Northwest Power and Conservation Council

September 4, 2008

MEMORANDUM

TO: **Power Committee**

FROM: Jeff King, Senior Resource Analyst

SUBJECT: Wind power development activity and assessment of additional wind resource potential

Over 2500 MW of installed wind power capacity has been constructed in the four Northwest states since adoption of the Fifth Power Plan. This represents 55 percent of all Northwest generating resource construction since that time. Wind power development is being driven by natural gas price uncertainty, state renewable portfolio standards, and emerging greenhouse gas control measures. The first part of the attached presentation explores aspects of Northwest wind power development, including where the development is occurring, who is doing the developing, who is purchasing the power, and who is integrating the projects.

The second part of the presentation is an overview of the staff's approach to the assessment of additional wind resource potential. The assessment of additional wind resource potential is among the most important Sixth Power Plan resource assessments because, despite significant cost increases, wind power is expected to remain the least-cost renewable resource available in large quantity. As such, the cost and availability of wind power will influence the cost-effective level of conservation, the costs of achieving state renewable portfolio standards and greenhouse gas reduction targets, and future retail power prices.

Though just getting underway, some preliminary findings of the wind resource assessment will be available for discussion at the meeting. Staff will provide a review of the completed assessment at a future Power Committee meeting.

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Windpower Development Activity and Assessment of Additional Wind Resource Potential

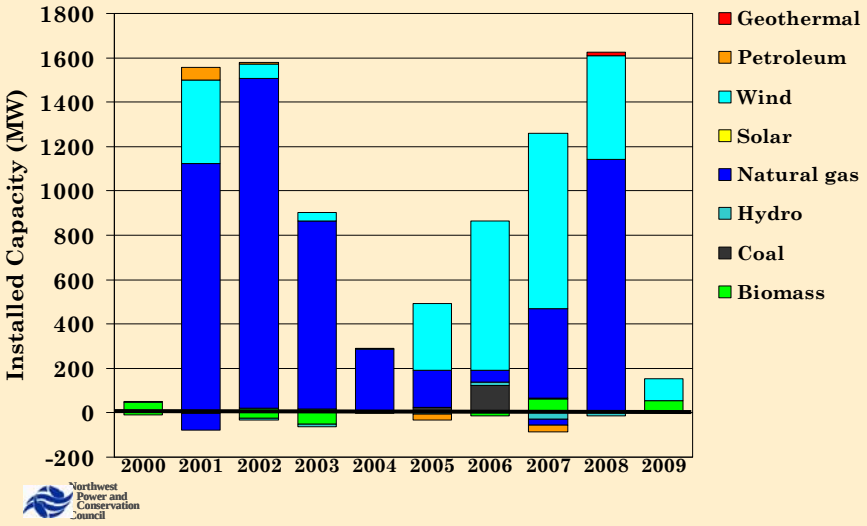
Northwest Power & Conservation Council

September 17, 2008

Scope of these remarks

- Provide an overview of current wind power development in the four Northwest states.
- Describe the approach the assessment of additional wind resource potential for the Sixth Power Plan.
- Describe available interim results of the wind resource assessment.

Northwest generating project development



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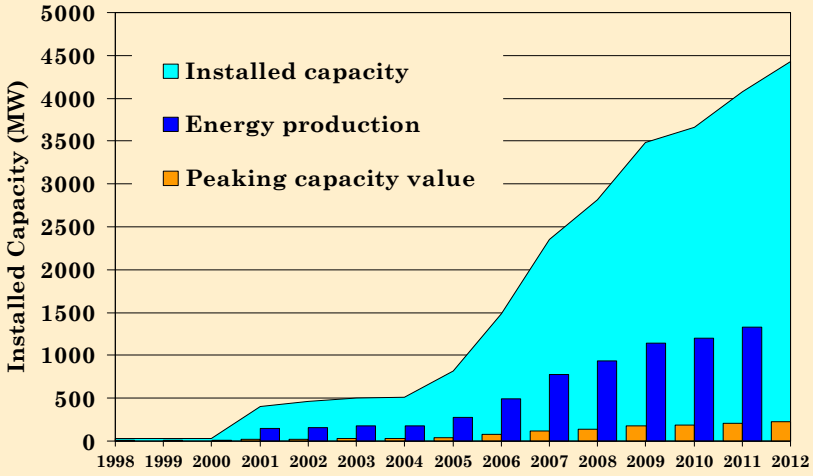
Cumulative existing & planned windpower development in the four states*



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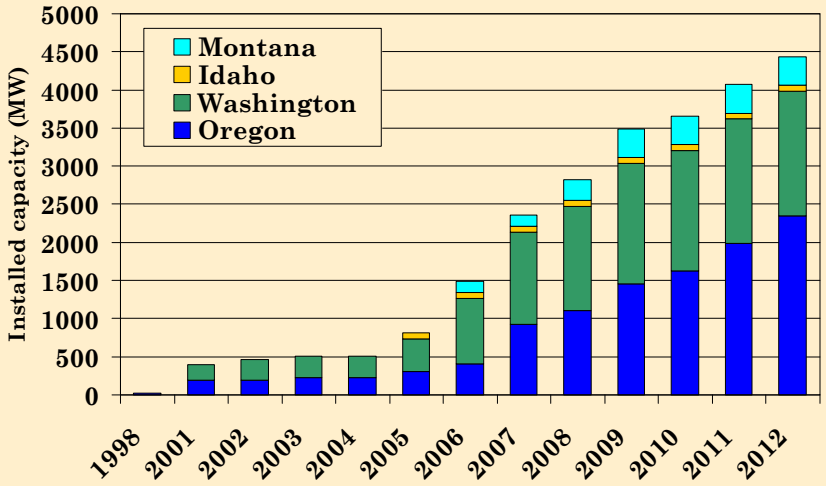
*Operating, under construction and planned
(identified customer and announced completion dates)

Location of Northwest wind capacity



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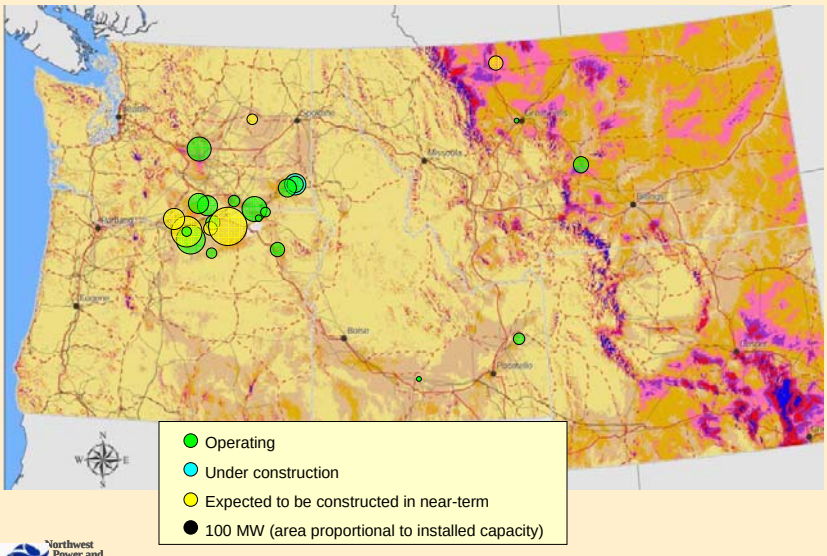
Wind Project Development Sep 2008



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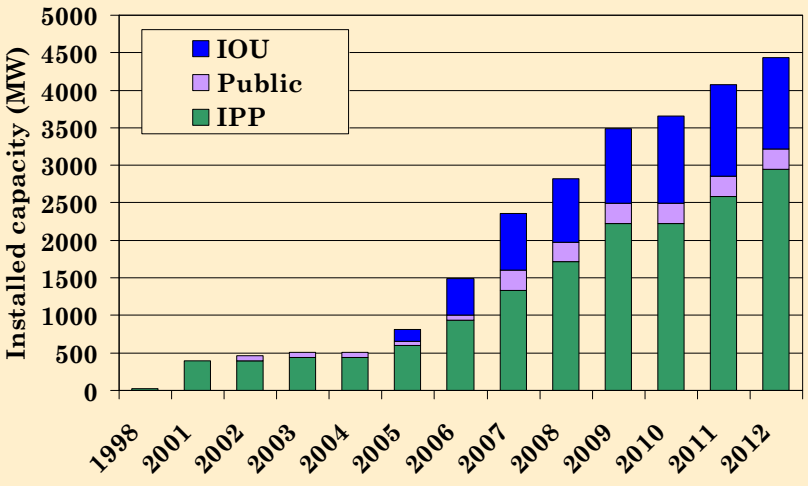
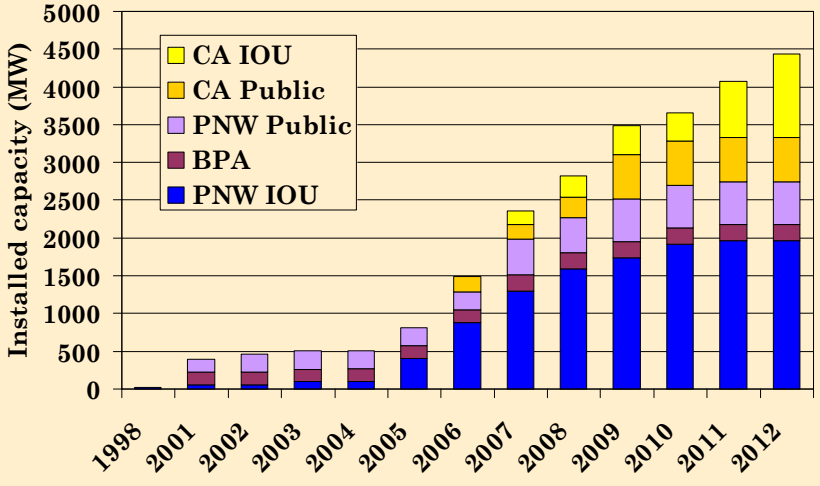
Ownership of Northwest wind capacity

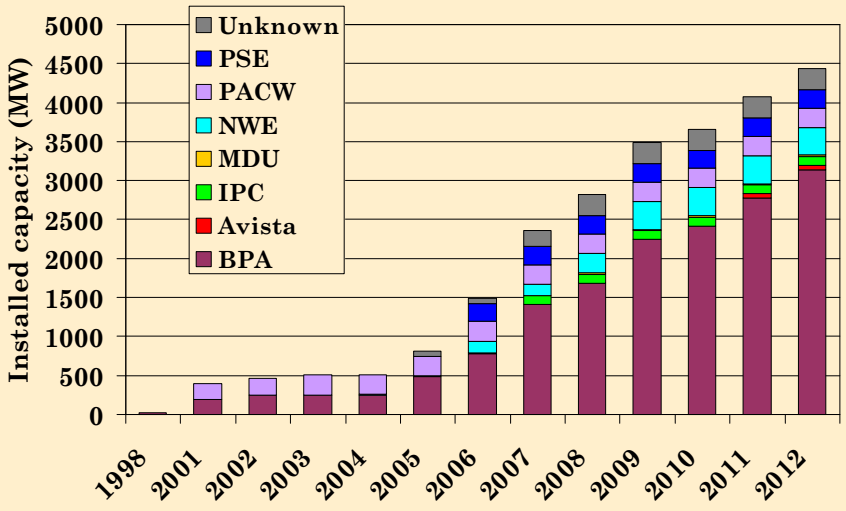


"Public" includes tax-credit driven "flip" ownership structure

Customers for Northwest wind power



Wind capacity by balancing authority



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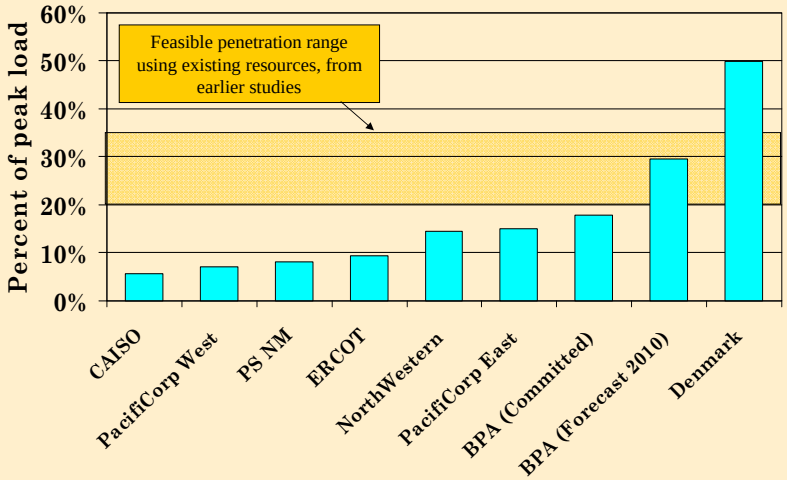
Wind penetration by balancing authority



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Sixth Power Plan Assessment of additional wind resource potential

- Estimate a supply curve of wind power plausibly available to the Northwest over the next 20 years
- Why the fuss?

  Least-cost renewable available in large quantity, affecting:

  Cost-effectiveness of conservation and competing low CO_2 resources

  Cost of renewable portfolio standards and alternative GHG control strategies

  Need for transmission

  Need for regulation, load-following and peaking capacity

Much information has become available since the 5th Plan

- RMATS - Rocky Mountain Area Transmission Study
- NTAC - Montana to Northwest & Canada-Northwest-California studies
- Western Governor's Association CDEAC initiative
- US DOE 20% Wind Energy by 2030
- WECC 2009 Long-term Reliability Analysis (LRTA) 15% renewables scenario
- WGA/USDOE Western Renewable Energy Zone project (Unlikely to be available in time)

Proposed approach

- Identify principal wind resource areas available to Northwest utilities
  - Substantial developable wind resource
  - Active transmission proposals
  - Competing markets
- Estimate cost components
  - Wind plant (i.e., busbar + local interconnection)
  - Transmission to regional wholesale marketing hub
  - Point-to-point transmission, hub to LSE (to establish parity w/energy-efficiency)
  - Regulation & load-following
- Estimate production characteristics of each resource area
  - Seasonal and diurnal hourly output (12 mo x 24 hr)
- Estimate resource availability
  - Plausible transmission corridor transfer capacity
- Estimate timing & option characteristics
  - Transmission and wind project development schedules
  - Key decision points, elapsed time and capital commitments

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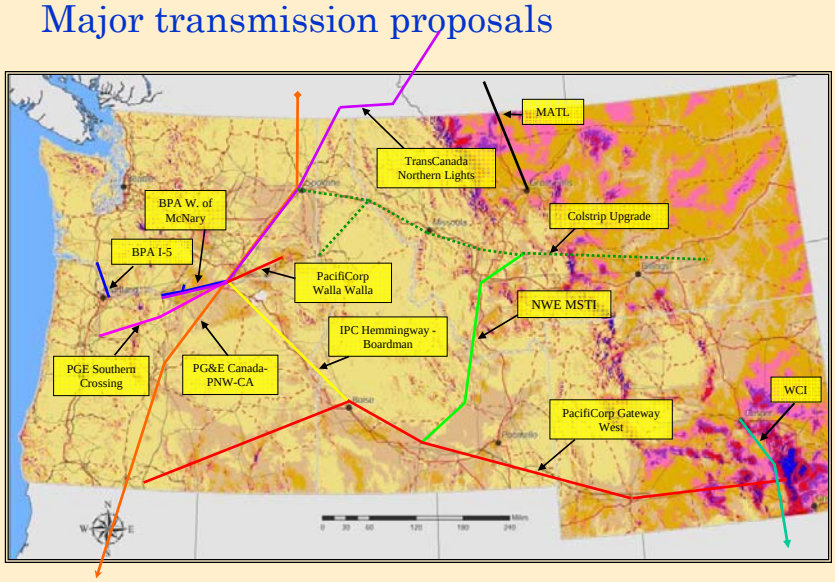
Major transmission proposals



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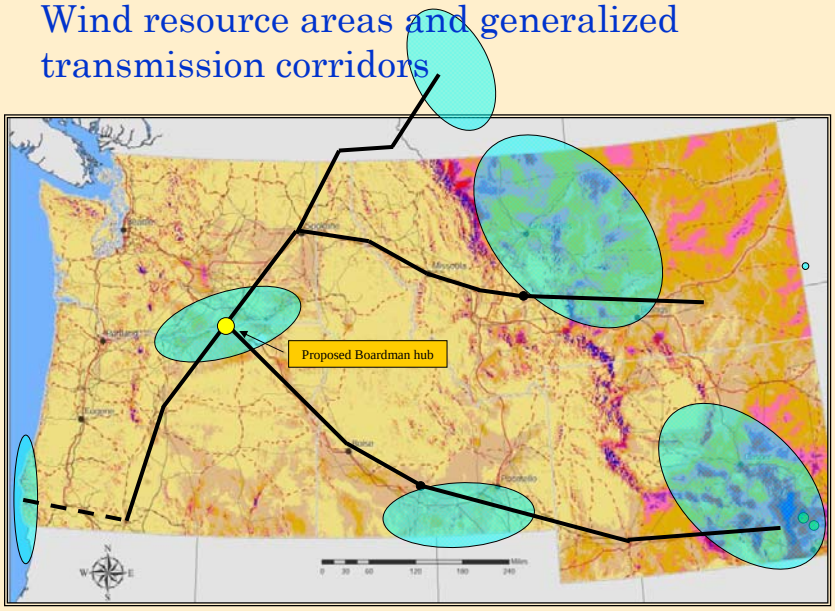
Wind resource areas and generalized transmission corridors



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Estimating resource area production

- Objective: Representative 12 mo x 24 hour time series for each resource area
- Preferred source: Synthetic wind plant production estimates from NREL mesoscale dataset
  - Will be used for WECC 15% renewables case & WREZ studies
  - ~~Availability for Council assessment not determined~~
  - Have confirmed availability for US areas - WECC will supply
- Other sources if NREL synthetic hourly not available:
  - Aggregate historical hourly production data (Columbia Basin areas)
  - Synthetic production estimates from anemometer data (Columbia Basin, Montana)
  - Annual capacity factors from RMATS and CDEAC studies
  - AESO aggregate historical Alberta hourly production

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Estimating costs

- Wind project costs:
  - Representative capital and O&M costs for on-shore & offshore projects
- Transmission costs
  - Unit costs ($/MW/mile) x approximation of line length
  - Escalated NTAC unit costs, w/consideration of other studies & reported transmission project costs
- System integration costs
  - Representative demand from utility wind integration studies (PAC, PSE, Avista, IPC, NWE, Bonneville, PGE + non-PNW)
  - Existing capability from utility wind integration studies (will require more BA - BA liquidity to fully utilize)
  - Additional capability from separate staff assessment

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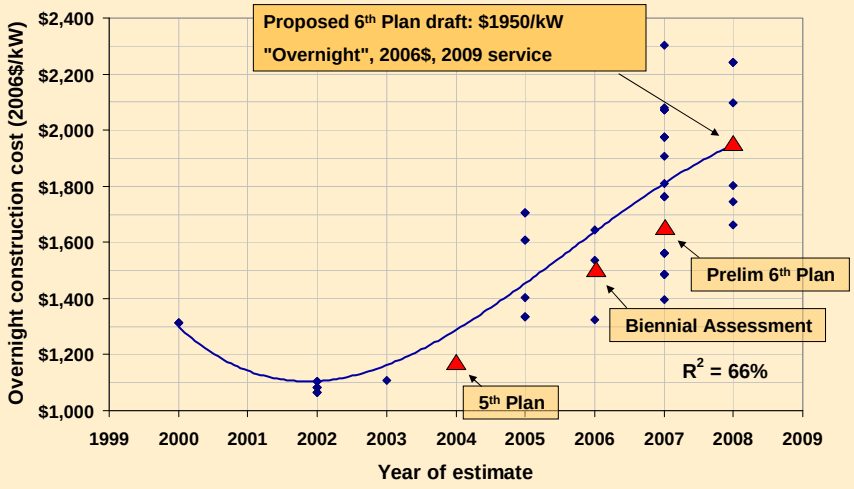
Announced utility-scale wind project costs



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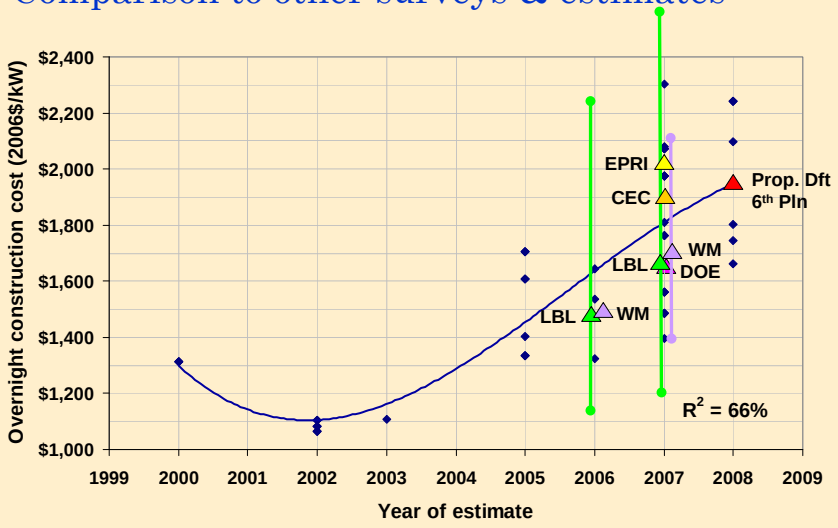
Comparison to other surveys & estimates



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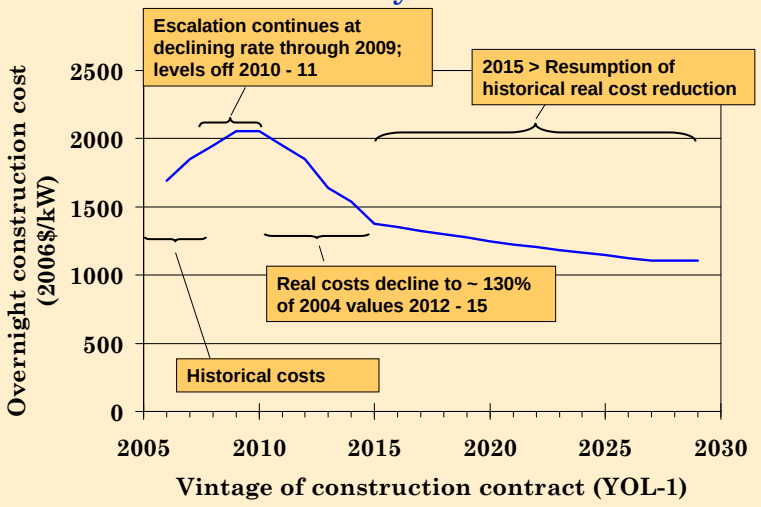
Thinking on future construction costs (to be revisited as CERA analyses become available)



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Related analyses (may follow initial supply curve development as time permits)

- Tradeoff between transmission capacity and energy transfer
- Tradeoff between location of firming services and transmission cost
- Benefits of geographic diversity in reducing demand for regulation and load-following services

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