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April 30, 2013

MEMORANDUM

TO: Council Members

FROM: Gillian Charles, Power Planning Division

SUBJECT: Update on the Region's Wind Development

The Pacific Northwest has seen a large influx of wind power development over the past ten years, significantly altering the region's portfolio of generating resources and reshaping how the region thinks about and operates its power system.

Today, wind projects account for almost 13% of the region's existing installed generating capacity. Driven both by tax incentives and state renewable portfolio standards, rapid development of wind power has pushed topics such as resource integration, power system flexibility, and marketing and scheduling practices to the forefront of conversations in the region by system operators, utilities, independent power producers, power traders, and government agencies.

An update on wind power in the Pacific Northwest will be presented at the Council meeting on May 8, 2013. Gillian Charles will begin the discussion by providing an update on the status of wind generating projects in the region and the outlook for future development. Then Tina Ko, Manager of Long Term Power Planning at the Bonneville Power Administration (BPA), will introduce the concept of annual firm wind energy and describe initial studies indicating that the annual variability of generation from the wind fleet is comparable to the variation in the hydro generation system. Finally, Ben Kujala will discuss the challenges of integrating wind generation into the power system.

Update on the Region's Wind Development

**Council Meeting
May 8, 2013
Boardman, OR**



Overview

- 1. Current status of wind development in the PNW**
- 2. Variability of wind**
- 3. Wind integration challenges**



Current Status of Wind Development in the Pacific Northwest



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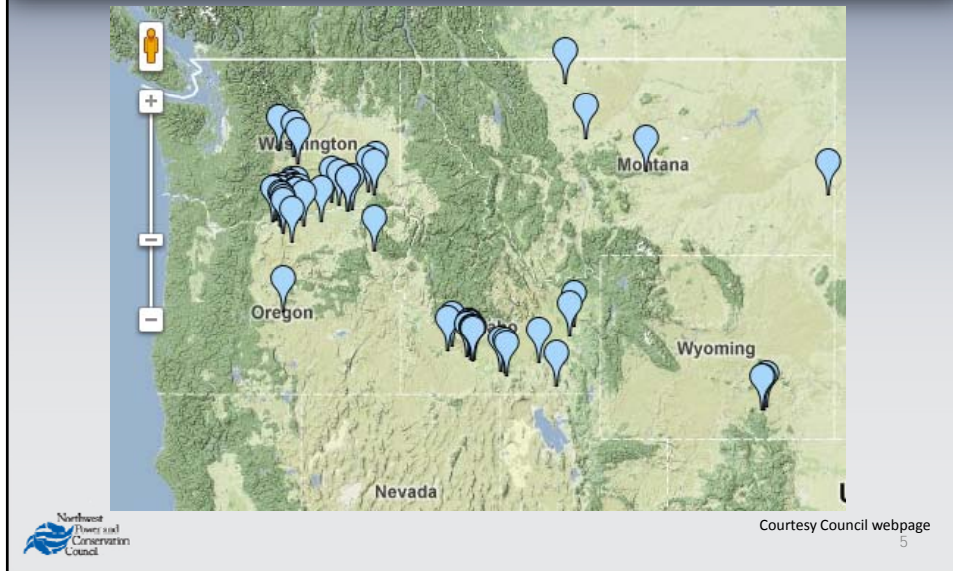
Current Picture of Wind in PNW

- **Almost 8,500 MW wind operating in the PNW**
 - 5% of the region's average annual generation
 - 13% of region's total installed generating capacity
 - 50% of total installed wind capacity is in BPA balancing authority
- **~1,700 MW new wind installed in 2012**



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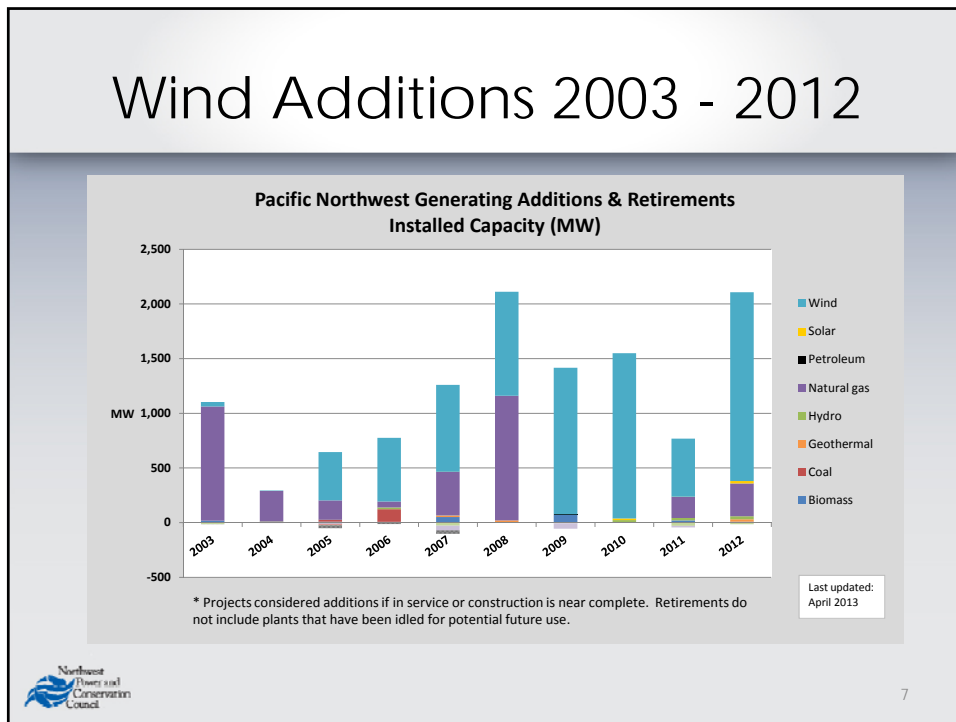
Current Installed Wind Projects



Recent Wind Projects in Operation

Name	State	Capacity (MW)	Load	Online Date
Mountain Air Wind Park (6)	ID	138 MW	IPC (20 yr PPA)	Dec 2012
Musselshell 1 & 2	MT	20 MW	NorthWestern (20 PPA)	Dec 2012
Palouse	WA	104 MW	Avista (30 yr PPA)	Dec 2012
Shepherds Flat (3)	OR	845 MW	SCE (20 yr PPA)	Aug 2012
Spion Kop	MT	40 MW	NorthWestern	Nov 2012
Swauk Valley Ranch Wind	WA	4.3 MW	Local (RECs likely sold elsewhere)	Mar 2013

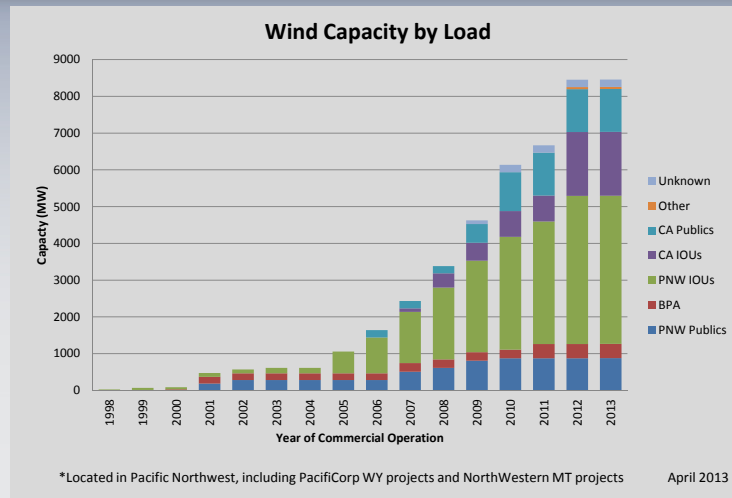
Wind Additions 2003 - 2012



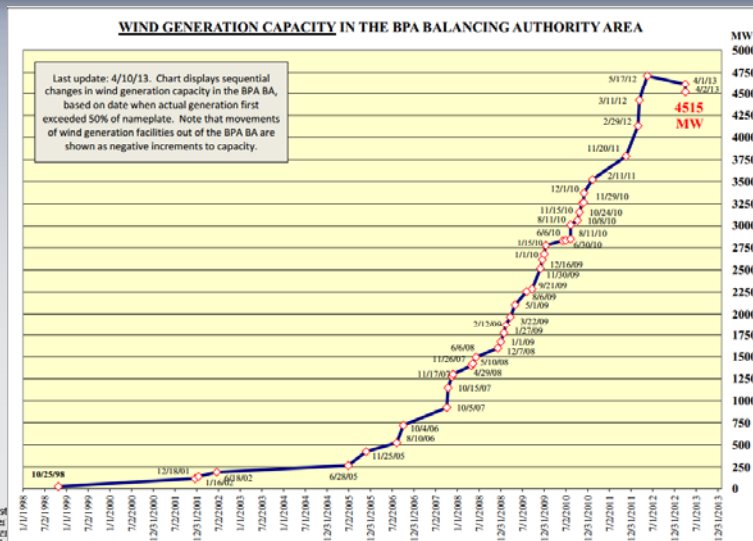
What drives wind development?

- **Renewable portfolio standards**
 - Wind currently makes up 70-90% of eligible resources for WA, OR, and MT
- **Federal Production Tax Credit (PTC)**
 - Extension - Projects are eligible if *under construction* by end of 2013 (2.3 cents/kWh over first 10 years of operation)
- **Emission-free resource with no fuel costs**

Where is the Generation Going?



Wind In BPA's Balancing Authority



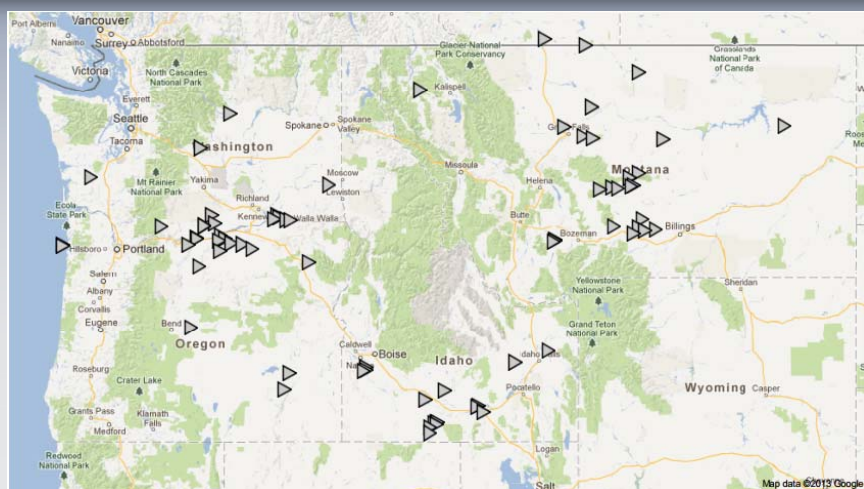
Future Status of Wind Development

- **Surge in development of wind projects in 2012, followed by lull in early 2013**
 - Industry uncertainty over future of production tax credit
- **~ 12,000+ MW wind projects “proposed”**
 - What does “proposed” really mean?
- **No new wind projects currently under construction in PNW**



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Proposed New Wind Projects



* Not currently operating or under construction; in various stages of permitting process

Courtesy of RNP, 4/26/13

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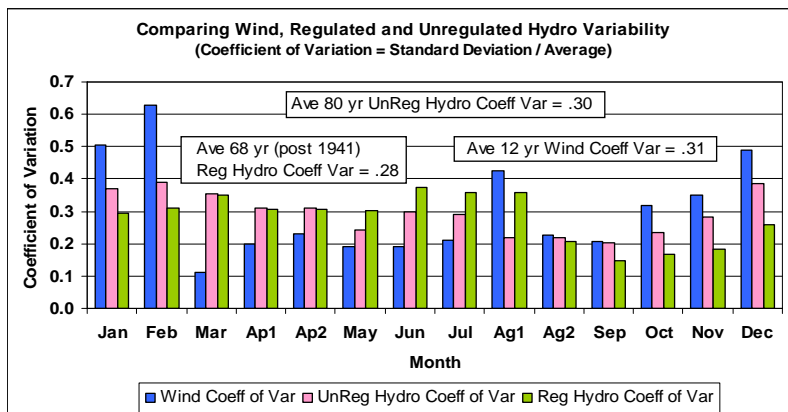
Variability of Wind



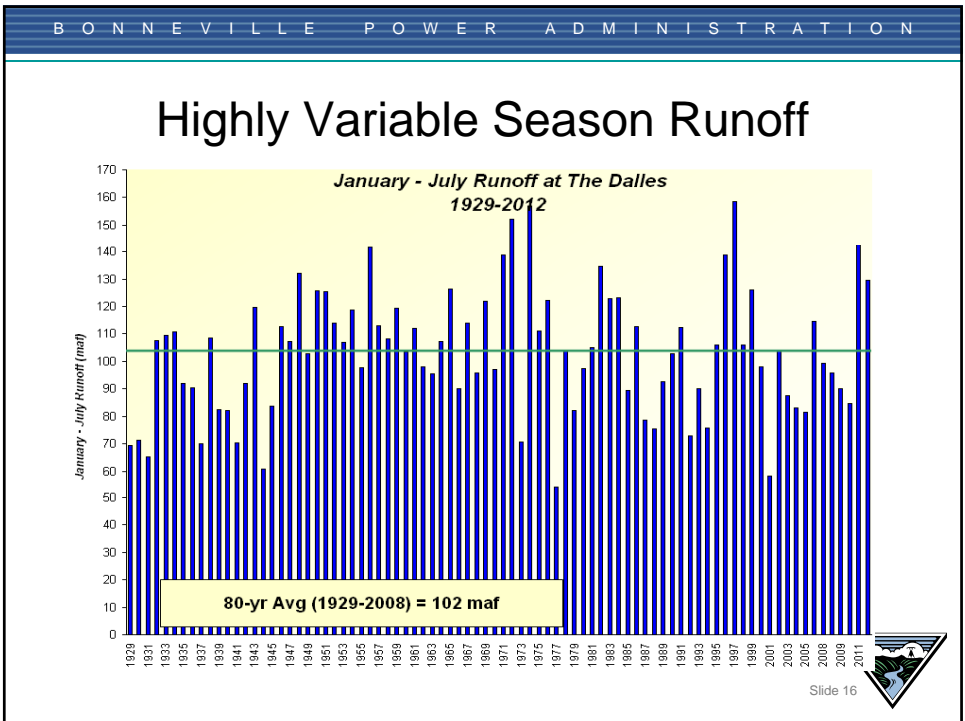
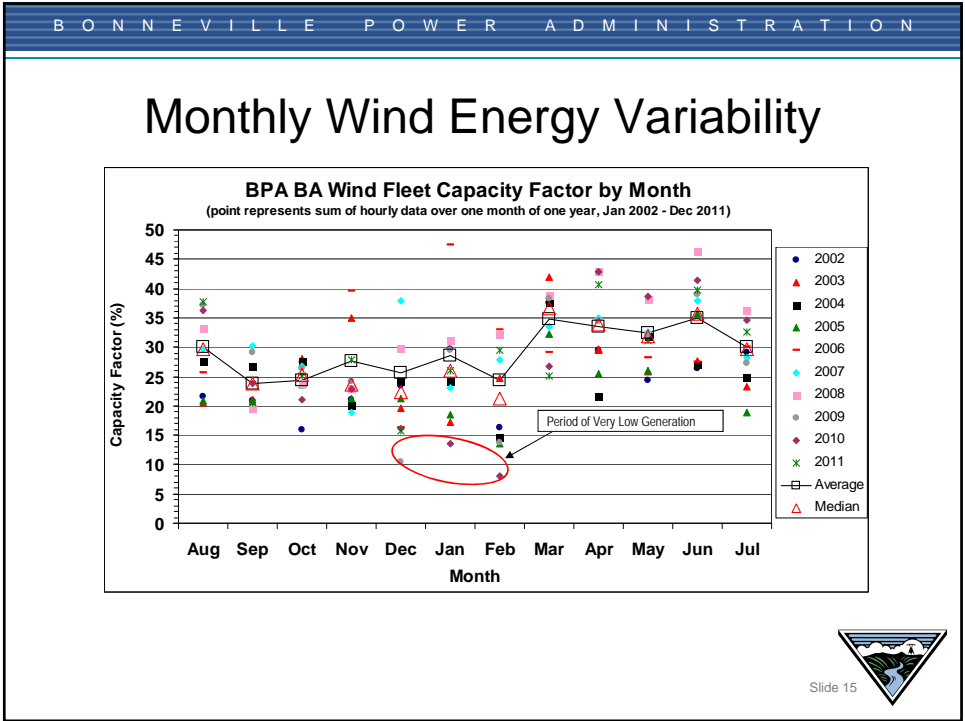
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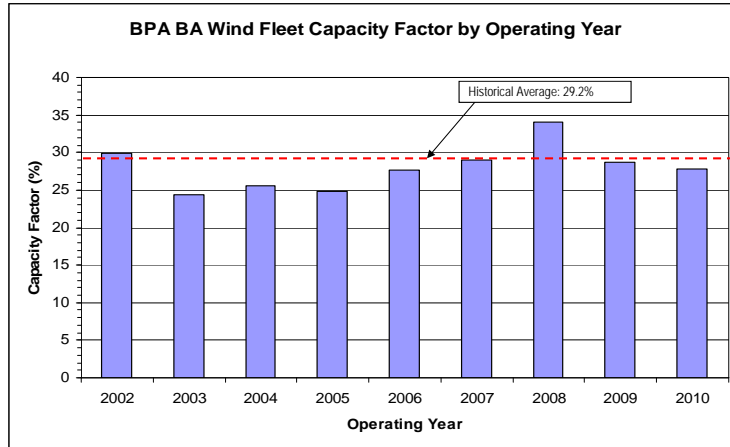
Variation in Wind vs. Flows



Slide 14



Annual Firm Wind Variability



Slide 17

Wind Integration Challenges

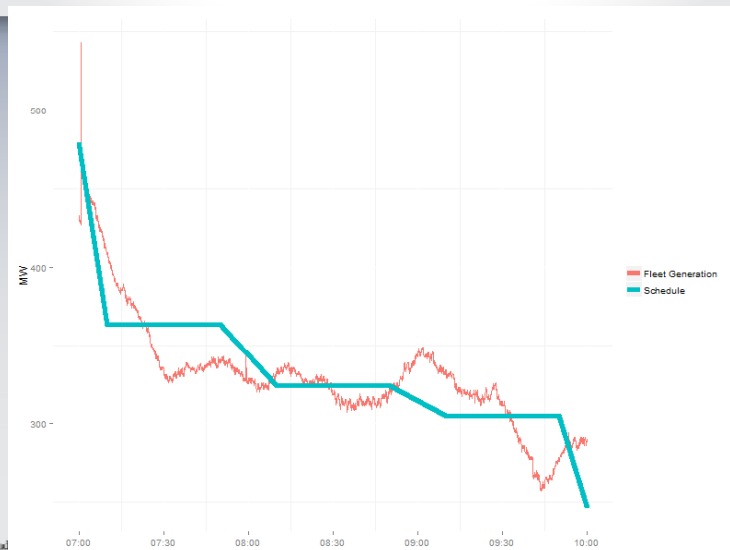
Wind Integration

- Integrating wind generation continues to be a challenge in the Northwest
- Significant factors in wind integration
 - Forecast Error
 - Scheduling Granularity
 - Market Design
- Regional Efforts in Wind Integration
 - Sub-hourly Scheduling
 - Energy Imbalance Market
 - Wind Integration Forum



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Actual vs. Scheduled Wind Generation



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