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June 29, 2011

## MEMORANDUM

**TO:** Power Committee Members

**FROM:** John Fazio, Senior Power Systems Analyst

**SUBJECT:** Outline for joint Council/PNUCC Wind Impacts Paper

Council staff is working with PNUCC and others to analyze the effects on the Northwest's power supply of anticipated increases in wind resource development. This work is in direct response to action plans in the Council's 6<sup>th</sup> power plan and actions called for by the Wind Integration Forum. More specifically,

- Action item GEN-5 calls for an examination of power system flexibility in light of increasing amounts of installed wind capacity.
- GEN-13 calls for the development of a synthetic wind data set for Northwest sites.
- TX-1 calls for the Council to participate in and track WECC activities. More specific to this analysis is the work of WECC's Variable Generation Subcommittee, which is developing ways to assess the capacity value of wind resources.
- The Wind Integration Forum has asked the NW Resource Adequacy Forum to reassess its 15% sustained-period wind capacity value.

Council staff completed a preliminary wind analysis in January and reported those results at the February 2011 Power Committee meeting and separately to the PNUCC System Planning Committee. Since the initial analysis, the GENESYS model has undergone extensive refinement of its hourly dispatch logic. Also, since that time, biological opinion hydro operating constraints have changed. Staff is currently in the process of updating data and testing the revised model, and will shortly begin reanalyzing its previous work. Work is expected to be completed by late summer and will be presented to the power committee as soon as it is available.

Attachment A provides an outline of the planned analysis and paper. The outline has been discussed with the PNUCC System Planning Committee but has not yet been finalized. It should be noted that the section on assessing the load carrying capability of wind resources may be moved to a separate paper.

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## **Attachment A**

### **Effects of Increasing Wind Generation on the Northwest Power Supply Outline**

**Objective:** To use the GENESYS model to provide insights into the effects of integrating larger amounts of wind generation into the Northwest's power supply.

#### **Proposed Studies:**

##### **1. Wind Load Carrying Capability (WLCC)**

- **Purpose:** To establish how much incremental load a specific amount of installed wind nameplate capacity can provide for. In other words, for a particular amount of load growth, how much installed wind nameplate capacity must be added in order to keep the adequacy of the power supply constant? This should be done for annual, monthly, sustained-peak and single hour load increments.
- **Note:** The PNUCC System Planning Committee has reservations about including this particular analysis in the paper. Council staff, however, is planning to proceed with this work in response to the 6<sup>th</sup> plan action item and also to provide information to WECC's Variable Generation Subcommittee. It is anticipated that this work will be reported in a separate paper.

##### **2. Effect of wind resources on oversupply**

- **Purpose:** To assess how increasing amounts of installed wind nameplate capacity affect the frequency and magnitude of oversupply conditions.
- These studies are planned to be done with no out-of-region surplus energy demand market. Assumptions regarding that market can be made post-analysis.
- To keep things simple, these studies will also be done without allowing the hydro system to exceed the biological opinion spill targets (even though there may be "room" to spill more, up to the EPA gas-cap limits).
- These studies will summarize the change in oversupply as a function of installed wind nameplate capacity on a monthly basis.

##### **3. Effect of wind on thermal resource dispatch**

- **Purpose:** To assess how the dispatch of thermal resources is affected by increasing amounts of installed wind nameplate capacity.
- Results for this section will be drawn from the analysis done for section 2 above.
- The analysis will include
  - Changes to aggregate resource type dispatch by month as a function of installed wind
  - Changes to specific individual resource dispatch by month
  - Changes to other critical operating characteristics, such as frequency of resource startups for individual resources

#### 4. Sensitivity of Results to Wind Data

- **Purpose:** To assess how the results of the above studies change with respect to different wind data sets.
- The current wind data set used by Council staff is a 40-year record of synthetic hourly wind capacity factors based on the historical operation of BPA's wind fleet. Questions have arisen regarding the appropriateness of this data.
- Sensitivity studies will be run with at least the following different wind data sets
  - BPA's 30-year wind data set used for its rate case analysis
  - Regional 3-year historical wind data
  - A 3-year wind data set based on NREL data
- A related topic (but not intended to be a part of this analysis) is work being done to investigate potential correlations between temperature (load) at demand centers and wind generation. This work began some time ago and is being spearheaded by BPA staff. Anecdotal investigation of historical wind data suggests that there is an inverse relationship between wind generation and extreme temperature events. In other words, when temperatures are extremely high or low, wind generation appears to be very low. It is anticipated that preliminary results of this work may be available sometime in 2012. Staff will keep Council abreast of progress in this area.