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# Energy and Telecommunications Interim Committee September 24, 2009

## Integrating Wind Energy

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**NorthWestern**<sup>™</sup>  
**Energy**

*Delivering a Bright Future*



# Integrating Wind Energy

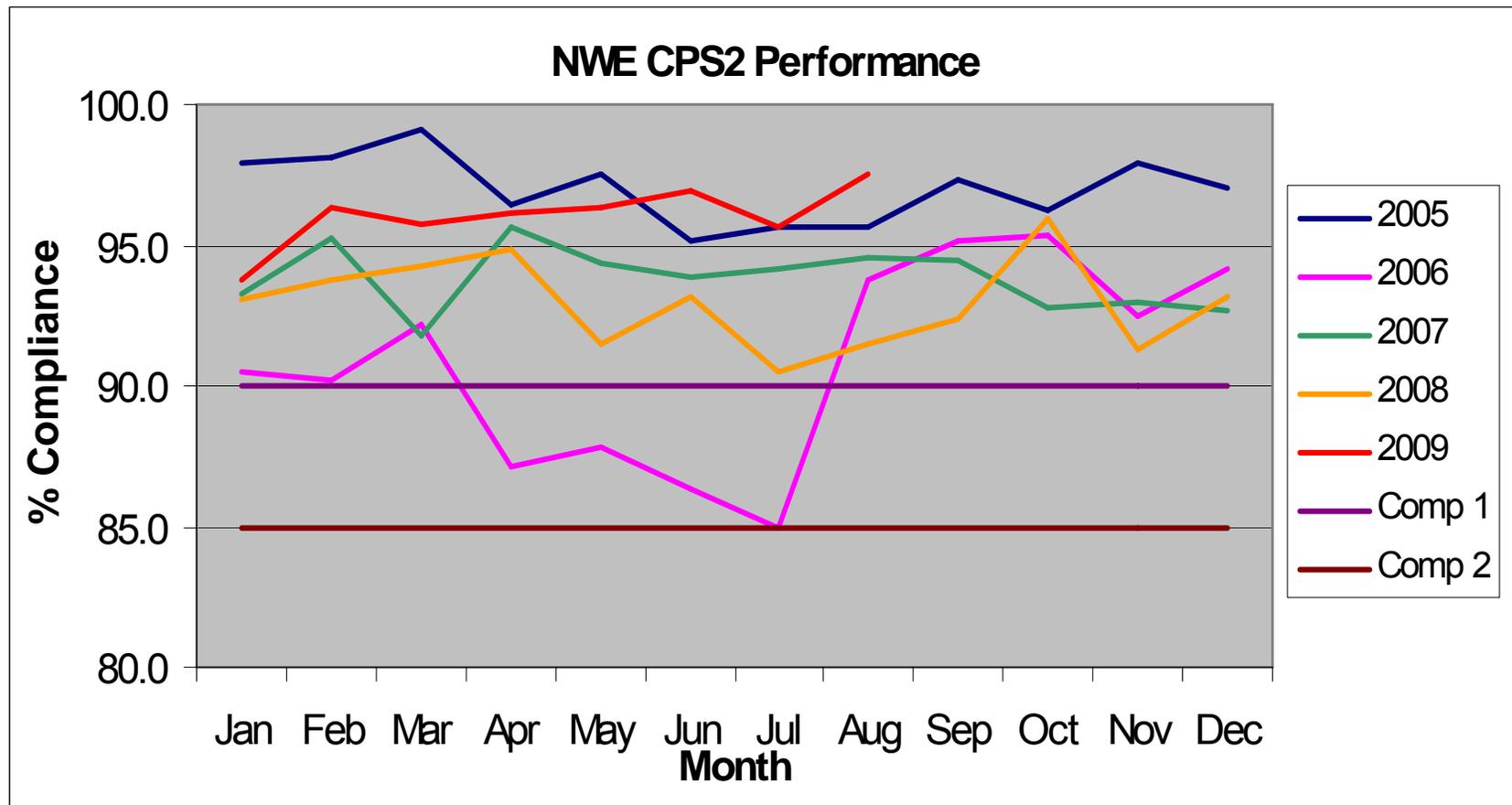
- **Wind integration on NorthWestern Energy's system – early 2006 Judith Gap facility**
  - » Steep learning curve
  - » Lack of data and experience led to bumps in the road and reliability violations
- **NWE does not own fleet of resources to integrate wind**
- **Variables**
  - Balancing authority resource stack is critical
  - Unique attributes of each balancing authority
  - Regional mix of generators and market products
    - Northwest is a hydro dominated region
- **Since mid-1980s MPC and now NWE has needed to rely on market purchases from 3<sup>rd</sup> party providers for required Regulating Reserves**

# Measure of Performance

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- **NERC and WECC criteria for instantaneously balancing loads with resources is CPS2**
  - » Measures this balance over 10 minute periods of each month
  - » A Balancing Authority Area Operator must “pass” this measurement in at least 90% of the 10 minute periods in a one month period

# How have we done?



# Where have we been?

## Regulating Reserves

- **Historical Transmission Customer Resource required (before wind integration)**
  - » Idaho Power – 60 MW ( $\pm$  30 MW)
  - » Terminated by Idaho Power 12/31/2007
- **New Wind Regulating Resource from Avista Corp**
  - » Purchased at the beginning of 2006
  - » 15 MW ( $\pm$  7.5 MW): ~11% of wind resource
  - » Reliability violations 4 months in 2006
- **Second Purchase from Avista**
  - » Added in June 2006 to correct CPS2 performance
  - » 10 MW ( $\pm$  5 MW)
- **CPS2 near misses in Summer 2008**
- **Current total Regulating Reserves associated with wind generation**
  - » 31 MW – over 20% of wind resource
- **Costs are increasing for this product....market is very illiquid**

# Request for Proposals

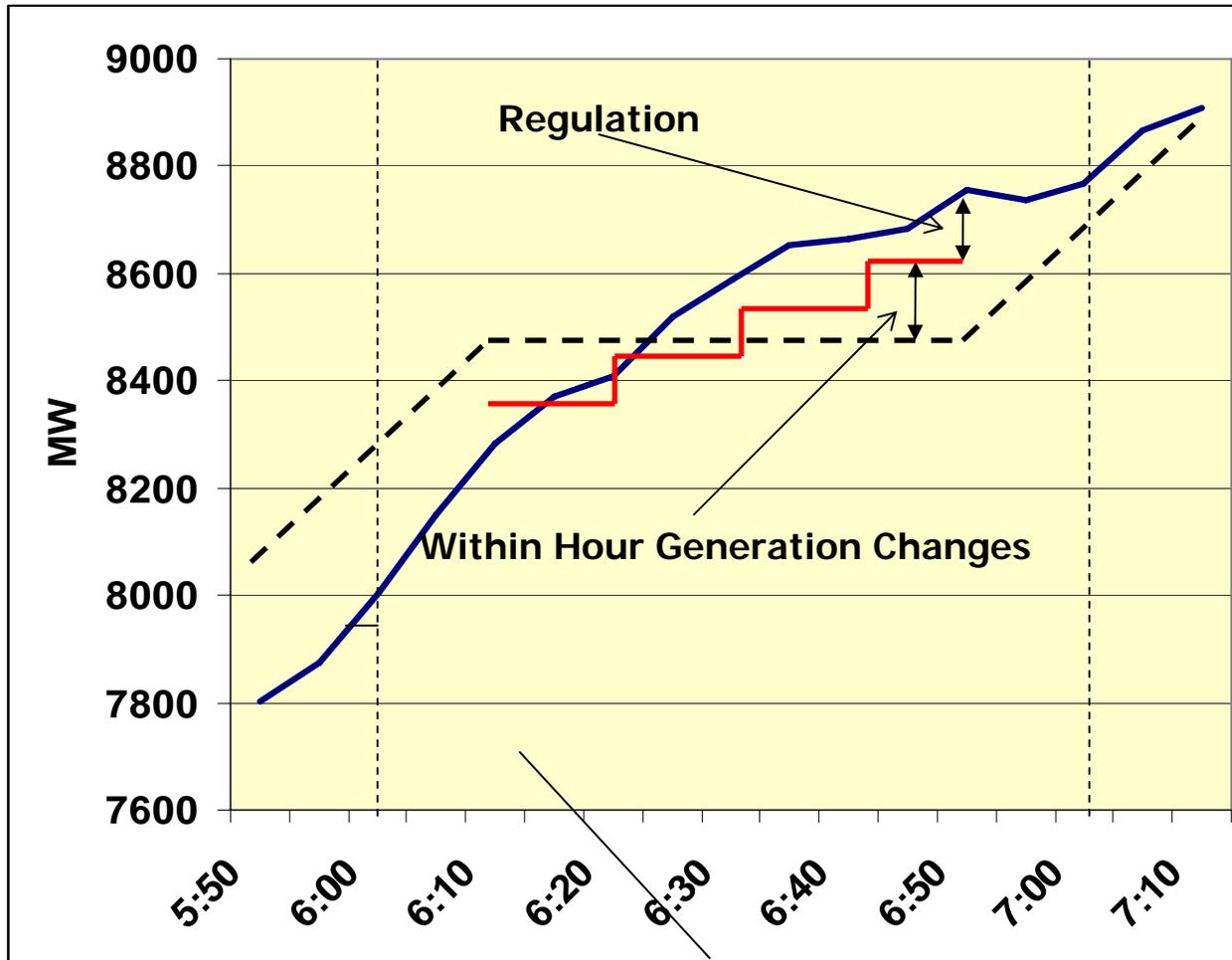
**Has been difficult to procure Regulating Reserve products.**

- **RFPs in November 2006 and November 2007**
  - » **Liquidity of the regulating reserves market**
    - ◆ **It is getting worse not better – others are integrating wind**
    - ◆ **Becoming more of a regional issue**
  - » **Very few proposals received in both RFPs**
    - ◆ **Verified that market is very illiquid for this product**
    - ◆ **No viable long term proposals received**
    - ◆ **Very broad solicitation to WECC parties, BPA, on-system generators and power marketers**
  - » **We have been a price taker – have taken what we could get to meet our requirements**
  - » **Result – short term market based contracts from remote (very) sources – no long term stability**



# How do Traditional Utilities Look at Wind Integration (BPA, others)?...in Contrast to NorthWestern...

# Illustration of Hourly Scheduling



# The Need Assessment

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- **How much capacity does a Balancing Authority need to set aside for within-hour regulation and load following?**
  - How much is due to load variation?
  - How much is due to wind variation?
  - How much is due to forecast error?

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# The Cost Study

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- **Reserving capacity for within-hour balancing is costly**
  - **Generating capacity that would have been dispatched “without wind” ends up being withheld from the energy market; and/or**
  - **Generation that would not have been dispatched “absent wind” ends up being committed into the energy market**

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# The Cost Study (continued)

- **Wind integration costs are “opportunity costs”**
  - Unless the resources belong to a 3<sup>rd</sup> Party, then they are “transaction costs” (NorthWestern situation)
- **Cost estimation requires comparison of variable system cost with and without the reservation of capacity for within-hour balancing due to wind**
  - Study Case: With reserved capacity
  - Base Case: Without reserved capacity
  - The difference is the wind integration cost

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# The Cost Study (continued)

- **Wind integration costs are:**
  - Very sensitive to wholesale power market price assumptions
  - Depend on the resource mix available to the Balancing Authority
- **Utilities often advise against comparing wind integration costs utility to utility**

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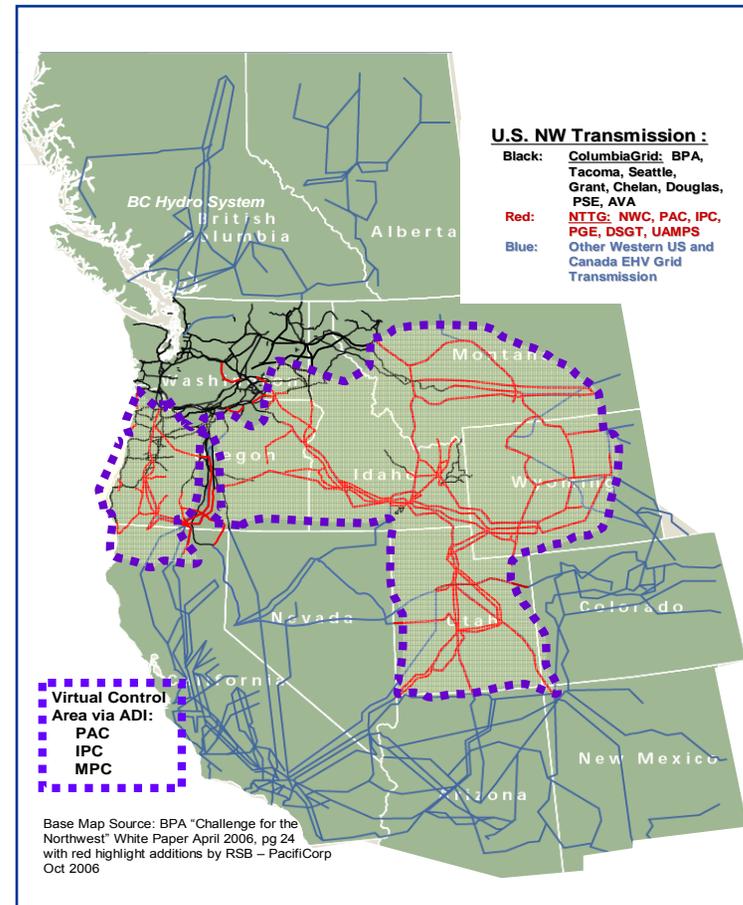
# What more is NWE doing?

## Regional Activity – Current

### ACE Diversity Interchange (ADI)

#### Current Scope of ADI:

- The initial Participating balancing authority areas are:
  - » Idaho Power Company
  - » NorthWestern Energy
  - » PacifiCorp – Eastern
  - » PacifiCorp – Western
- Joined by 16 balancing authorities in 2008/2009
- The British Columbia Transmission Corporation is the “host” of this activity.
- Any balancing authority area operator located in the WECC and adjacent to and interconnected with one or more Participating balancing authority may join as a new ADI participant.



# What more continued...

## Future Possibilities and Activity

### ■ Regional Joint Initiative

- » **Dynamic System Scheduler (DSS)** – a regional platform to facilitate dynamic schedules between any of the BAs that choose to participate
  - ◆ Not a new concept to NWE
- » **The DSS Strike Team** investigated the potential and issues regarding within-hour variations of transmission schedules and generation changes

### ■ New Technology review...

- » **Batteries**
- » **Flywheels**
- » **Compressed Air Storage**
- » **Demand Side Response**

## Other Activity – Genivar Study

- **From a uniquely Montana perspective, collaboration among**
  - » wind developers,
  - » Governor's office
  - » NorthWestern Energy
  - » MATL
- **contracted with Genivar to assess the effects of wind variability on NorthWestern Energy's system.**
- **worked together to provide data and to offer feedback as the study progressed over two years.**

# Genivar Study - NorthWestern Energy's perspectives of the study

- **Amount of Regulating Reserves**
  - » Under “Modeling Conditions”, the system would need additional “regulating reserves” to return to a pre-wind level of performance
- **Better than “persistence forecasting” and the use of other tools has made our actual experience somewhat different than modeled.**
- **The study also concluded that even more regulating reserves will be needed to be acquired as more wind generation comes on line, which is consistent with our expectations.**
- ***Impact of Geographic Diversity***
- **Diversity is absolutely critical. That’s referred to as geographic diversity among the wind generating projects.**

# Genivar Study - NorthWestern Energy's perspectives of the study

- ***Modeling Perfect Scenarios v. Actual Operating Conditions***
  - » ***Lack of control over the location and, even more importantly, the timing of the potential generation.***
- **Since the potential wind generation will not likely be developed in an integrated fashion, we should not expect that location or timing of the generation would occur exactly as set forth in the model.**
- **The Genivar study, by its own definition, is a model that is able to make perfect use of the regulation available to it each hour just prior to the start of each hour. Actual operation does not reflect this perfect scenario.**
- ***Study did not address small wind installations***
- ***Study does not address the cost responsibility or regulatory impacts of wind integration***

# Wind Integration: Disagreement – Efforts to Collaborate

- **Contested Cases**
  - » *There must be a better way*
- **Wind Integration Working Group**
  - » *Kickoff Meeting September 2, 2009*
    - ◆ **Generally view this as a 3 phase process**
      - **Phase 1: Scoping**
        - ▶ *Define what needs to be studied and the associated assumptions*
        - ▶ *Partly depends on availability of data*
        - ▶ *Select a vendor to perform the study*
      - **Phase 2: Study**
        - ▶ *Vendor performs study*
        - ▶ *Likely some communication back and forth with vendor*
      - **Phase 3: Application of Study Results**
        - ▶ *Understand study results*
        - ▶ *Craft suitable application of results to an integration mechanism*

# Mill Creek Generation Station (MCGS)

## Mill Creek Generating Unit in Montana

- Existing regulating services are becoming more expensive and scarce
- 150 MW plant near Anaconda, MT
  - » To be built for regulation services to balance supply and load for NWE's Balancing Area
  - » Rate-based cost of service investment
  - » Estimated to cost approximately \$200 million
- MPSC approved plant in 2Q '09
  - » Construction underway
  - » Market Contracts terminate 12/31/10
  - » Sized to provide regulation service to NWE's retail and wholesale load customers



In service date for Mill Creek Generation Station is 4Q 2010

# Mill Creek Generation Station (MCGS) – 2009 RFP

## MCGS Final Order

- **“NWE must continue to issue periodic RFP’s for regulation services and evaluate whether within-hour load following services, whether combined with market regulation or MCGS dispatch, would improve the cost-effectiveness of NWE’s approach to satisfying control performance criteria. Each quarterly report (discussed in the previous paragraph) must detail NWE’s efforts in this regard.”**
- **RFP Issued September 14, 2009**
  - » Any length of term will be considered by NWE; however, a minimum of 1 year is required.
  - » Other potential within-hour services will be considered in conjunction with regulating reserve capacity and/ or the operation of the MCGS. Other potential within-hour services are any product which is commercially available and sufficient to be used to provide normal regulation margin to meet NERC Control Performance Criteria.
  - » Pursuant to FERC expectations, NorthWestern will employ an independent third party to monitor the RFP process.

# Mill Creek Generation Station (MCGS) – 2009 RFP

<u>Activity</u>	<u>Date:</u>
RFP posted on NWE OASIS Website	09/14/2009
Electronic Solicitation for Request for Proposal	09/14/2009
Pre-Bid Conference	09/28/2009
Deadline to Respond	11/02/2009
Evaluate RFP/Negotiations	11/02/2009 to 01/01/2010
Execution and Filing of Agreements with FERC	Early 2010

NWE, in its sole discretion, reserves the right to modify the Timeline if required.

# What About Wind for Export?

- ***NorthWestern’s Open Access Transmission Tariff (“OATT”) specifically excludes obligation to provide regulation services to transmission customers serving load outside of NorthWestern’s Balancing Authority Area.***
- ***Schedule 10 to OATT provides several options for intermittent generation to “self provide” regulation services***
  - » ***Provide adequate regulation to NorthWestern***
  - » ***“Telemeter” generation to balancing authority load being served***
  - » ***Form own balancing authority***

***Each of these options are being used already in some form...***

# Policy Considerations

- *Montana has vast wind potential*
- *Transmission upgrades are required for any substantial wind development*
- *Within hour regulation services are critical and must be considered in overall evaluation*
  - » ***Where will it come from?***
    - ◆ ***Very illiquid Market purchases***
  - » ***How much regulation is required for additional wind penetration?***
    - ◆ ***Allocation***
    - ◆ ***Should size, location, etc, impact requirement***
  - » ***Who Pays?***
    - ◆ ***When for serving load within NWE BA – load customers will pay***
      - ***Mill Creek Generation Station currently designed only for customers serving load in NorthWestern BA***
    - ◆ ***For Transmission Customers serving load outside NorthWestern BA load customers should not pay***
      - ***Protection of rate-payers***
      - ***Federal***
      - ***State***
  - » ***Who will procure?***