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June 29, 2011

## MEMORANDUM

**TO:** Power Committee Members

**FROM:** Ken Dragoon

**SUBJECT:** Wind Integration Forum Update and Staff Work Plan

The Wind Integration Forum (WIF) is jointly hosted by the Council and BPA for the purpose of addressing regional issues around accommodating the unique characteristics of wind generation on the Northwest power system. A meeting of the WIF Steering Committee, comprised of executives from utilities and stakeholder groups across the Northwest, was held on June 6. A condensed review of the Steering Committee meeting will be presented to the Power Council along with a short discussion of the seven resulting action items.

BPA Administrator Stephen Wright requested that the Council lead efforts on one of the seven action items: longer term infrastructure changes to accommodate over-supply events. Council staff produced a draft work plan that will be presented and discussed. It is likely that the work envisioned will ultimately need financial support from the Council and BPA for engineering studies or analysis. The extent of such support will likely not be known for several months.

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# Wind Integration Forum Update and Draft Work Plan

Power Council Meeting July 7, 2011  
Ken Dragoon

# Steering Committee Meeting, June 6

- ▶ Attendees:
  - Two dozen steering committee members representing executives from NW utilities and other stakeholders.
  - More than sixty additional physical attendees.
  - Ninety telephone attendees.
- ▶ Reviewed wind resource development to date and associated benefits and challenges.
- ▶ Came away with 7 Action Items, one requested Council assignment.
- ▶ Notes, recording, and public internet forum have been posted to Council web site:

<http://www.nwcouncil.org/energy/Wind/meetings/2011/06/Default.htm>

# Rapid Growth of Wind Generation Largely Driven by Renewable Standards

## State Renewable Standards

### Montana

- 5% for 2008 - 2009
- 10% for 2010 - 2014
- 15% for 2015 and beyond

### Washington

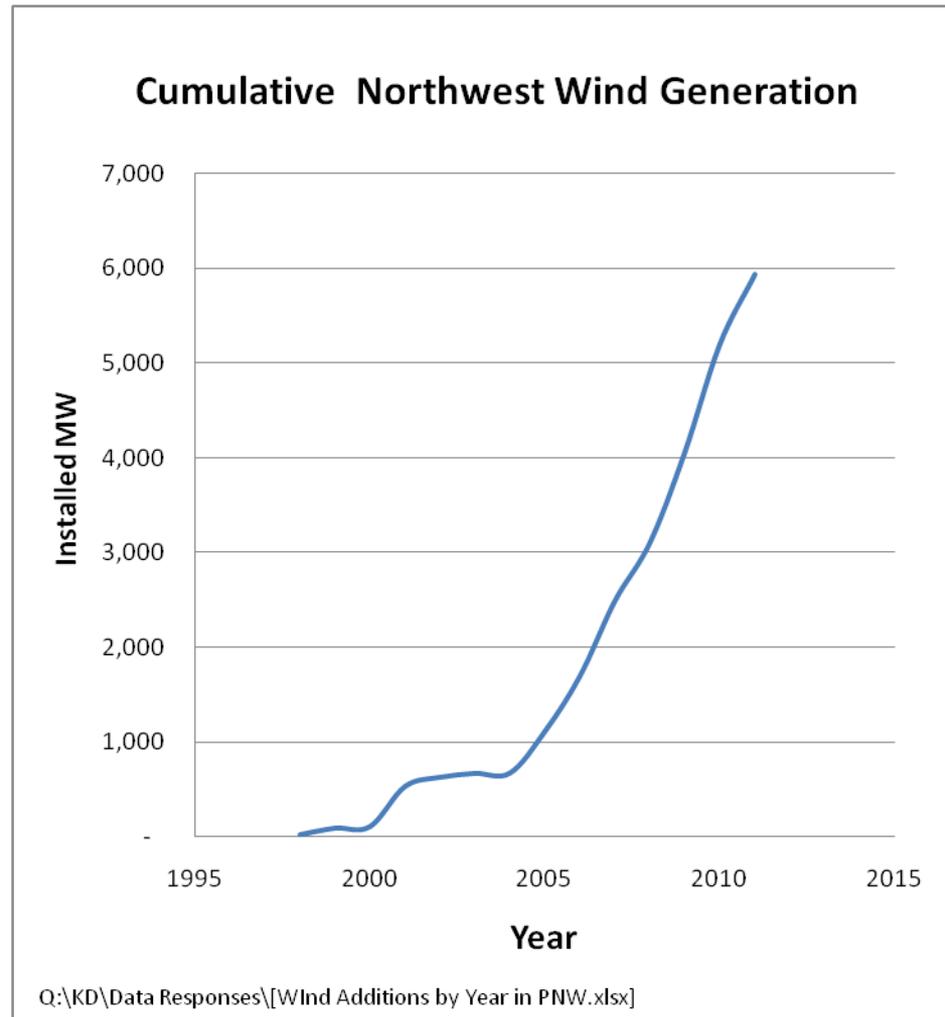
- 3% by 2012
- 9% by 2016
- 15% for 2020 and beyond

### Oregon

- 5% by 2011
- 15% by 2015
- 20% by 2020
- 25% for 2025 and beyond

### California

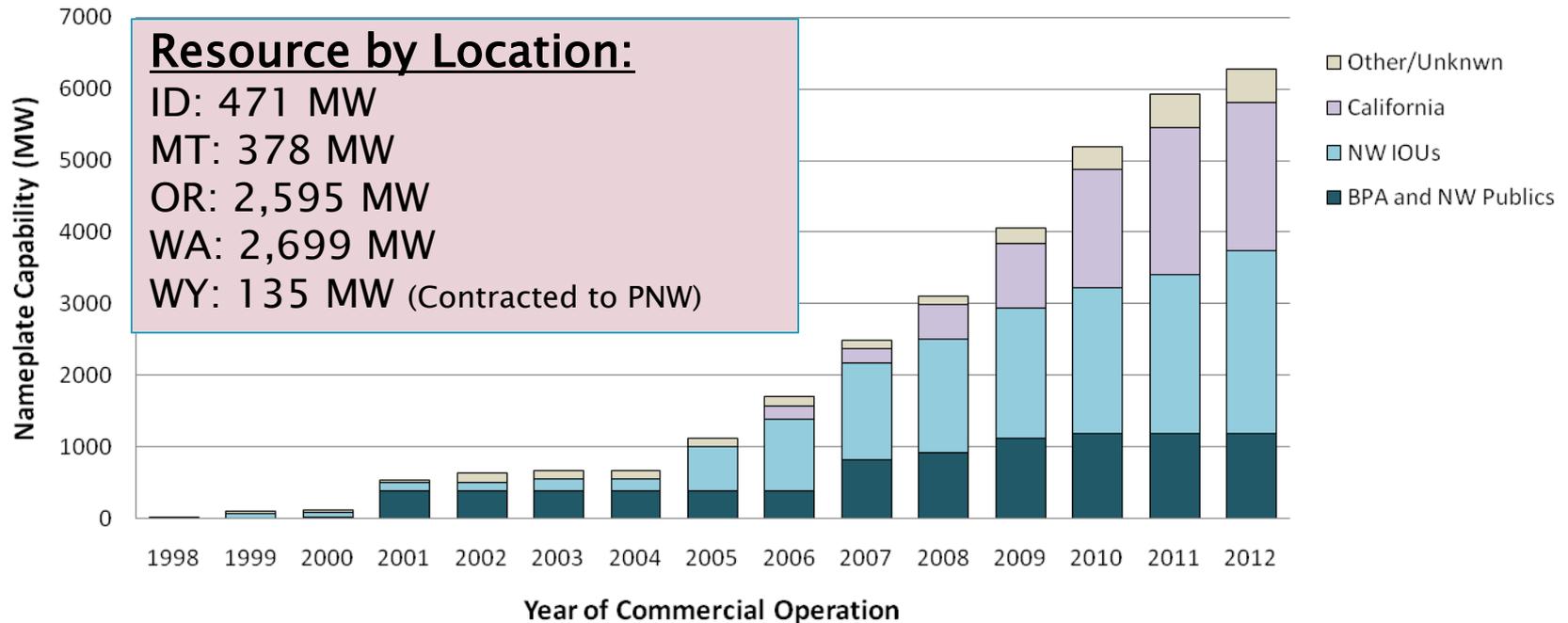
- 20% by 2013
- 25% by 2016
- 33% by 2020



# Breakdown of NW Wind Generation

## NW Wind by Ownership

In operation or under construction, June 2011

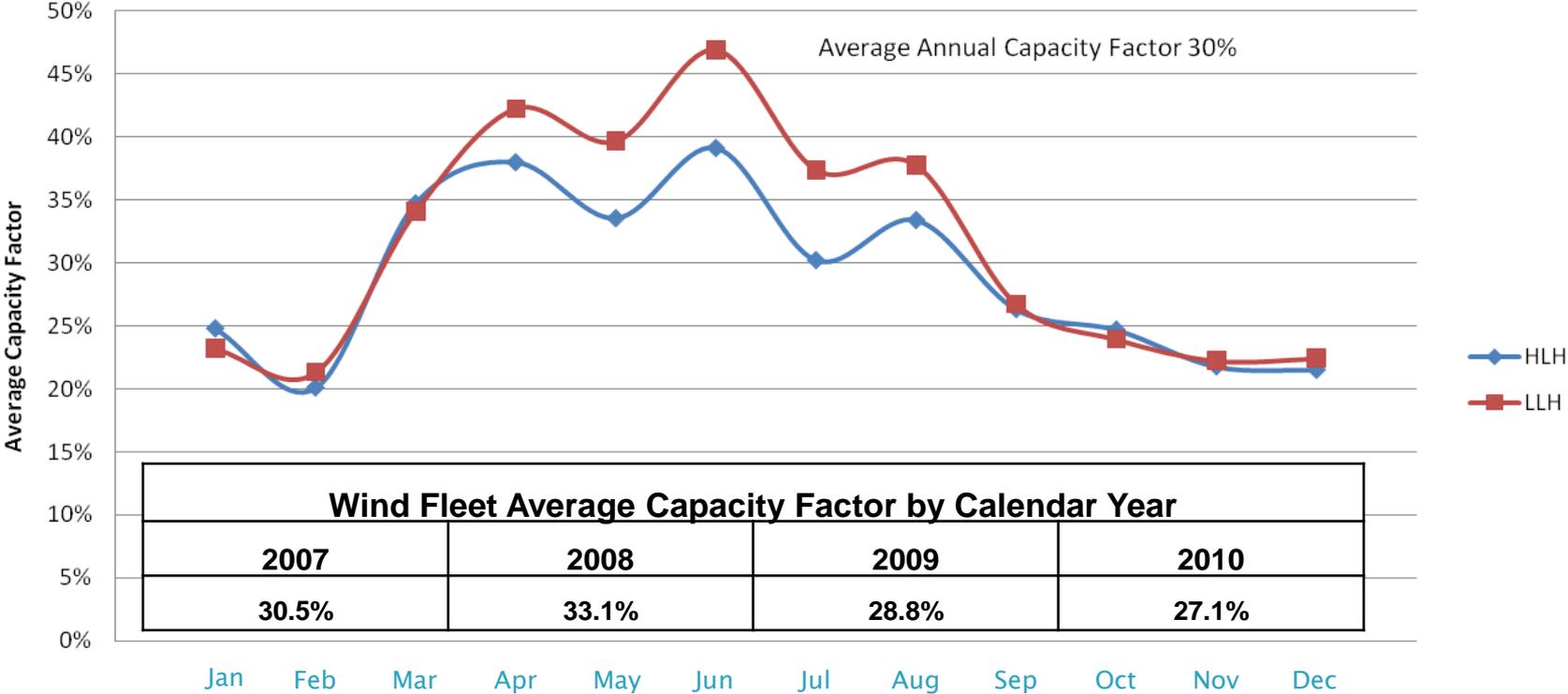


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# Wind Fleet Capacity Factors

Average Wind Capacity Factor on BPA System 2007-10



Q:\KD\Wind\Wind Data\[BPA Wind and Load Hourly

# Economic and Environmental Benefit Estimates

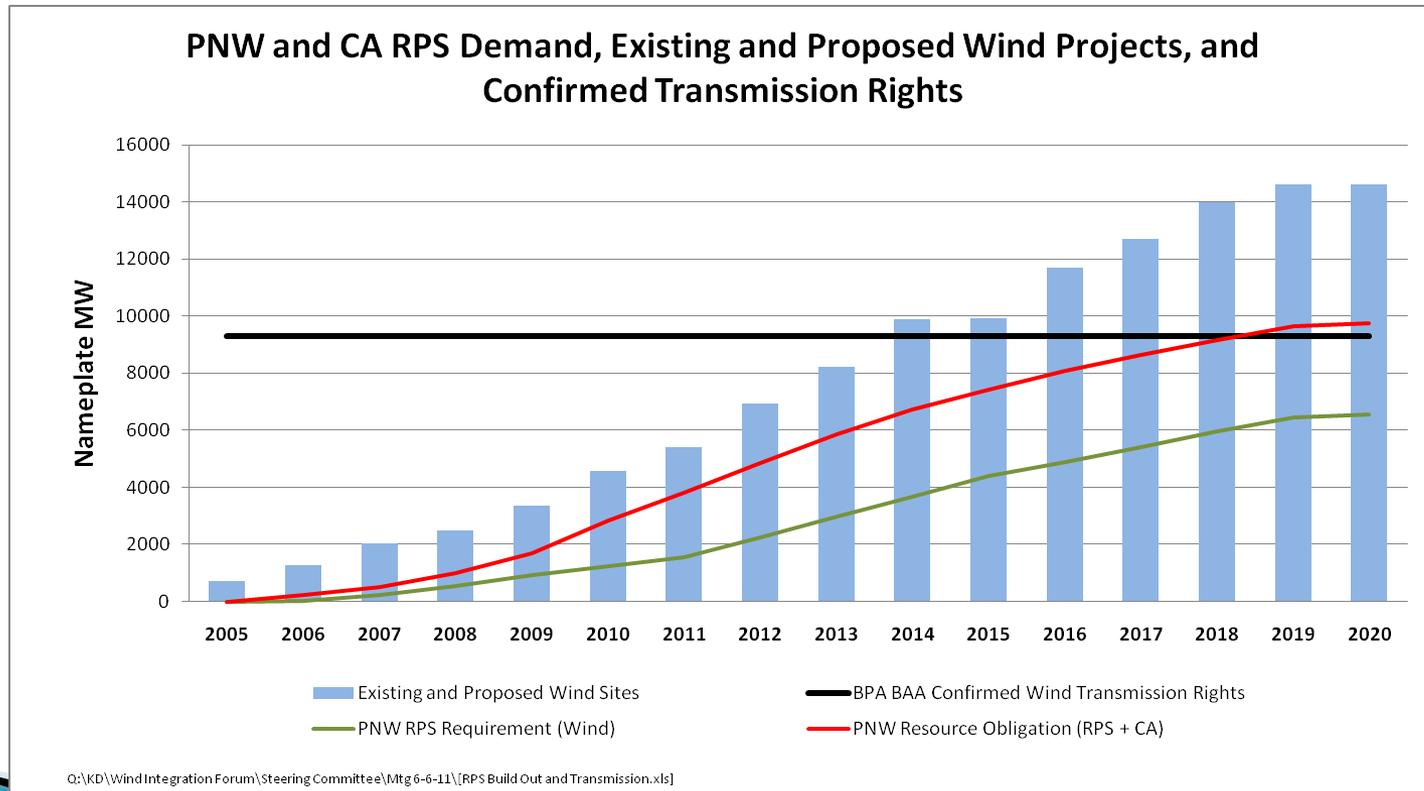
- Economic Benefits:
  - \$30 to \$60 million annual tax revenues
  - \$12 to \$30 million annual royalty payments
  - 350 to 650 new permanent jobs
  - Average of ~300 temporary construction jobs each year
  - \$12 billion capital investment
- Environmental Benefits:
  - CO<sub>2</sub> emissions reduced nearly 30 million tons
    - 2011 reduction equivalent to removing 1 million cars.
  - Nitrogen oxide emissions reduced 450 tons

# The Cost Ledger

- ▶ Utility procurement costs and associated rate impacts.
- ▶ Wind integration charges and balancing costs.
- ▶ Increasing wind generation lowering wholesale energy prices.
  - Lower prices benefit short buyers, hurt long sellers
  - Council analysis suggests RPS resources reduce annual average wholesale market prices by 4–8%, as much as 20% during the spring.
- ▶ Possible increased wear and tear on balancing units, especially hydro.
- ▶ A better understanding of these impacts requires additional information and analysis.

# Wind Resources to 2020

- PNW and CA RPS targets would require ~10,000 MW of installed NW wind by 2020.
  - Nearly 6,000 MW currently operating or under construction.
- At least 14,400 MW of supply between existing projects and interconnection requests.
  - Significant excess supply relative to 2020 regulatory demand.
  - BPA has offered ~ 9,300 MW of transmission service to wind projects.



# Three Interrelated Challenges

- Provision of Balancing Services
  - How can we manage wind variability in a reliable, efficient manner while recognizing the limits on the region's hydro flexibility?
- Oversupply
  - How can we reliably and equitably manage high hydro/high wind conditions?
- System Flexibility
  - How much do we have, how much will we need?

# Balancing Initiatives

- Improved wind forecasting and state awareness
- Intra-hour scheduling/ITAP/Dynamic Scheduling System
- BPA Committed Intra-hour Scheduling Pilot
- Iberdrola Self-Supply Pilot
- NW Power Pool Combined Reserve Task Force
- BPA/other purchase of third party supplied balancing reserves
- WSPP Ancillary Service Schedule Filing
- WECC Energy Imbalance Market (EIM) cost-benefit analysis
- Dynamic Transfer Capability Study Group
- Ace Diversity Initiative and Reliability-Based Control
- SmartGrid/Demand Response

# Oversupply Initiatives

- ▶ Refine BPA/Council oversupply forecasting and financial evaluation
- ▶ Continue measures that reduce need for Environmental Redispatch
  - Maximize displacement of thermal generation
  - Optimize transmission maintenance schedules
  - Maximize storage/draft flexibility with Corps of Engineers, Bureau of Reclamation, and Canada.
  - Maintain open communication through Friday Spring Operations call
- ▶ Evaluation of other suggested physical, market and institutional alternatives
  - New intertie transmission
  - Storage/load control
  - Reducing dissolved gas levels (e.g., flow diverters, temperature control)
  - Pumping load
  - Fuel substitution (e.g., steam processes).
  - Resistive (dummy) load banks.
  - Encourage diverse wind, or non-wind renewable resource development.
- ▶ Alternative cost-allocation/legislative approaches

# Flexibility: Observed Ramping

The absolute magnitude of ramps on BPA's system is increasing, although ramping as a percentage of the installed wind capacity is declining a bit (reflecting some diversity value).

## 30-Minute timeframe

### Ramps Up

Largest in MWs -> 1120 MW (40%, 2010)

Largest % of nameplate -> (51%, 2008)

### Ramps Down

Largest in MWs -> -937 MW (34%, 2010)

Largest % of nameplate -> (-49%, 2008)

## 60-Minute timeframe

### Ramps Up

Largest in MWs -> 1580 MW (57% 2010)

Largest % of nameplate -> (67% 2008)

### Ramps Down

Largest in MWs -> -1161 MW (42% 2010)

Largest % of nameplate -> -49% (2008)

# Flexibility Adequacy Initiatives

- ▶ NW Resource Adequacy Forum evaluation of contribution of wind to regional reliability and development of flexibility adequacy metric;
- ▶ PNUCC System Planning Committee review of capacity, energy and flexibility definitions and planning requirements;
- ▶ Utilities beginning to explicitly address flexibility requirements in their IRPs.
- ▶ Manufacturers responding with more flexible/efficient generators.
- ▶ SmartGrid and Demand Response Initiatives looking for flexibility on the load side of the equation.

# Key Takeaways

- ▶ With the region already approaching 6,000 MW, the potential supply of additional wind energy significantly exceeds total 2020 RPS demand of ~10,000 MW.
- ▶ Region appears to have identified and subscribed the necessary transmission builds to support RPS for 2020 and likely beyond.
- ▶ Economics of large-scale intertie expansion are questionable.
- ▶ Springtime oversupply is our most acute challenge today, but the efficient provision of balancing services will require continued coordinated, focused attention.
- ▶ While there are challenges, they don't appear insurmountable if we work together to address them.

# 7 Action Items

1. **Examine Potential Reliability Concerns.**
  - BPA will report results of the August 23 workshop on voltage stability and transient issues associated with large-scale wind integration.
2. **Examine Balancing Authority Consolidation and Energy Imbalance Markets.**
  - BPA will reconvene the NW Power Pool BA Leadership Group by Oct 1 to discuss these interests.
  - Make available the preliminary report on costs and benefits of consolidating the Grant, Chelan, and Avista BAs by October.
  - Make available a report on cost/benefit analysis of implementing an Energy Imbalance Market-- expected to be available in early fall.
3. **Report on Dynamic Transfer Capability (DTC).**
  - BPA and Columbia Grid to report on analysis of available DTC and costs of increasing it.

# 7 Action Items

## 4. Potential Legislative Initiatives.

- A subgroup will investigate the feasibility and desirability of seeking legislative changes to qualify hydro power under state RPS and federal PTC laws.

## 5. Cost Allocation.

- A group was established to discuss cost allocation issues– one proposal BPA expressed interest in was for BPA to engage in negative market price transactions in a limited way and recover costs incurred from wind schedulers.

## 6. Long Term Physical Solutions to Oversupply.

- Steve Wright requested that the Council lead a process to examine the feasibility and economics of the alternative physical solutions to oversupply.

## 7. Flexibility Adequacy, with Focus on Natural Gas.

- PNUCC and utilities will engage gas suppliers in advancing the discussion of relying more heavily on natural gas for balancing services that has already begun.

# Draft Oversupply Work Plan

Establish Technical Oversight Committee (TOC)	July 2011
TOC Brainstorming meeting	July 2011
Categorize proposed solutions	July 2011
Establish category workgroups	August 2011
Category workgroup meetings	August - October 2011
Workgroup Report to TOC	November 2011
TOC recommendations for in-depth analysis	November 2011
Analysis of Proposed Solutions (by subgroups/contractors)	December 2011 - June 2012
Reports to TOC	June 2012
TOC Summary Report to Wind Integration Forum Steering Committee	August 2012

# Potential for One More

- ▶ Interest was expressed in spending some time thinking about how a system with much larger wind penetration levels might be envisioned.
  - Small work group getting together with Council staff to consider the question.

# Questions and Discussion

