



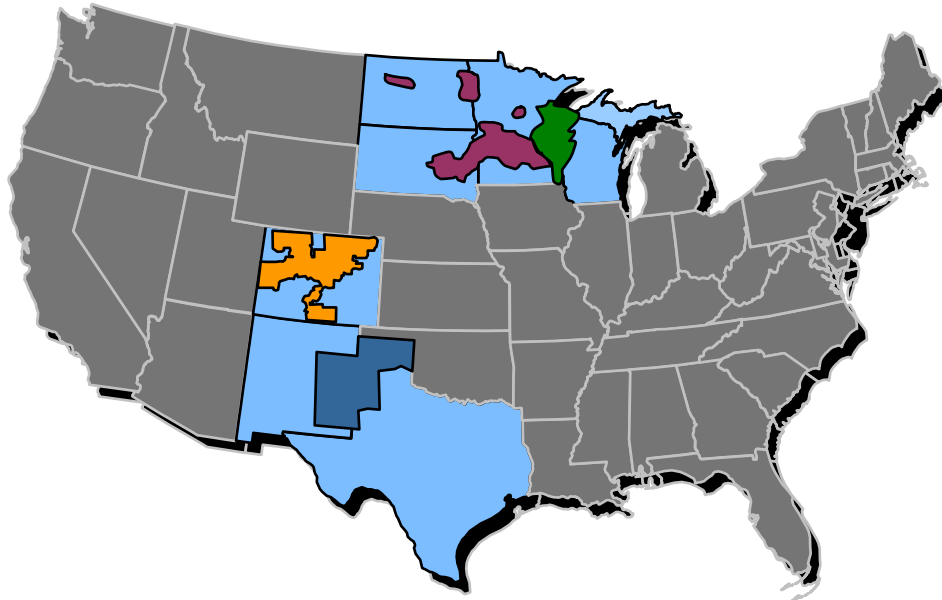
Renewable / Grid Integration Issues Best Practices Discussion June 7, 2011

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Topic Outline

- **Xcel Energy Overview**
- **Western Interconnection Delivery**
- **Discussion**

Who We Are...



- 26,000+ MWs of generation
- No. 1 wind power provider
- No. 5 solar power provider

Customers

3.4 million electric; 1.9 million gas

**Wind capacity installed*
for native use:**

NSP: 1591 MW

PSCo: 1735 MW

SPS: 712 MW

Total: 4038 MW

**Includes through Q3 2011*

Western Interconnection Delivery

- **CAISO**

- Modern market, full LMP-style design

- **Rest of western interconnection (U.S.)**

- Bilateral market, OATT pancake rates

- Pacific Northwest: “Firm within the Hour”

- Disparate Contingency Reserve practices

- Extremely limited congestion management practices, conservative ATC calculations

Western Interconnection Delivery

- **What integration practices have been tried?**
 - **ACE Diversity Initiative**
 - **Reliability-based Control Field Trial**
- **Others pending:**
 - **Dynamic Scheduling System (DSS)**
 - **ITAP (OASIS reservation & scheduling efficiency improvements)**

Greatest Impediments to renewables

- Bilateral focus precludes efficiency benefits
 - Pent-up variability within Balancing Areas
 - Inefficient scheduling business practices
 - Grid utilization business practices

Where is market headed?

- **Today in Western Interconnection approximately 13,500MW of renewable supply**
- **By 2020 forecasted penetration approximately 69,000MW based on portfolio standards**
- **Issue for efficient renewable integration will remain on the table!**

How to advance integration?

- **Proposed Energy Imbalance Market for West**
 - **Virtual BA consolidation**
 - **Voluntary offer-based dispatch participation**
 - **Parties enter operating hour with traditional balanced portfolio – provides a physical hedge**
 - **Balancing market dispatch optimization does not use bilateral schedules or OASIS reservations**
 - **Effective congestion management**
 - **Grid reliability-based flow limits**

