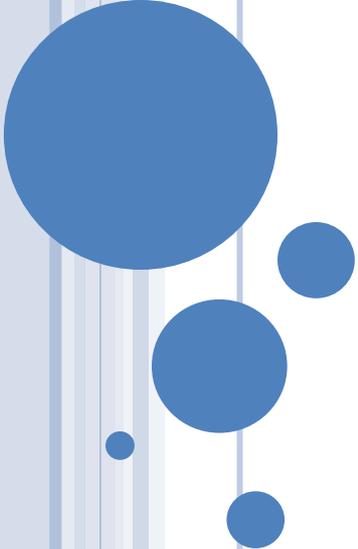


# Nebraska Public Power District

*Always there when you need us*



## NEBRASKA WIND CONFERENCE

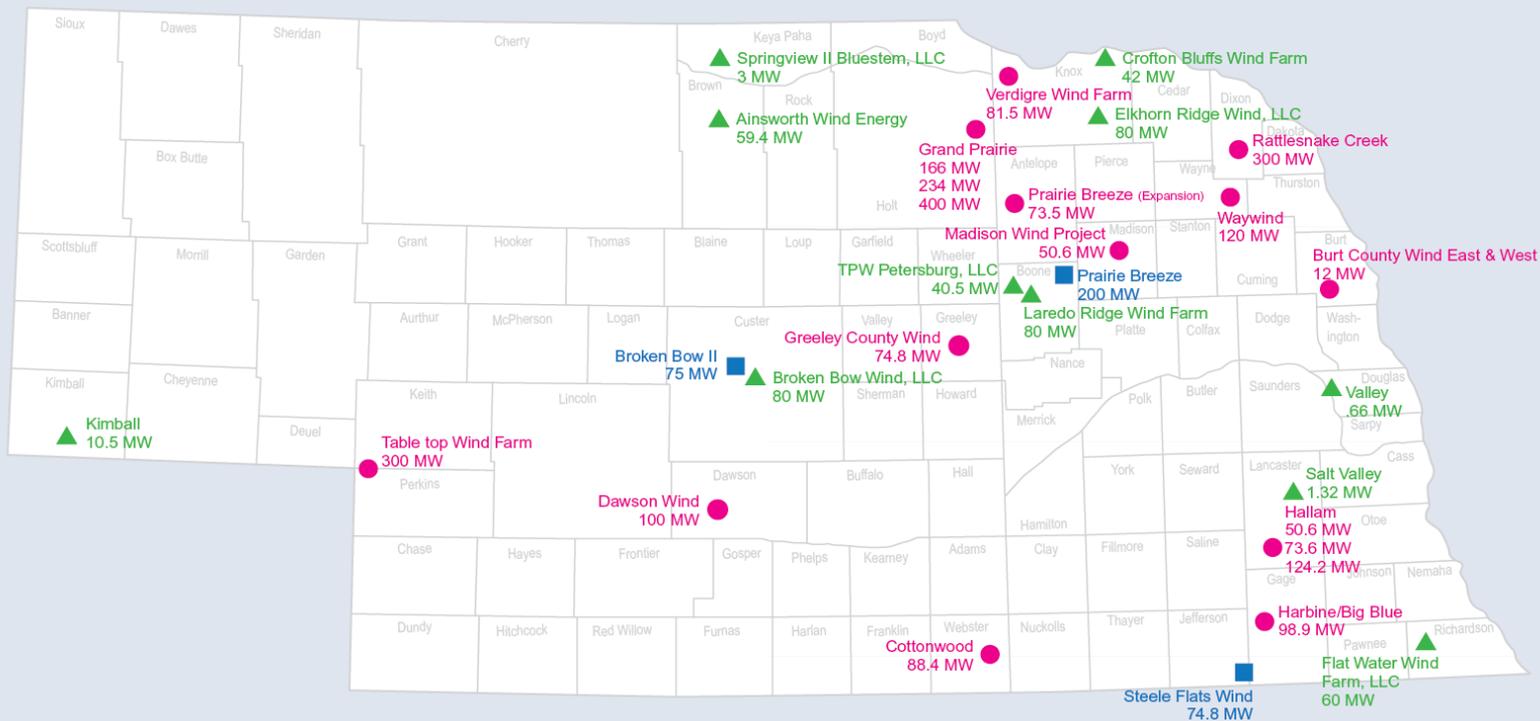
Ron Thompson

November 2013

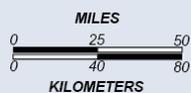


# Operating and Proposed Wind Farms in Nebraska

October 2013



APPROXIMATE SCALE



Legend Status

- ▲ Operating
- Contracted or Under Construction
- Proposed





# IMPACTS TO THE MARKET

- When congestion occurs, Congestion Management Events (CMEs) are utilized by SPP to re-dispatch online dis-patchable resources through the market system
  - Market Locational Imbalance Prices (LIPs) have experienced volatility as wind has been added to the system
  - Minimum issues and needing resources for Reliability
  - NPPD's large Baseload Resources, which has historically experienced very little dispatch movement as a base load resource, has experienced significant cycling as a result of CMEs and LIP volatility





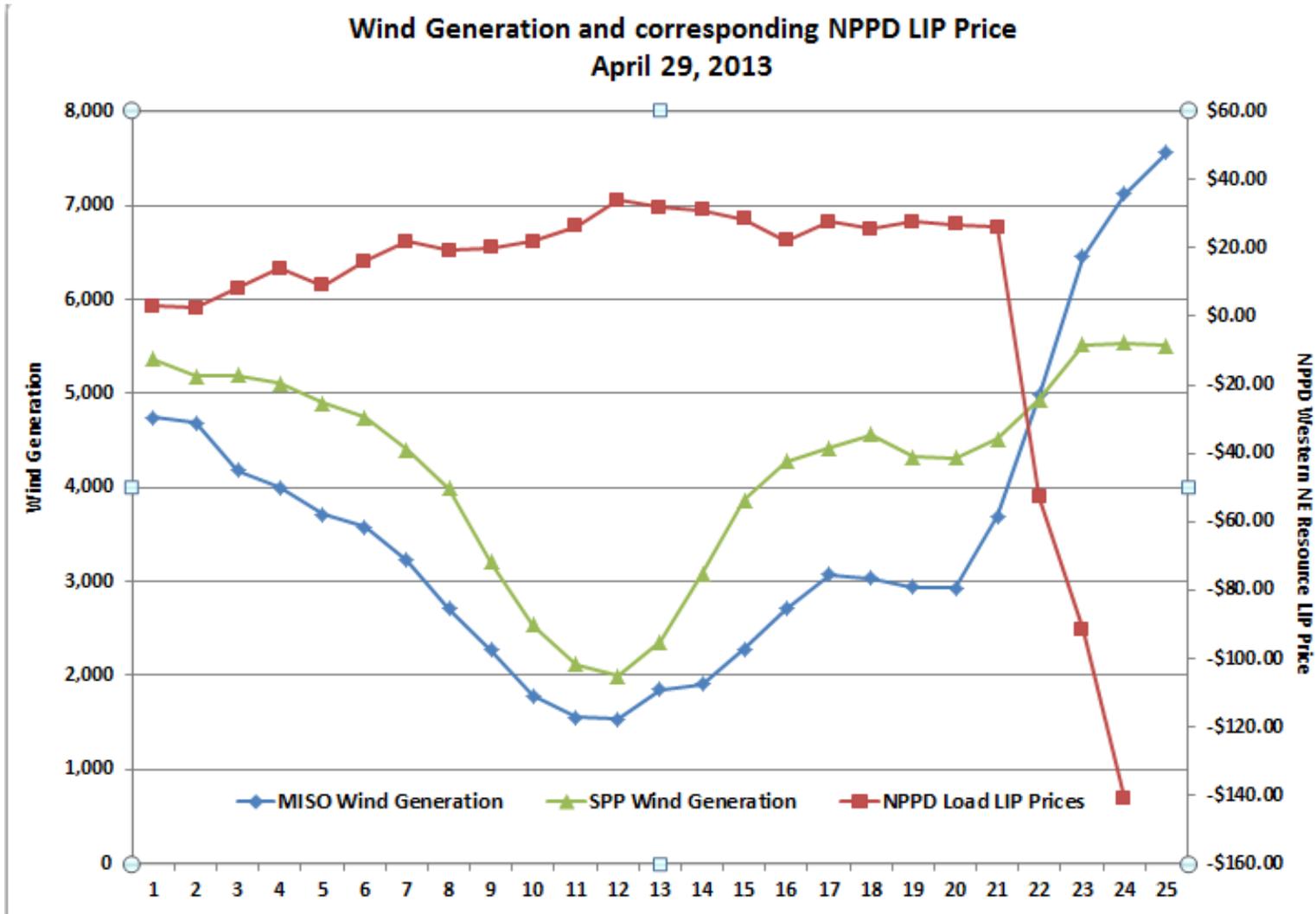
# WIND GENERATION IMPACTS TO NPPD

- NPPD manages their Resources for reliability needs as well as Economic
  - NPPD's Minimum Generation Plan
  - Units needed to manage variable resources
- Wind Generation impacts NPPD's from different locations
  - Nebraska
  - SPP
  - MISO
  - WAPA
- Risk for Transmission Flowgate Congestion is highest when wind output is high during low load periods
  - High Volatile Prices
  - One five minute pricing period impacts





# SPP LIP PRICES WHEN WIND GENERATION CHANGES





# RESEARCH ITEMS FOR A RTO MARKET

- **Investigate ways to factor in economic impact of wind curtailment**
  - Reduce financial and operational risk to Generators
  - Need to find a way where Baseload and intermediate Resources can work together
  - How and can this be incorporated into CME process?
- **Moving projects from Non-Dispatchable Variable Energy Resources (NDVER to DVER**
  - Are projects capable?
    - PURPA Qualified Units (QF's)
  - What are the potential costs and benefits?
  - How can the RTO models be improved to manage Wind Generation
- **How will this change with Integrated Market**
  - Consolidated Control Area
  - Will help manage variable resources





o Thank You

