

The Lugar Center for Renewable Energy
Diversification of Energy in Indiana
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Wind -- An Emerging Technology in Indiana

Sean R. Brady, Regional Policy Manager

INDIANA WIND -- Today

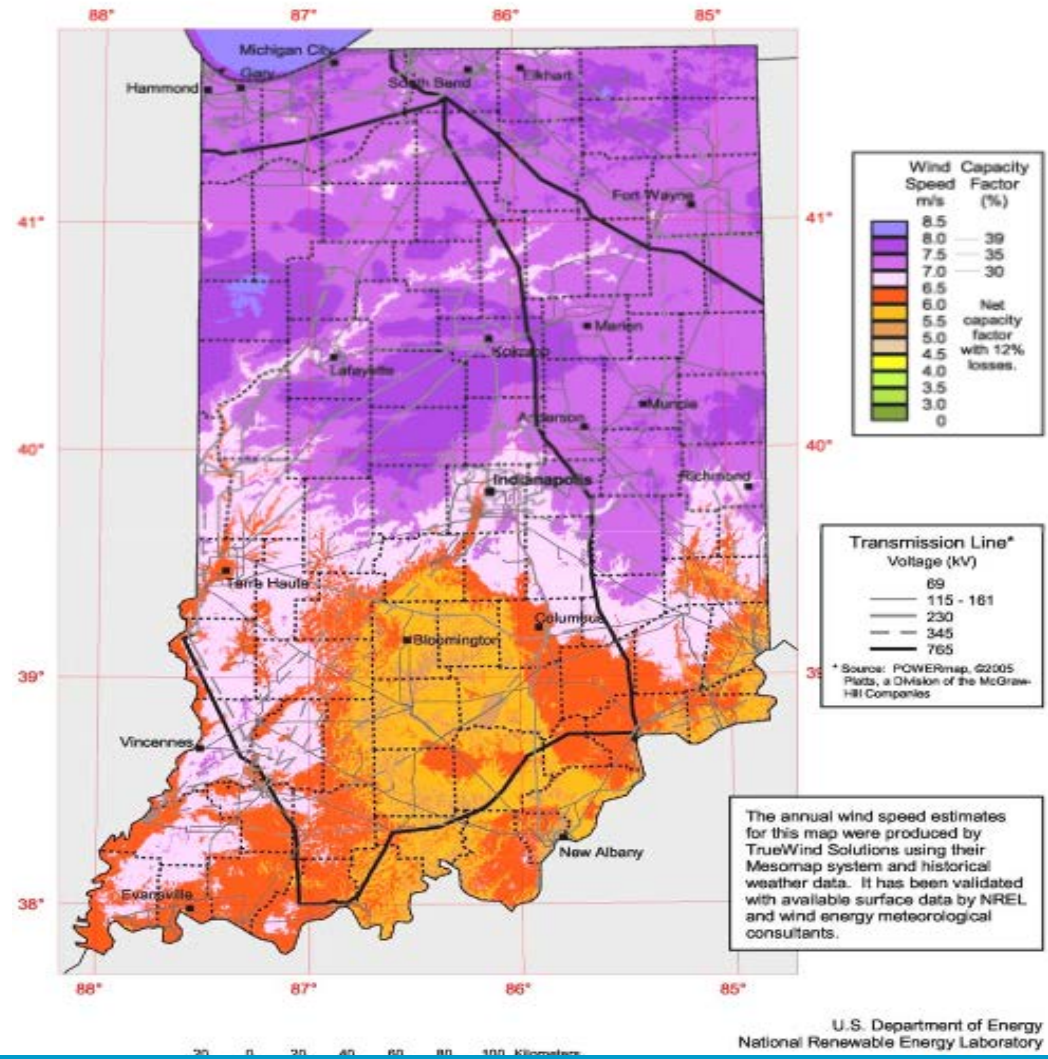
Indiana - 100 m Wind Speed

**Installed Wind Capacity:
1745 MW**

State Ranking: 13th

of Wind Projects: 14

**Wind as a Percentage of
In-State Energy
Production: 3%**



WIND – In 2030

NATIONALLY . . .

- Nationally – 20% by 2030
- Reduce cost of wind by 33% by 2030
- Increase transmission
- Increase Coordination and Supply of Flexible Resources
- Advanced Controls for Grid Integration of Wind

and in INDIANA

- Indiana -- ??% by 2030
- Indiana's wind capacity will grow through exter-Indiana policies:
 - Improvements in RTO policies
 - Demand for wind from states in PJM and MISO
 - Compliance with EPAs Clean Power Plan

Future Trends to Reach 2030 Targets

- Turbine improvements
- Reduce maintenance and minimize costs
 - Improving components and sub-systems
 - Increase service life
- Operate wind turbines at higher penetration levels
 - Increase transmission
 - Increase Coordination and Supply of Flexible Resources
 - Advanced Controls for Grid Integration of Wind

Increase Transmission

- To reach 20%/2030 or 35%/2050 Analysis by US Dept of Energy shows a need for supportive transmission policy such as
 - ERCOT has Comp Renewable Energy Zone (CREZ)
 - MISO has Multi Value Projects
 - PJM has State Agreements and Multi Driver Projects
- Improved transmission *between* RTOs
 - MISO and neighbors need to agree on economic and public policy standards
 - Increase use of HVDC lines: Grain Belt transmission line and Rock Island transmission line

Improving Flexible Resources

- Assess and Optimize existing conventional generation and purpose-built storage
- Increase amount of generation that has fast-start capability
- Increase amount of demand response and storage
- Expand ancillary services markets to include demand response and wind resources, or use performance-based rates
- Coordinate/forecasting wind with solar and hydro to complement natural gas ramping

Exter-Indiana Policies Driving Indiana Wind Growth

- PJM, MISO and states making previously discussed improvements
- State policies using competitive procurement or direct contracting with renewable generator
- RPS policies in PJM and MISO states
 - 7 of 14 states in MISO have RPS and 3 states have goals
 - 8 of 13 states in PJM have RPS + DC and 2 states have goals
- Compliance with EPA's Clean Power Plan
 - Purpose: between 2020 and 2030 states are to reduce CO2 emissions from electric generating plants to approximately 30% of 2005 CO2 levels
 - States can use wind energy to offset energy from Existing Generating Units that emit CO2

Thank you

Sean R. Brady
Regional Policy Manager
Wind on the Wires
sbrady@windonthewires.org

