

9. In terms of counting resources:
    a. For ***wind***, use 20 percent of the installed capacity for the ***sustained peaking*** assessment and use historical monthly average production for the ***energy*** assessment (if historical data is not available use 30 percent of installed capacity).

    b. For ***thermal*** resources, ***energy*** calculations should assume normal maintenance schedules, forced outage rates and operating constraints based on environmental restrictions. For the ***sustained peaking*** assessment, the installed capacity should be used.

    c. The same assumptions as in subsection b (above) apply to regional resources owned by independent power producers (IPP). (It was not discussed at the meeting but an underlying assumption is that all firm contracts into and out of the region would be part of the load/resource balance calculation. Thus, any IPP contracted energy out of the region would be taken into account.)

10. For further analysis:
    a. Other models should be reviewed as possible candidates to assess the regional LOLP (or other probabilistic metrics). Suggestions were to look at the AURORA model, the GRIDVIEW model and perhaps the CEC SAM model.

b. The committee wanted to see how the GENESYS model was benchmarked. Without this supporting documentation, the members felt uncomfortable basing the load/resource target on GENESYS results.

Table 1 below summarizes some of the potential options for metrics and targets (and the associated parameter assumptions). *It should be noted that each case below corresponds to the equivalent level of adequacy (namely the 5% LOLP as currently calculated by the Council).*

Table 1
Pros and Cons of Various Equivalent Energy Metrics and Targets

Energy Metric	Target	Hydro	Load	Imports	Pros	Cons
Annual L/R Balance *Calculated using 85% hydro, average loads and no spot market imports*	0	85%	Normal	0	Target is not less than 0 Correlates with a 5% LOLP.	The 85th percentile hydro condition is not likely to be associated with the same historical water year for all hydro facilities in the PNW. May not be appropriate for summer.
Annual L/R Balance *Calculated using critical hydro, average loads and no spot market imports*	-1500	Critical	Normal	0	Uses traditional methods to calculate L/R balance. Correlates with a 5% LOLP.	Requires planning to a deficit; individual utilities are not able to determine their share of deficit. May not be appropriate for summer.
Annual L/R Balance *Calculated using critical hydro, average loads and 1500 aMW of spot market imports*	0	Critical	Normal	1500	Uses traditional method to calculate L/R balance. Target is not less than 0	Must assume some help from imports. Unclear how much individual utility should assume for spot market winter imports. May not be appropriate for summer.
Annual L/R Balance *Calculated using critical hydro, loads based on adverse weather and no spot market imports*	Unknown	Critical	Adverse	0	Explicitly takes adverse weather into account.	Lack of analysis. May result in overbuilding of resources May not be appropriate for summer.
Monthly L/R Balance *Calculated using monthly values for critical hydro, loads based on adverse weather and no spot market imports*	Unknown	Critical	Adverse	0	Can do winter and summer separately.	May result in overbuilding of resources Lack of analysis. Potential data problem.

Other Issues

Why not use a seasonal or monthly load-resource balance?

This issue is as yet unresolved and more discussion and analysis is anticipated. The arguments for using a seasonal or monthly load-resource balance include the idea that it would more closely reflect the status of the power supply over the peak demand season. However, a monthly or seasonal assessment of resources requires more detailed information, some of which (such as maintenance schedules) has become very difficult, if not impossible to obtain. Also, linking an LOLP assessment to a monthly or seasonal load-resource balance would not improve the planning process. It would merely change the metric to be computed and also change the target, but the outcome (i.e. an LOLP of 5 percent) would remain the same.

What roll do out-of-region resources play in the assessment of adequacy?

California Energy Commission (CEC) data has historically shown large amounts of surplus winter capacity to be available for export. However, that data may not have included limitations due to fuel supply (or fuel contracts) and air quality concerns. Bonneville staff have taken a cursory look at the potential out-of-region ***winter*** capacity supply and concluded that 3,000 megawatts would be a conservative estimate. Three thousand megawatts of available winter capacity from outside the Northwest translates into approximately 1,500 average megawatt-seasons of energy actually used to meet Northwest load in the analysis. Because the northwest competes with southern utilities for summer resources, simulations examining ***summer*** adequacy should assume no available out-of-region supply.