

CANWEA – AWEA Workshop 2007

Pre-Conference AESO Wind Power Forecasting Pilot Project

April 24 2007

Calgary, Alberta, Canada

Reliable **Power**

Reliable **Markets**

Reliable **People**



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Operations and Reliability



Agenda



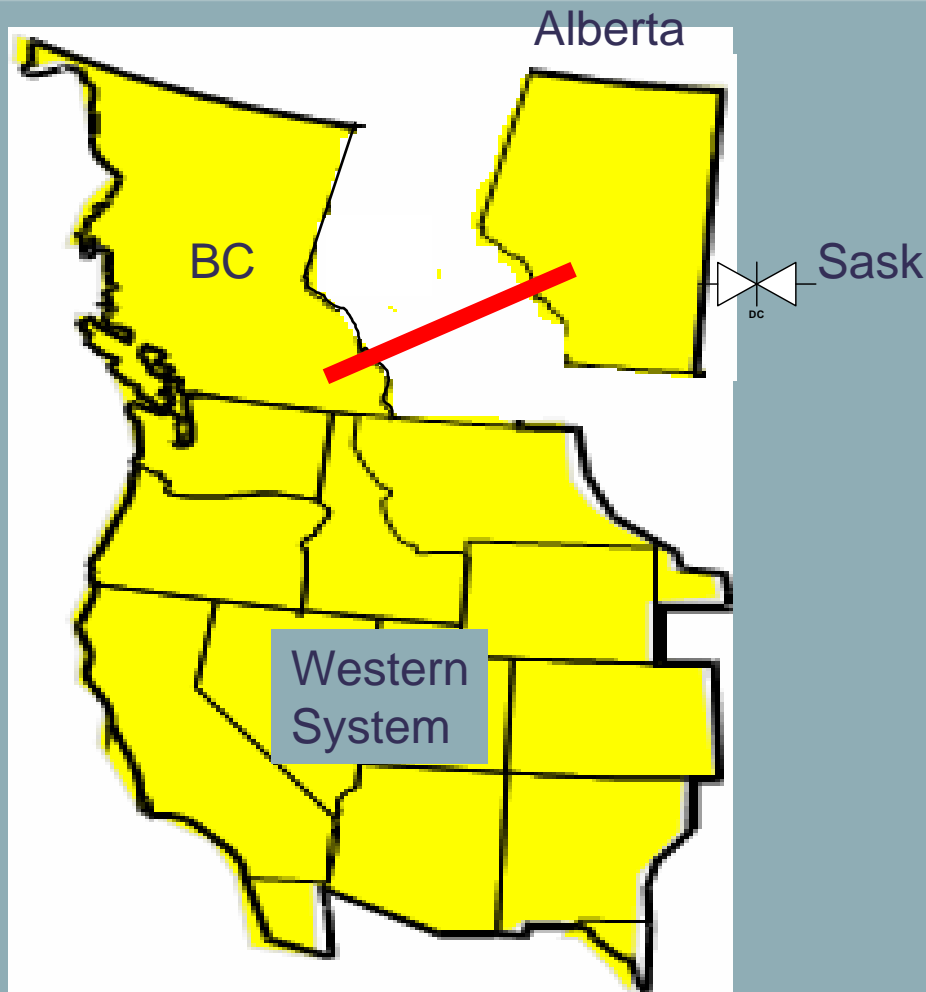
- 1300 Welcome/Introductions
- 1310 AESO background on Wind Integration
- 1325 Project overview (objectives, design and timelines)
- 1340 Phoenix Engineering (Data Collection)
- 1400 ORTECH presentation (25 min, 5 min questions)
- 1430 Break
- 1445 Weprog presentation (25 min, 5 min questions)
- 1515 AWS Truewind presentation (25 min, 5 min questions)
- 1545 energy & meteo presentation (25 min, 5 min questions)
- 1615 Summary and Questions
- 1630 Meeting Adjourned

Wind Integration in Alberta



Quick Facts

Alberta Power Supply



Fuel Type	Supply Capacity (MW)
Coal fired	6182
Gas fired	4606
Hydro	899
Wind	443
Biomass	133
Other	30
BC Intertie	780
Sask Intertie	150
TOTAL	13223

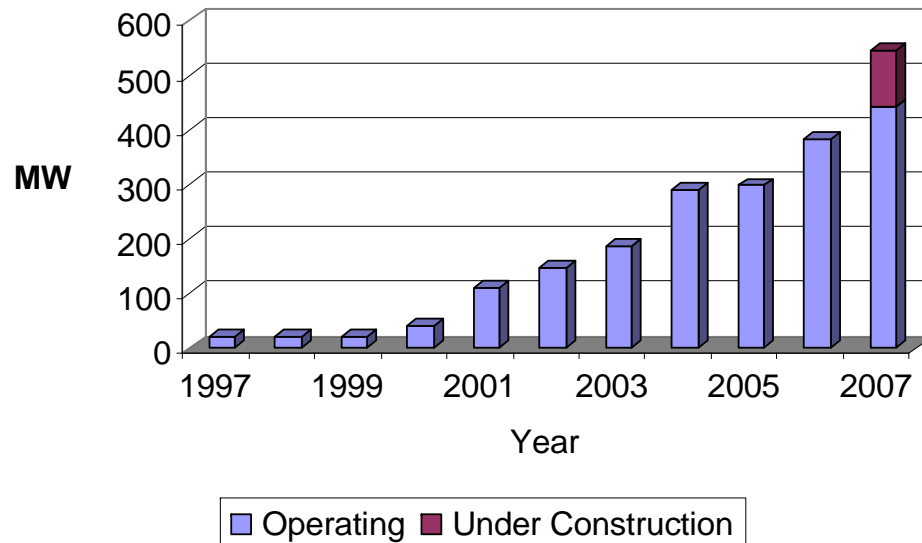
2006 Peak Load	9661
Annual Load Factor	80%

Quick Facts

Alberta is the current Canadian leader in wind power development



Historical Installed Capacity of Wind Power



- 4100 MW of interested wind power development and not under construction
- Current transmission system upgrades (SE + SW) will accommodate wind power up to 1400 MW
- 10 Year Transmission plan (2007-2016) has scenarios with up to 3100 MW of wind power

Wind Power Overview



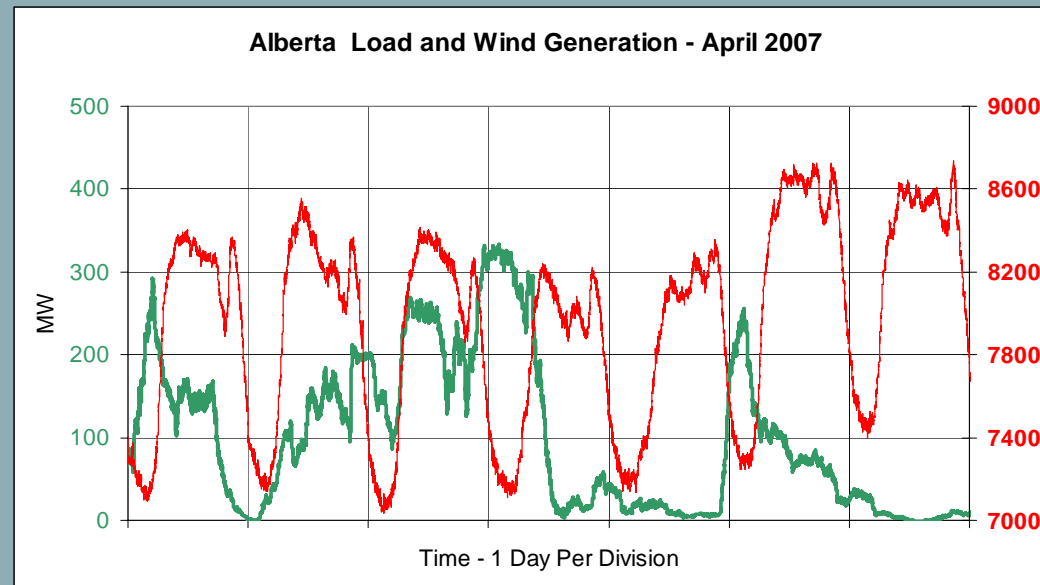
- AESO's objective on wind power integration
 - Continue to adopt a leadership position in the industry
 - Enable further wind power without compromising system reliability or the fair, efficient, and openly competitive operation of the Alberta system and market"
- Alberta highlights
 - High level of wind power penetration
 - Interconnection standards specific for wind power issues in 2004
 - Initiate detailed work on the forecasting issue 2007

Wind Power Operation

Operator Perspective - Variability



- Load varies by seconds, minutes, hours, days and seasons and can be forecasted with reasonable accuracy
- Dispatchable generation varies typically within 1% of dispatch
- Wind power variability and ramping can create more operational uncertainty for system operators – sometimes assisting and sometimes exaggerating requirements

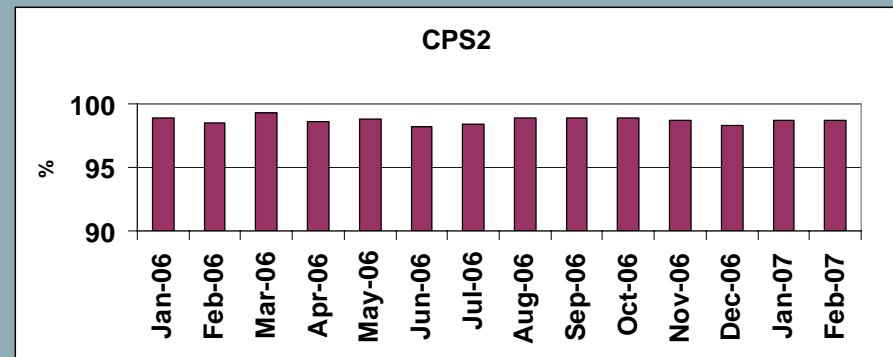
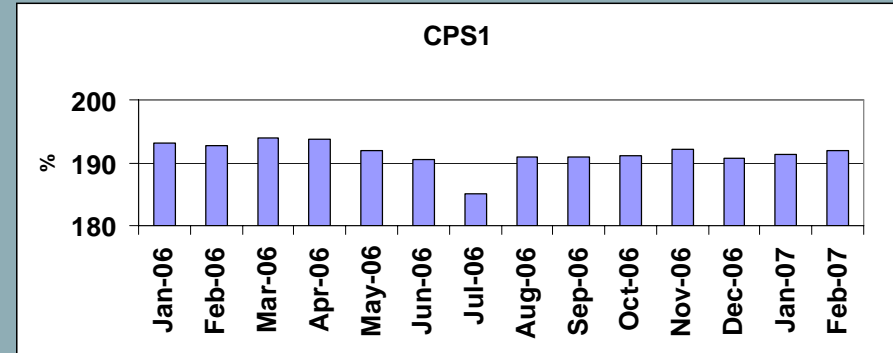


Wind Power Operation

System Performance



- Wind power capacity currently at 443 MW
 - (~4.6% of peak load)
- No increased levels of Regulating reserves to support 443 MW
- Satisfactory performance operating criteria



Data from the NERC website

Challenges



- To integrate more wind power onto the grid, the operator needs to “know what to do” and “have the necessary resources/tools”
 - Big Ramps: Forecasting is key and in particular, the ability to forecast the very large ramps that will be seen in Alberta.
 - Advance Dispatch: Operators also need to get resources in place “prior” to the need and again forecasting will help here.

Solutions

Alberta Focus – Market and Operational Framework



Issued March 7, 2007 for stakeholder consultation

If the System Operator receives a reasonable forecast of wind power generation, ***then*** the System Operator can establish an operating plan to accommodate the forecast wind energy by using the following tools:

- The Energy Market Merit Order
- Regulating Reserves
- Load / Supply Following Services
- Wind Generation Power Management

Wind Power Operation

Current use of Predicted Wind Power



- Where we use wind power considerations today
 - Energy Market dispatch – System controller takes the actual wind levels and adjusts dispatch accordingly (persistence)
 - Short term adequacy – Wind power is set at 80 MW or system controller best judgment
 - Alberta – BC export Available Transfer Capability (ATC)
 - Minimum wind power based on 99% certainty for the next 2 hours

Wind Power Operation

Current use of Predicted Wind Power



- Where we don't consider wind power output today
 - Wind power is assumed at 0 MW for market or operational activity outside of 24 hours
 - Day ahead pool price forecast
 - Day ahead interconnections ATC
 - Procurement of ancillary services
 - 14 day / 3 month supply adequacy

Next Steps (1)

- We are continuing to integrating wind power facilities
- Finalize the “Market and Operational Framework”
- Conclude the Wind Forecasting Pilot Project:
 - Understanding of achievable and reasonable forecasting
 - Develop recommendations for technical standards/requirements.
- Develop tools for the System Operator to incorporate wind forecasting and wind power management.
 - AESO is currently prototyping a “Dispatch Support Tool”

Next Steps (2)

- Establish technical requirements, operational practices and rules for;
 - wind power forecasting,
 - load/supply following services
 - wind power management systems
 - Supply surplus, Short Term adequacy, etc.
- Reconcile the obligations of the framework with the current obligations of existing wind generators.
- Review generation forecasting and transmission planning assumptions in view of the framework.
- Further explore the benefits of dynamic scheduling of the interconnections with neighboring jurisdictions

Wind Power Forecast Pilot Project

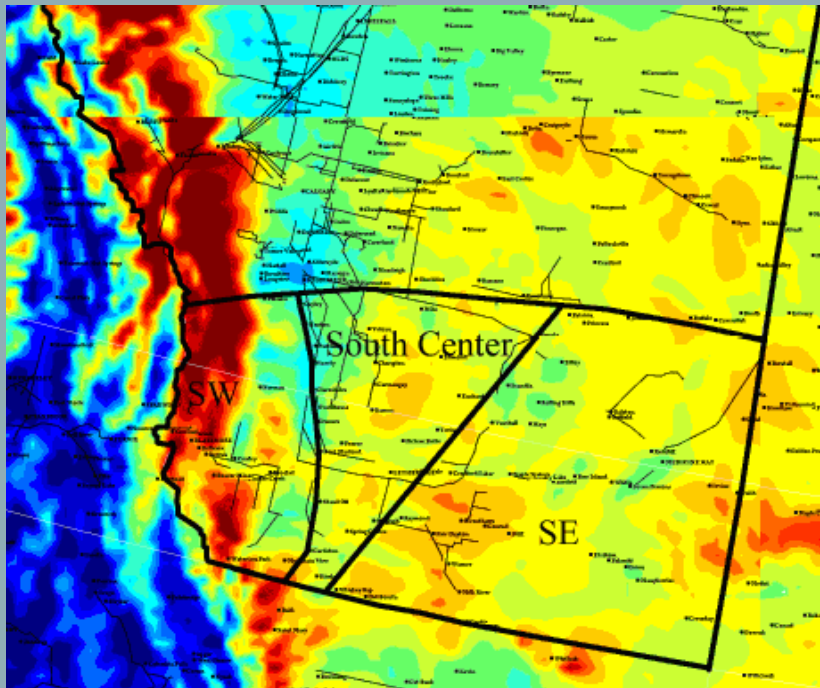


Wind Power Forecasting Pilot Project - Objectives



- Determine the best way to forecast wind power and how well it can be done in Alberta
- Wind Power Forecasting should support:
 - More efficient procurement and dispatch of ancillary services and reduction in ancillary costs related to wind variability
 - Ongoing data supply from sites for centralized model “learning”
 - Policies, Procedures and Technical Requirements
 - Policy on forecast error considerations for the procurement of ancillary services and constrained operation of wind power facilities
 - Consideration in the OPPs for ancillary service dispatch, reliability unit commitment, supply surplus and supply shortfall
 - Requirements for wind power facilities - technical standards, market rules and methods for forecasting requirements

Wind Power Forecasting Pilot Project - Design



Funded by
AESO

*Alberta Energy Research Institute
Alberta Department Of Energy*

- Trial three very different forecasting methods over a one year period:
 - AWS Truewind (US)
 - WEProg (Denmark)
 - energy and meteo (Germany)
- 4 different geographic terrains / wind regimes in Alberta
- 7 existing and 5 future facilities to represent geographic diversity and future expansion
- Independent analytical analysis from Ortech (Canada)
- Data Collection by Phoenix Eng. (Calgary)

Wind Power Forecasting Pilot Project - Timelines



- July - Oct 2006
 - Industry Work Group Stood up, Develop Project Design, Write Terms of Reference, and RFP development
- Oct 2006
 - Issue RFP (x 2)
- Nov 2006
 - Evaluation of Submitted Proposals
- Dec 2006 - Feb 2007
 - Contract Negotiations
 - Develop Data Collection

Wind Power Forecasting Pilot Project - Timelines



- Feb 2007 - April 2007
 - Data Collection, model training
- April 16, 2007
 - Forecast Delivery Begins
- Quarterly Reports
 - End July 07, End Oct 07, End Jan 08
- Final Report
 - Draft End Apr 08
 - Final End Jun 08

Questions

