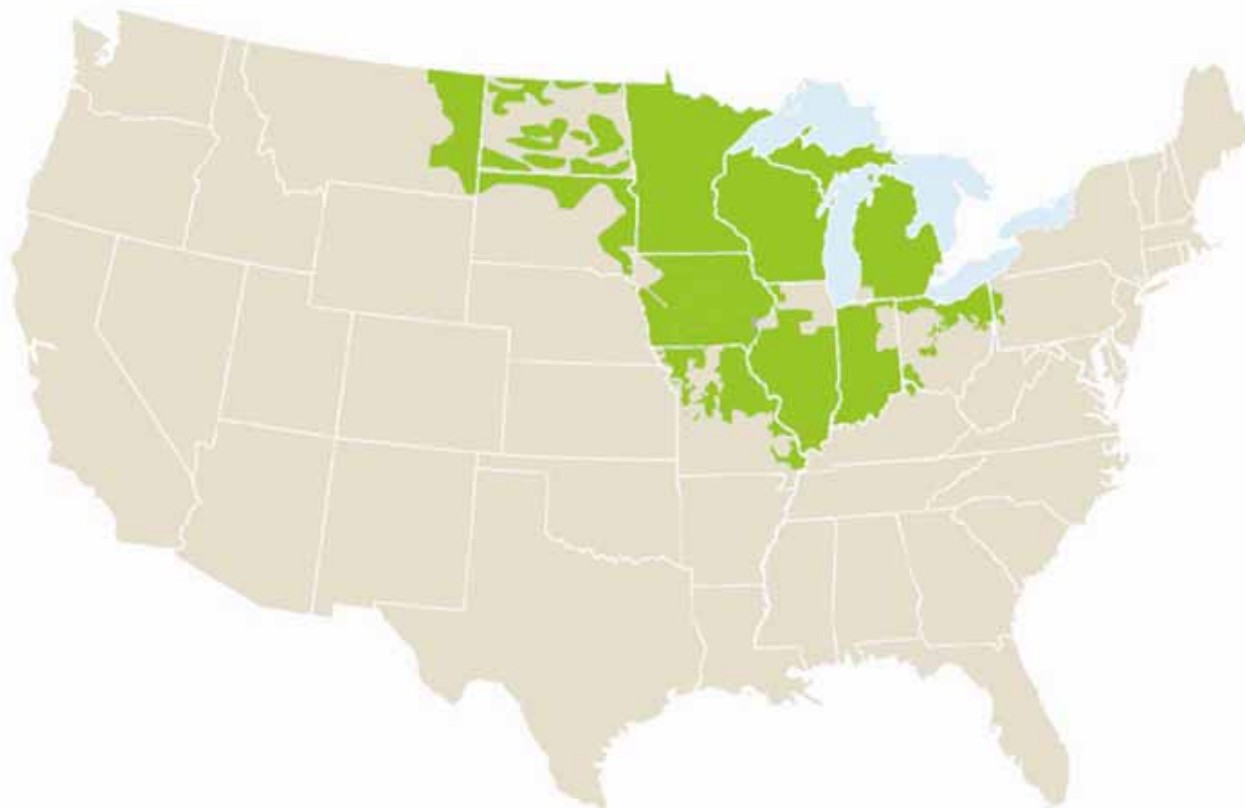


Integration of Renewables at the Midwest ISO

By Bill Malcolm

to the Joint Session of the Staff Subcommittees
on Electricity and Electric Reliability -- NARUC Winter Meetings
Washington, D.C. -- February 14, 2010

Midwest ISO Footprint



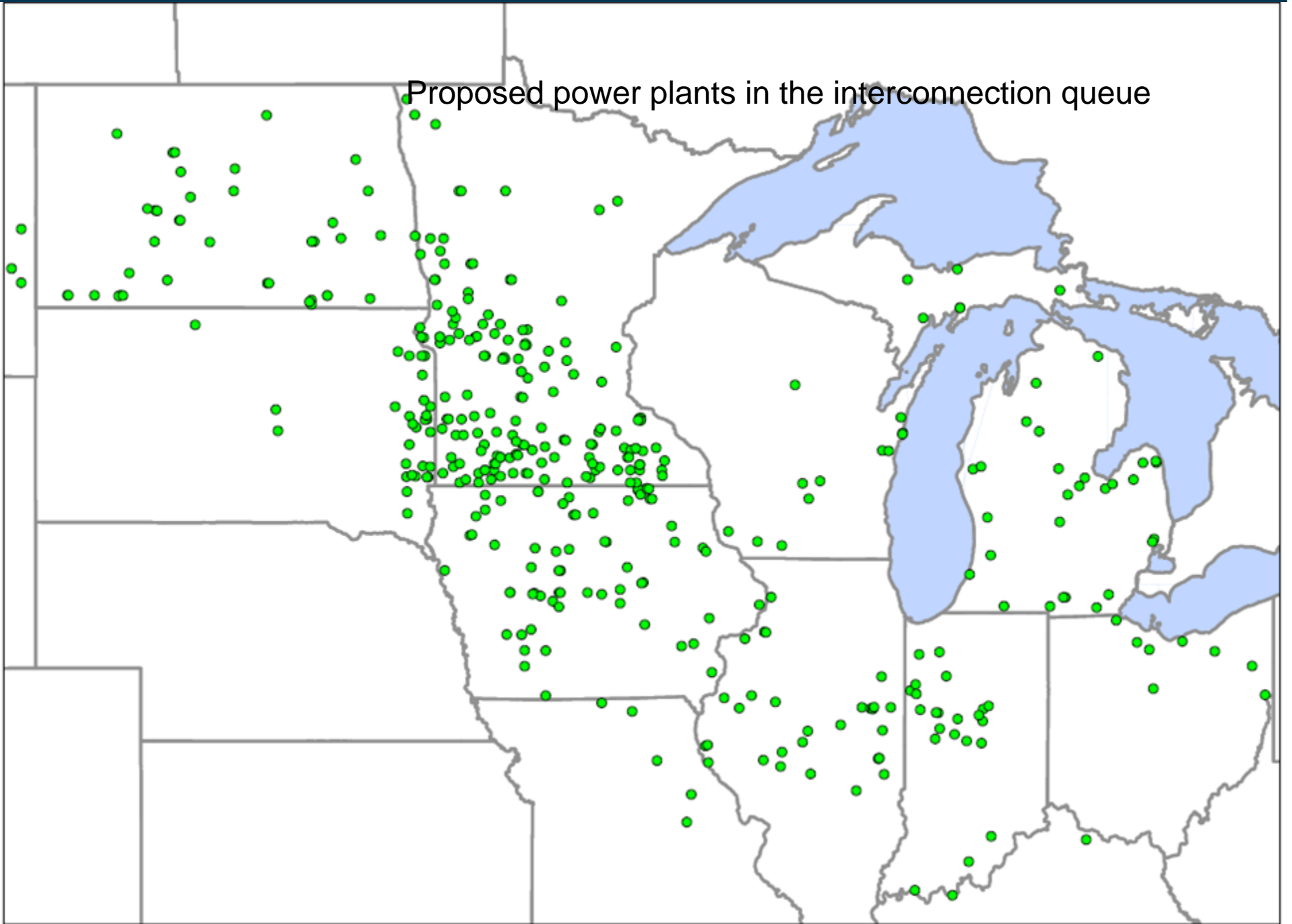
What's New

- New members: MidAmerican, Dairyland (mid-2010), and Big Rivers (pending regulatory approvals)
- Transmission cost allocation discussions (filing mid-July): the injection withdrawal method
- New reserve margin requirement: 11.94%
- Winter peak: 87,208 MW (12/10/09)

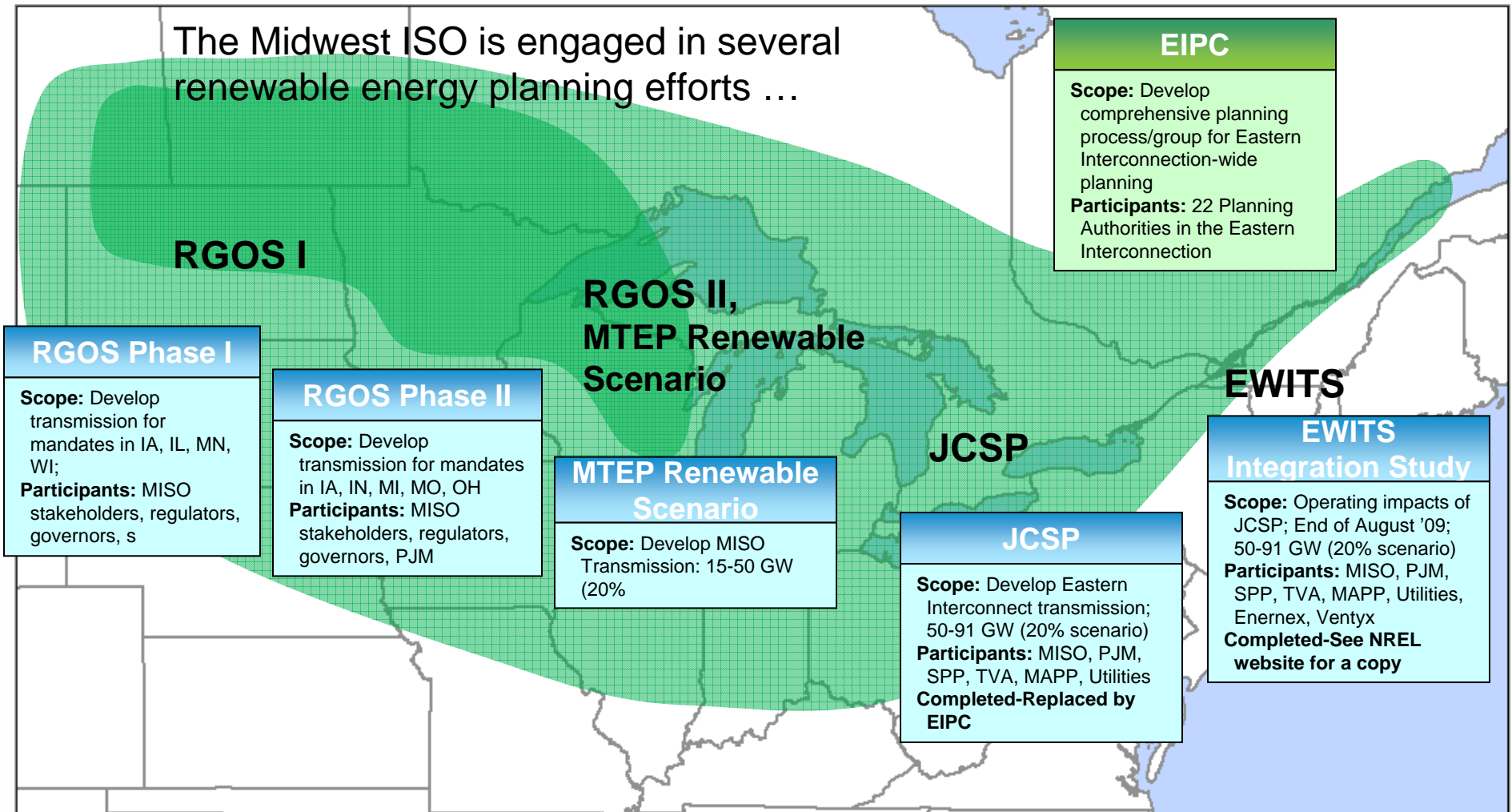
The Midwest ISO and Wind: A National Leader

- 4/05: 1,000 MW
- 6/08: 3,000 MW
- 12/09: 3,999 MW
- Today: 7,625 MW
- Coming soon: 21,000 MW+ per the RPS mandates in our footprint
- In the queue: 61,000 MW of wind

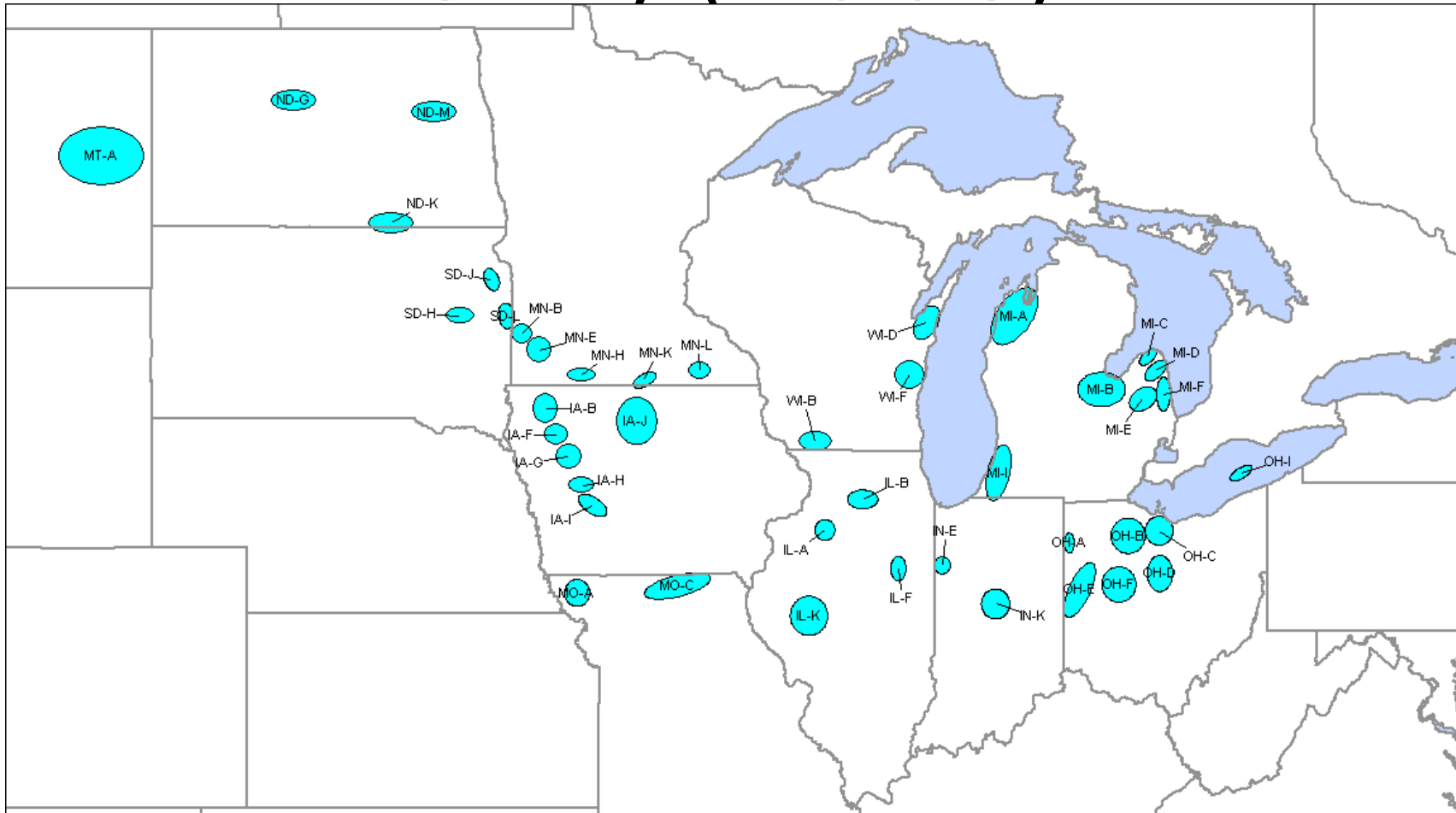
Proposed power plants in the interconnection queue



Renewable Energy Planning



Regional Generator Outlet Study (RGOS)

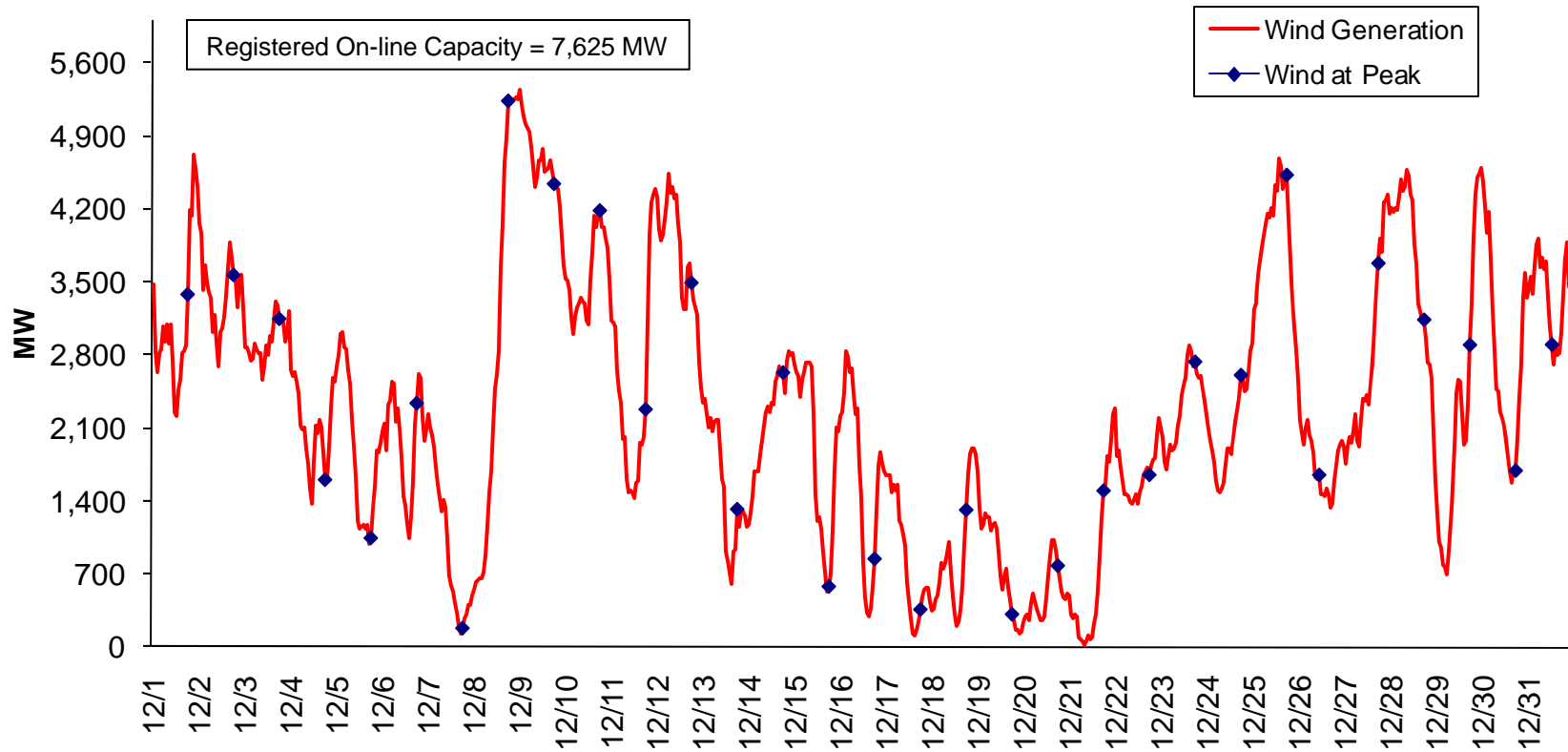


How Intermittent Resources Work

- Currently, intermittents can't be dispatched as part of our real-time dispatch software
- This inability to dispatch necessitates manual curtailments to relieve transmission congestion constraints in various parts of the Midwest ISO system:
 - On average, more than 3 manual curtailments per day
 - On average, several hundred MWHs per day

Wind Utilization

Hourly Energy Contribution from Wind
December 2009



Wind Integration Initiative Goals

- Enable integration of wind resources in a manner that will ensure:
 - Enhancing the value of wind
 - Reliable system operation
 - Efficient and effective market
 - Equal treatment regardless of generation type
 - Recognition of new technologies

Potential enhancements

- Improved wind forecasting
- Development of new market rules to better utilize the new wind turbine control technologies
- Use of storage
- New intermittent dispatchable tariff
- Revised interconnection procedures
- Development of new load following products
- Revised treatment under emergency conditions

Wind Forecasting

- Midwest ISO now forecasts wind via a vendor product for the next 72 hours
- Potential enhancements:
- Developing wind forecast granularity down to 5 minutes
- Increased coordination and analysis with our generators, forecast vendor, and neighbors to increase accuracy.

Proposed New “Dispatchable Intermittent” Resource

- Would be very similar to a standard generation resource
- The resource would be included in the real-time co-optimization and would be eligible to set price
- The resource must submit offers for energy and will clear based on economics
- Primary source for the maximum limit would be a new participant-submitted forecast (a CP node level forecast for 5 minute periods)
- Details of new tariff being worked out in reliability subcommittee and other stakeholder groups
- April tariff filing anticipated

“Dispatchable Intermittents”

- By allowing the real-time optimization to determine an economic dispatch for these resources, *with consideration for congestion*, manual curtailments will be minimized

Increased **operational efficiency**

Increased **market efficiency** and provide **market transparency**

Manual curtailments will be minimized

Upcoming

- February 22: Reliability subcommittee
- March 3: Tariff proposed to market subcommittee
- March 30: Stakeholder vote on new tariff at market subcommittee
- April 7: Dispatchable intermittent tariff filing
- December: All other wind integration changes filed

For more information

- bmalmcolm@midwestiso.org (317/409-3674)
- Visit our website, midwestmarket.org (see wind integration tab under “Documents”/Workshops and the renewables section of our website)
- Participate in the reliability subcommittee or market subcommittee stakeholder meetings for updates