Northwest Power and Conservation Council

November 1, 2010

MEMORANDUM

TO: Power Committee Members

FROM: John Fazio -- Senior Power System Analyst

SUBJECT: Status Report on Resource Adequacy Analysis

In April of 2008, the Council adopted the NW Resource Adequacy Forum's proposed adequacy standard for the Pacific Northwest. It was expected that the Forum would assess the adequacy of the power supply on an annual basis, to provide an early warning should resource development fall short. It was also anticipated that the standard would be reevaluated after a couple of years to ensure its viability as a measure of adequacy. The Forum also suggested that the underlying methodology should be peer reviewed.

The reevaluation process, which is ongoing, began in January of 2010 and the peer review of the methodology should be completed by December. In the meantime, the Forum has updated resource and load data and has overhauled the model to better address capacity issues. The preliminary assessment for 2015 shows the regional power supply to be adequate. However, that assessment depends heavily on assumptions regarding how "borrowed hydro[1]" is dispatched and on what contingency resources and actions are available during periods of stress. Assumptions about these variables have not been reviewed in some time and may no longer be representative of current operations. *Thus, the recommendation is to postpone releasing a report until about March 2011 when these issues should be resolved.*

However, some relevant information can be extracted from this preliminary work;

1. Summer appears to be the critical period for the Northwest, in terms of the gap between resource capability and demand.
2. In fact, summer energy needs may outweigh summer capacity needs.
3. Conservation is crucial to maintaining an adequate supply.
4. Capacity issues have greatly increased the complexity of the problem.
5. Early indications are that the standard will likely have to be modified to include magnitude of curtailment along with probability.

[1] Borrowed hydro refers to water below the Pacific Northwest Coordination Agreement's drafting rights rule curve elevations, which can be used during normal operations for short periods of time and is then replaced.

Status of Resource Adequacy Analysis

Power Committee Conference Call
November 1, 2010

Initial Observations

- No definitive adequacy standard exists
- Most regions use probabilistic methods
- Probabilistic methods vary radically
- Council adopted NW standard in 2008
  - To be tested for a couple of years
  - Then to be reevaluated and peer reviewed
- Reevaluation and review underway
- Capacity issues greatly increase complexity
- Standard will likely have to be modified

Early Results & Recommendation

- Analysis indicates summer is the critical period
- Conservation is critical to maintaining adequacy
- Must address summer energy as well as summer capacity
- Based on current standard and assumptions, supply is adequate in 2015
- However, assumptions regarding borrowed hydro[1] and contingency resources[1] are likely out of date

Recommendation: Due to the high sensitivity of LOLP to the variables mentioned above, postpone releasing a report until major issues are resolved.

[1]Defined later in this presentation

Status of work

- Model has been enhanced to focus on capacity
  - Greatly increases the complexity of the problem
  - Must be more thoroughly tested and benchmarked
- Data has been updated
  - Temperature-correlated wind data not yet ready
- LOLP very sensitive to certain variables
  - Need to better define use of borrowed hydro
  - Need to better define contingency resources
- Methodology undergoing peer review

Adequacy Assessments[1] (for 2015)

LOLP (%)	Winter Capacity	Winter Energy	Summer Capacity	Summer Energy
Jun 2008	0.0	0.0	0.0	N/A[2]

[1]Loads are forecast using the HELM algorithm (old methodology and data) and include (implicit) new conservation . BiOp assumptions and hydro peaking capability are based on 2008 data.

[2]Summer energy LOLP is not defined in the current standard. The Forum assumed that satisfying the winter energy need would suffice for summer – this turned out to be a bad assumption.

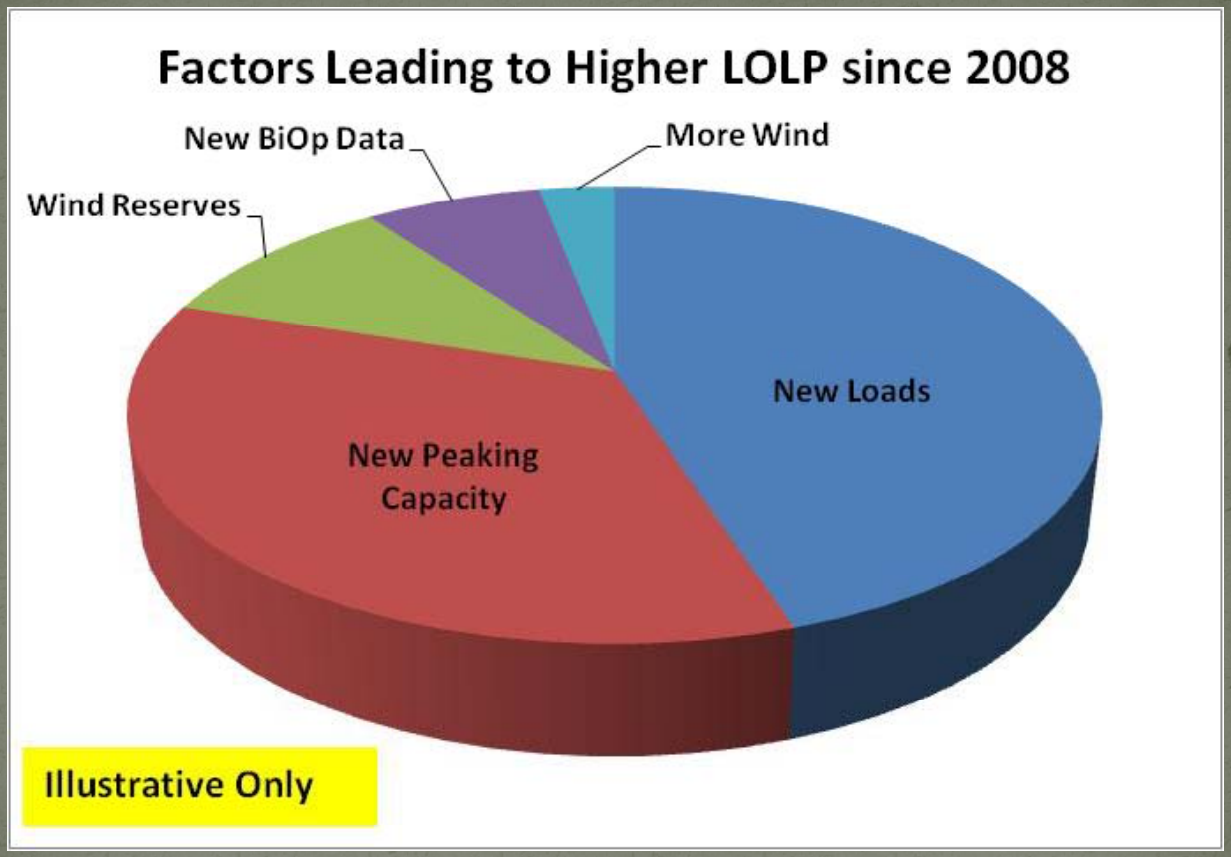
Adequacy Assessments (for 2015)

LOLP (%)	Winter Capacity	Winter Energy	Summer Capacity	Summer Energy
Jun 2008	0.0	0.0	0.0	N/A
6th Plan[1]	0.0	0.0	5.0	N/A

[1]These 6th plan LOLP values are inferred from deterministic metrics. For example, the summer capacity minimum reserve margin (based on a 5% LOLP) is 24%. The calculated 2015 reserve margin using 6th plan loads, existing resources and (implicit) new conservation is 24%, implying a 5% summer capacity LOLP.

Changes since 2008
(all result in a higher LOLP)

- Better load forecasting tools
  - Higher monthly and hourly loads
- Better hydro peaking analysis
  - Lower sustained peaking capability
- Lots more wind
  - More variation to load
- Wind reserves
  - Reduce peaking capability
- New BiOp
  - Increases hydro constraints



Major Issues Remaining

1. Use of "borrowed" hydro
2. Curtailment event thresholds (surrogate for contingency resources)
3. Temperature-correlated wind data

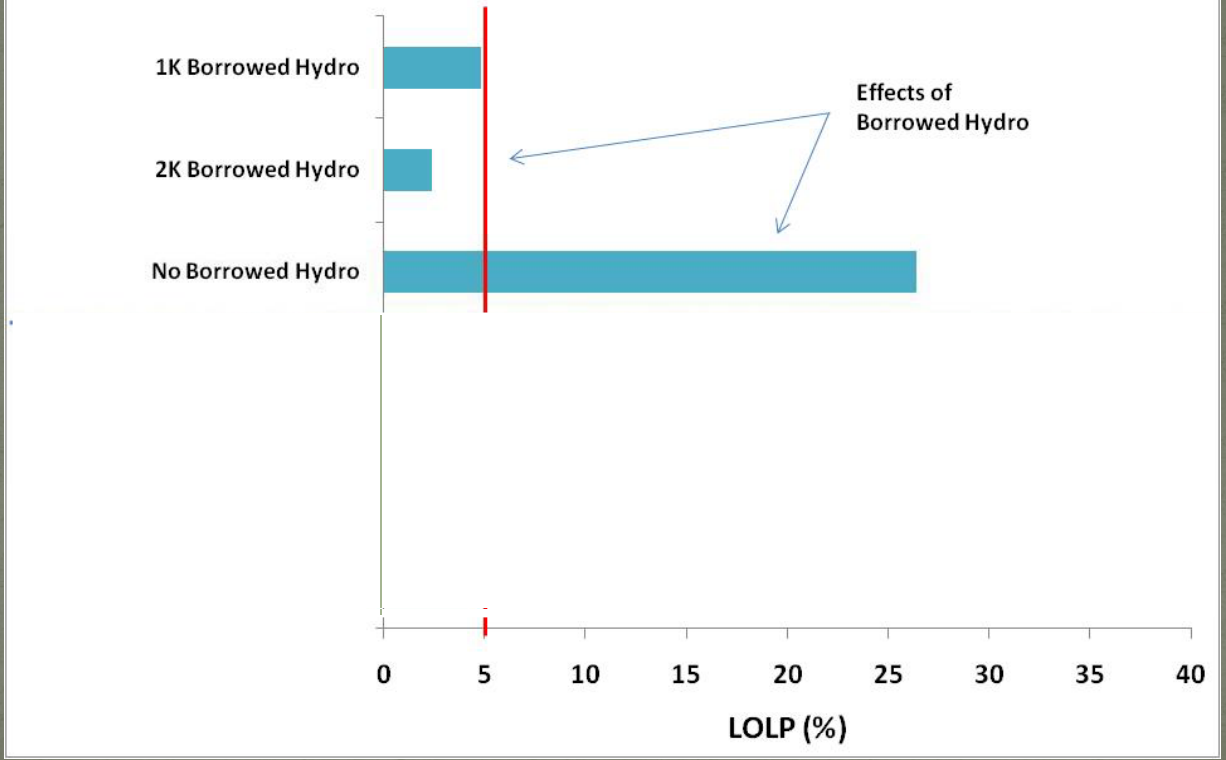
Borrowed Hydro

- Hydro energy below PNCA drafting rights rule curve elevations
- If drafted, paid back as soon as possible
- Used in normal operations, not just during emergencies
- Concern: Borrowed hydro operating assumptions are 10 years old and may not reflect current practices

Action Items:

- BPA staff to assess current use of borrowed hydro
- Model will be modified to simulate current use and limitations

2015 Summer Energy LOLP Sensitivity



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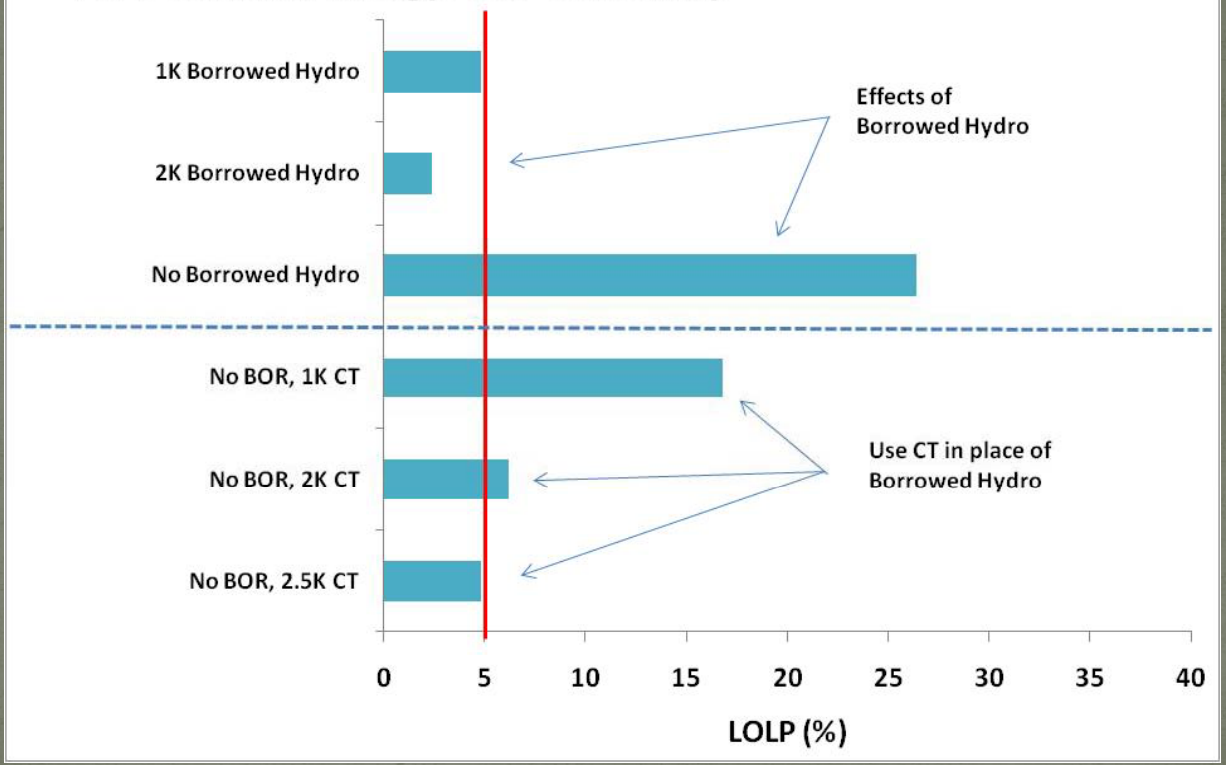
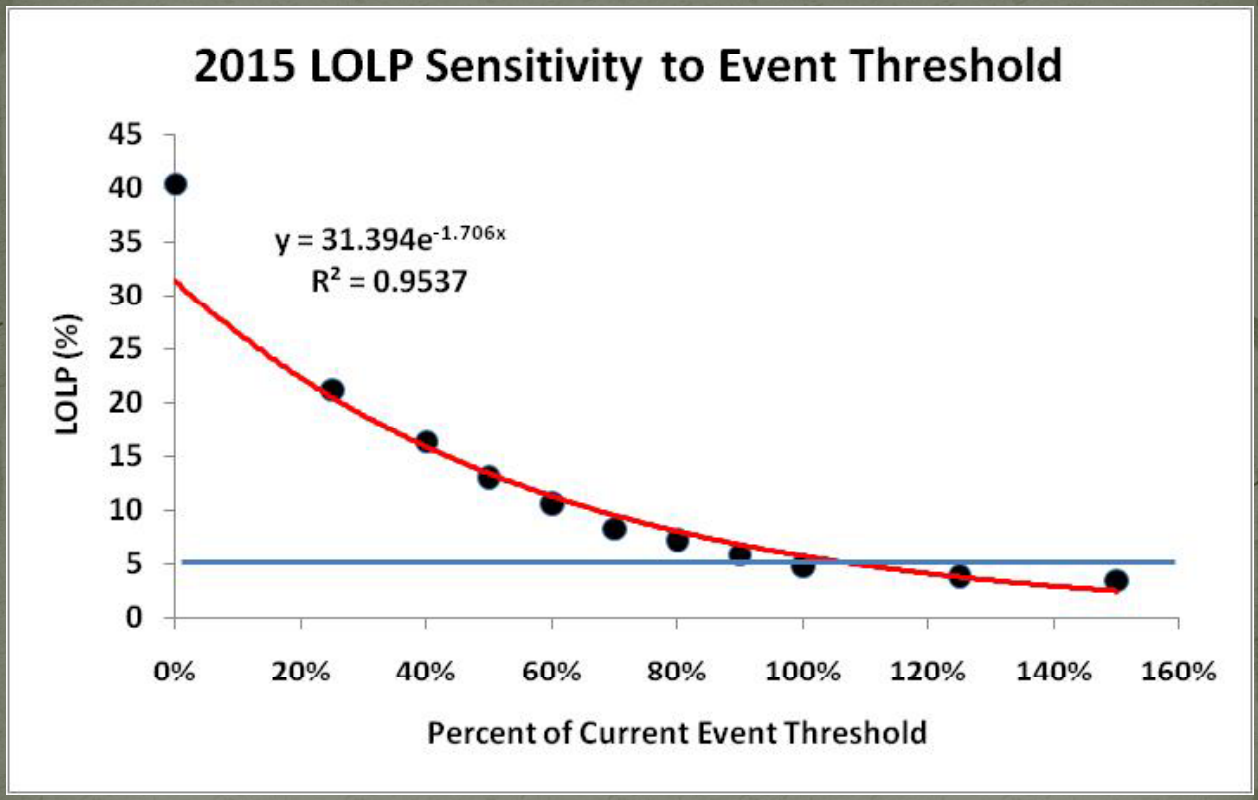


Curtailment Event Thresholds

- Energy Adequacy: Any winter or summer period in which total curtailment exceeds 28,800 MW-hours
- Capacity Adequacy: Any winter or summer period in which curtailment in any hour exceeds 3,000 MW
- Used as a surrogate for contingency resources
- Concern: May no longer be representative of current emergency resources and actions

Action Items

- BPA will develop a list of available contingency resources
- Future event thresholds will be modified accordingly



Temp-correlated Wind Data

- Wind generation appears to be inversely proportional to large temperature diversions
- New data probably not available until spring 2011
- Concern: Currently used hourly wind data is not temperature correlated and could result in overly optimistic adequacy assessments

Action Items

- BPA will complete work on temperature-correlated data
- Interim solution: investigate modifying the model to discount wind during extreme temperature deviations

Peer Review of Methodology

- Independent third party review (PSRI)
- No national or international standard or methodology
- Stochastic assessment is most used methodology
- LOLP only captures probability and not magnitude

Action Items

- Complete review by early 2011
- Revise methodology to include measure of magnitude
- Modify current standard as needed

Work Plan for 2011

- November 2010
  Status report to Council
- February 2011
  Remaining major issues resolved
- March 2011
  Assessment based on current standard
- April 2011
  Technical committee completes proposed revisions to the standard
- June 2011
  Steering committee votes on revisions
- August 2011
  Council votes on adopting new standard
- October 2011
  Adequacy assessment for 2016 with revised standard
- June 2012
  Adequacy assessment for 2017