

# *Wind Forecasting*

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## Getting Wind Forecasts into the System Operator Control Room

NE Region  
System Operators' Wind Integration Seminar

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# *Key Points - Wind Integration*

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We should first identify cost & operating impacts, then design the services, tools and methods to minimize costs at the system level.

Cost impacts can be reduced with adjustments to operating strategies, improvements in wind forecasting and access to real-time markets.

Operating impacts and operator confidence, even if they are issues of operator perception, are equally important... and perhaps more difficult.

Merchant wind plants will be popular in deregulated power markets, and the wind forecasting relationships may get “interesting” between the system operator and market participants.

# *Operating Impacts of Wind Energy*

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- Regulation and load following impacts are usually modest
  - If wind “shows up” without being in unit commitment:
    - Too many units are committed and efficiency of operation suffers
    - Non-wind generators suffer - inefficient operation of committed units
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*Costs are incurred to accommodate wind generation variability and uncertainty of schedule. Some of these costs are “real” and others are likely artifacts of our current tools and practices.*

*Cost impacts can be reduced with adjustments to operating strategies and software tools, improvements in wind forecasting and access to real-time power markets.*

# *Perception is Reality?*

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- Many systems operators remain skeptical
- Do integration studies fully capture the operating reality?
- Would integrating forecasts directly into the EMS, load forecasting or market system software add more value?
- Can we help operators with enhanced forecasts and information for planning defensive measures?
  - High-wind events
  - Vulnerable system situations
  - Integration into contingency analysis
  - *When should I be careful, and when are things OK?*

# *Defensive Operating Strategies*

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*Studied in the “Utility-scale Wind Energy Forecasting System” R&D project funded by the Xcel Renewable Develop Fund (Task 2)*

**Team Members:** WindLogics, EnerNex, AREVA, UWIG

## **Information systems for extreme events**

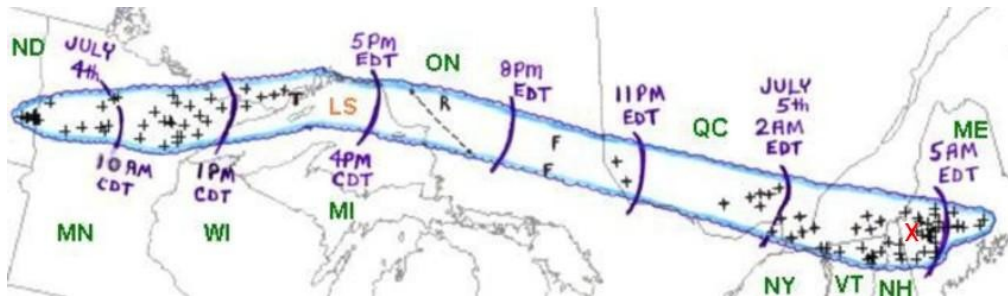
- Network of meteorological towers surrounding the Buffalo Ridge established as backbone of high wind warning system
- Data received in real time via satellite modem
- Demonstrating real-time GIS interface with watch & warning areas

## **Improve accuracy of short-term forecast**

- Local mesoscale forecast prototype for NSP footprint
- Integrating additional off-site met towers into “MRUC” forecasts

# Extreme Weather Events

Convective winds, straight-line winds, non-convective high winds, icing...  
Example: Derecho event of 1999 - Winds estimated between 80 and 100 mph

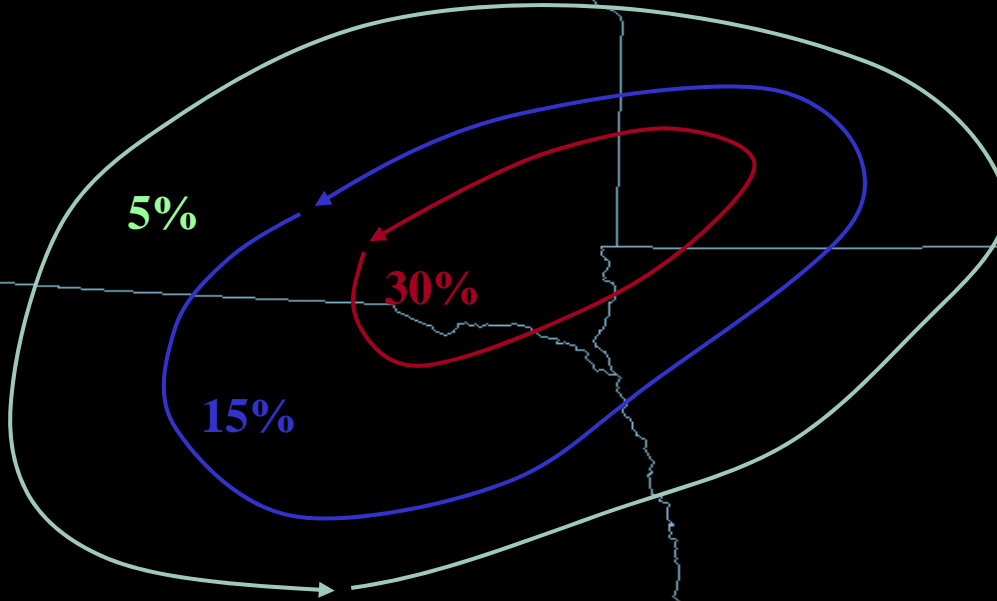


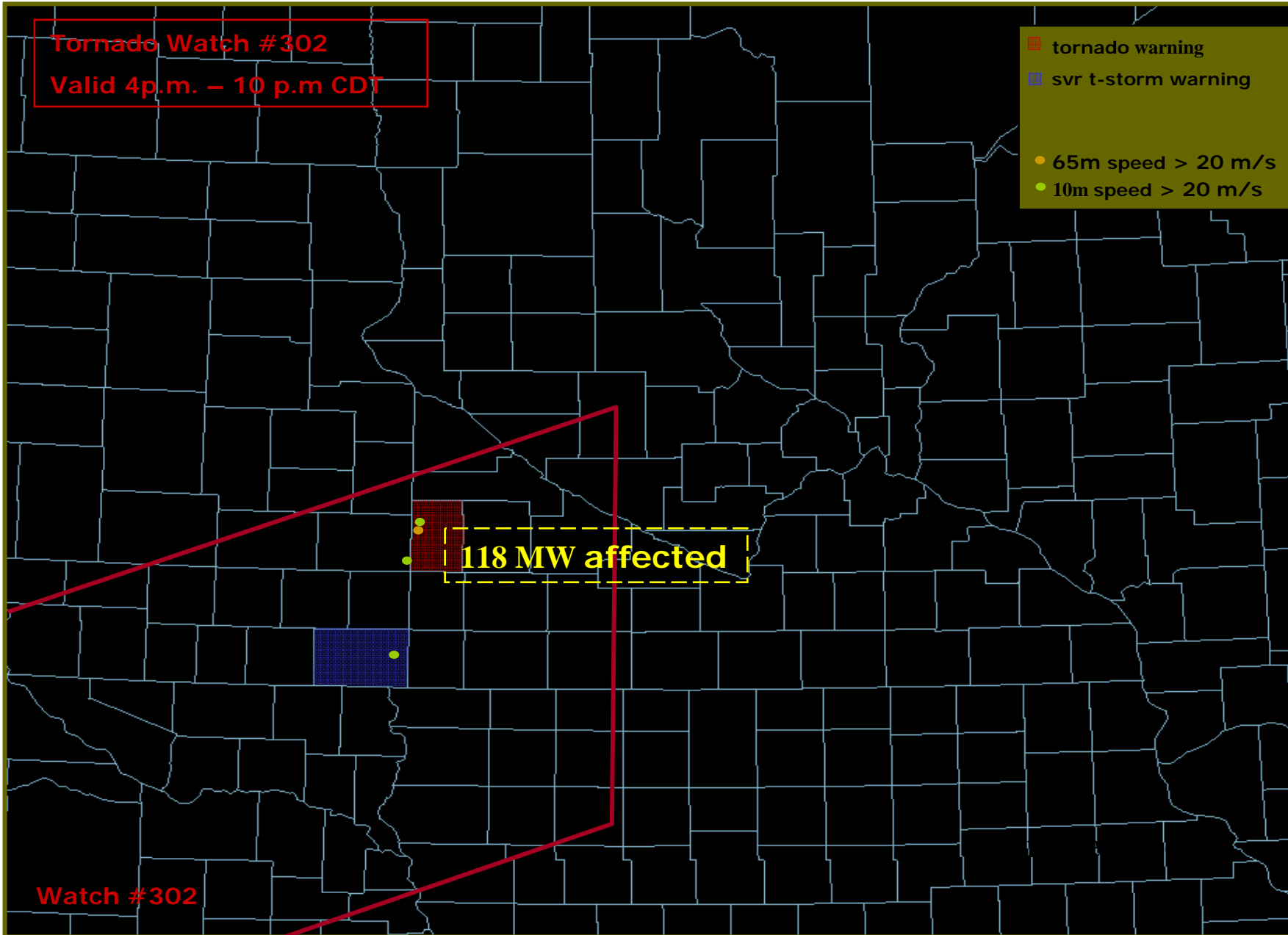
# Day 1 Convective Wind Outlook (SPC)

Valid June 1 11:30 a.m. CDT – June 2 7:00 a.m. CDT

Probability of winds exceeding 50 kts (25.7 m/s) within 25 miles of a point

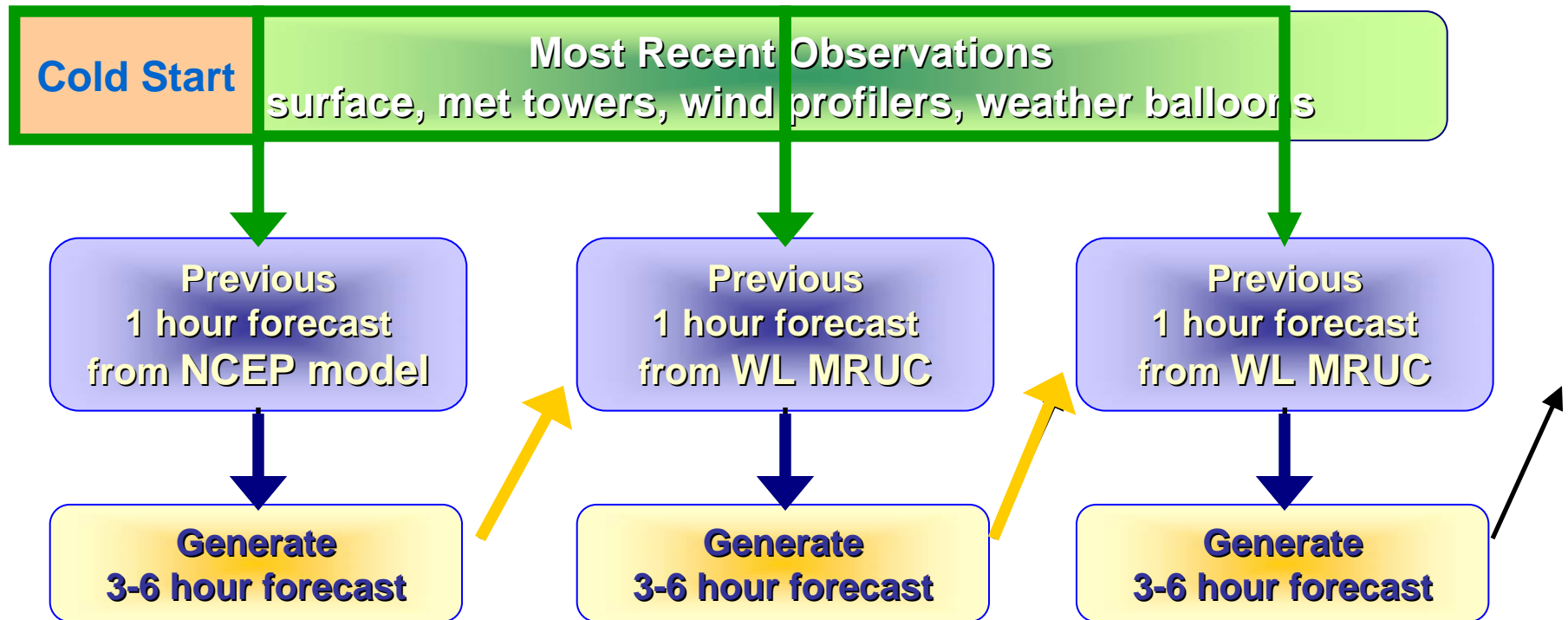
**517 MW potentially affected**





# Rapid Update Cycle Forecasts

- Updated frequently (every hour) with the most recent observations
- Used to make short-term (6 hour) forecasts.
- “Hot Start” uses previous forecast to initialize forecast & minimize “spin-up”



# Control Room Integration of Wind

The screenshot displays a SCADA control room interface with multiple windows and panels. At the top, a window titled 'GEN\_UNIT\_STATUS\_INSTRUCT\_RTGEN[DTS] PC1258(B) page:3 habitat60' shows system parameters: 'AGC DTS ACE: -15', 'Interchange - Current: 1117', 'Gen: 3233', 'Frequency: 59.845', 'Scheduled: 1000', and 'Load: 2116'. Below this, a 'Generation Unit Status' panel lists units: 'CHFALLS' (CF1, 1, 2), 'NANTCOKE' (1), 'HOLDEN' (1), and 'CHENAUX' (1). A 'Local Unit Controller' panel shows 'Status: RUNNING' and 'CHF' for 'CHFALLS' and 'LAKEVIEW' units. The main display area is split into two panels: 'LAKEVIEW' and 'CHFALLS'. The 'LAKEVIEW' panel shows a network diagram with nodes 'MOSELLE1', 'HEARN', and 'GEN1\_GENERATOR' (0SPFB) connected by lines with numerical values (2931, 3132, 3536, 3537). A 'Generator Information' popup window for 'Gen: GEN1' shows 'Current: 211', 'Min: 50', and 'Max: 700'. The 'CHFALLS' panel shows a network diagram with nodes 'MARTDALE', 'CHENAUX', and 'DCVG:CHFLCNVB'/'DCVG:CHFLCNVT'. A 'Generator Information' popup window for 'Gen: 1' shows 'Current: 272', 'Min: 50', and 'Max: 700'. The bottom status bar indicates 'SCADA/MAPBOARD' and the time '3/26/2004 12:55:07 PM'.

# *Focusing on Operator Needs*

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- Do the wind forecasts add value to control room operations *in the eyes of the operator?*
- Should wind forecasts be displayed separately, or must they be deeply integrated into the EMS software to maximize value in the control room environment?
- Enhanced forecasts for high-wind events seem very valuable, but exactly how should they be used in the control room?
- “Perception is reality...”

*Changing perceptions requires studies and tools that increase both understanding & confidence.*

# *Wind Forecasting Value*

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- **Benefits to system operators**
  - Ancillary service cost impact for wind integration
  - Transmission congestion and scheduling
  - Forecast value grows with increasing wind on the system
- **Benefits to wind plant operators**
  - Depends on the rules and the penalties
- **Merchant wind power plants**
  - Balancing wind risk through pooling (portfolio effects)
  - Hedging and trading become very important
- **Who gets the value?**
  - Those using the forecast to reduce costs or maximize revenues

# *Things to Think About*

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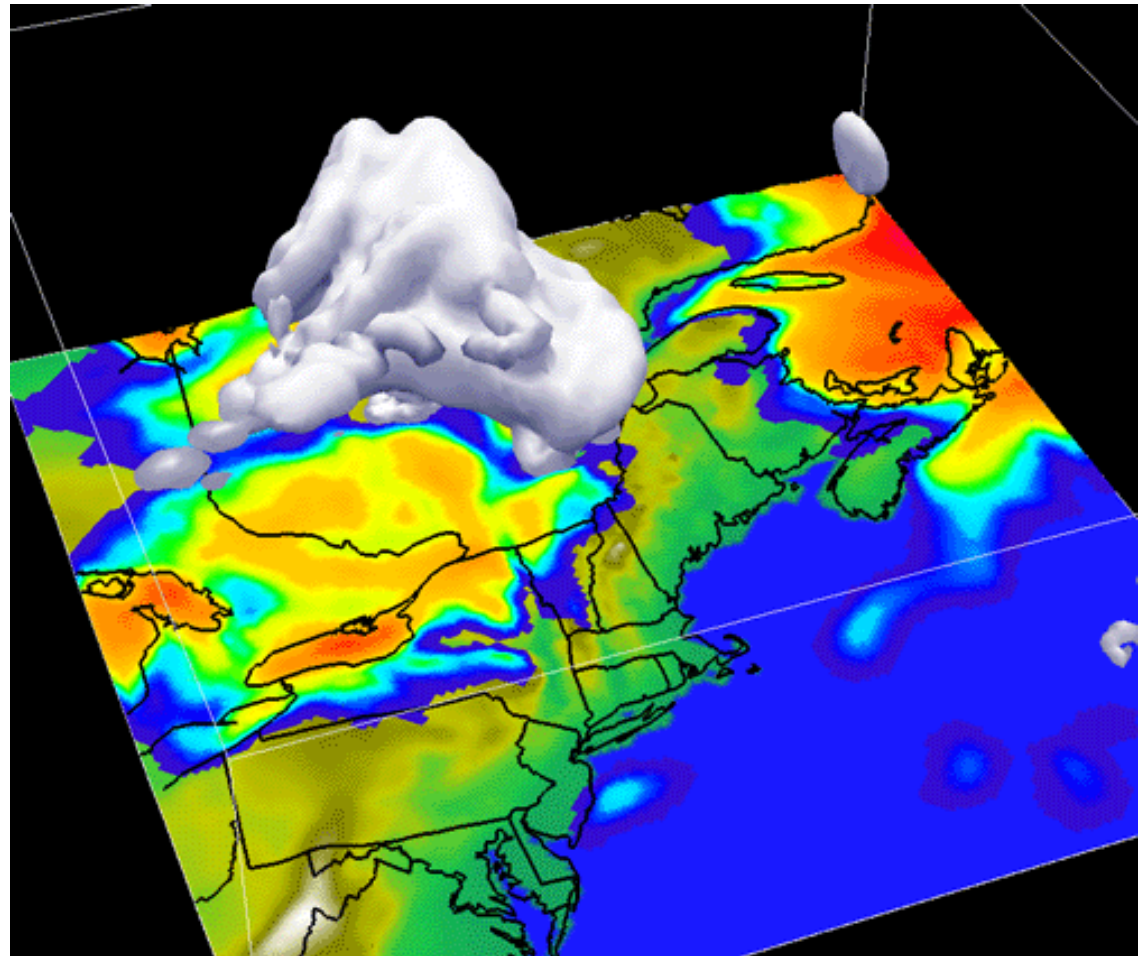
- **The motivations (and costs) of doing wind forecasting yourself**
  - It will take longer and cost more to do it yourself... but there may be good reasons to do so
- **The role of hedging by market participants**
  - Wind variability, hedging/trading (flat-block), locational marginal prices...
  - This leads to a very necessary and very active interest in trading
- **Conflict of interest**
  - System forecast versus market participant forecast
  - The greater the difference, the greater the overall value to the forecasting service provider

*Should the provider of one forecast be prohibited from doing the other?*

# Questions & Discussion

Time series showing  
forecast with wind speed  
and cloud cover

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