

DEBORAH ERWIN  
PROGRAM AND PLANNING ANALYST

PUBLIC SERVICE COMMISSION  
OF WISCONSIN



# Harnessing Wisconsin's Energy Resources:

An Initial Investigation into Great Lakes Wind Development

Great Lakes Wind Collaborative  
2<sup>nd</sup> Annual Meeting

June 10, 2009

# Governor's Task Force on Global Warming



- Present viable, actionable policy recommendations to reduce greenhouse gas emissions in Wisconsin
- Advise regarding opportunities to address global warming locally while growing the state's economy
- Identify specific short and long term goals for reductions in greenhouse gas emissions in Wisconsin



# Governor's Task Force on Global Warming



## Recommendations driving the Wind on the Water Study:

- 1) The Public Service Commission of Wisconsin (PSC) and other state agencies complete a study of the feasibility of generating electricity from off-shore wind resources in the Great lakes by the end of 2008
  
- 2) Adopt legislation establishing an enhanced Renewable Portfolio Standard including:
  - Move current 2015 requirement up to 2013 (10%)
  - Impose new state total requirements of 20% by 2020 and 25% by 2025
  - Create an in-state requirement of 6% by 2020 and 10% by 2025



# Wind on the Water Study Group



## Commission Docket 5-EI-144

INVESTIGATION TO ASSESS WISCONSIN'S POTENTIAL FOR THE DEVELOPMENT OF WIND ENERGY RESOURCES IN LAKE MICHIGAN AND SUPERIOR

26 Members representing a wide variety of constituencies, including:

- Local governments
- Nonprofits
- Utilities
- State agencies
- Other stakeholders



# Wind on the Water Study Group



- Task was not to determine whether offshore wind is in the best interests of the state, rather to determine whether or not off-shore wind in the Great Lakes is possible
- Meetings were open to the public and documents were shared
- Materials are available on the PSC website at:

<http://psc.wi.gov>



# Off-shore v. Terrestrial Wind, Technical Aspects



## **Similarities:**

- Turbines are essentially the same technical design
- Transmission system aspects are basically the same
  - Would require both onshore and offshore transmission facilities
  - Underwater transmission lines already exist in the Great Lakes, and the PSC has permitting experience



# Off-shore v. Terrestrial Wind, Technical Aspects



## **Differences:**

- Foundations are more complex in design and installation
  - Specialized vessels such as jack-up barges and barge-mounted cranes
  - Most existing offshore projects are sited in water depths of 30 meters or less (“shallow water”)
  - Foundations may be even more complex for Great Lakes projects sited in deeper waters
    - ✦ Majority of water in Lakes Michigan and Superior is deeper than 30 meters (“deep water”)



# Off-shore v. Terrestrial Wind, Environmental Aspects



## **Similarities:**

- Birds and bats
- Threatened and endangered species
- Environmental assessment or environmental impact statement
- Construction requires a lay-down area
- Construction of transmission facilities is needed
- Historic and cultural sites
  - Including underwater sites – submerged buildings, shipwrecks
- Avoid interference with air traffic, electronic signal communication paths
- Hazardous substances, waste and air emissions



# Off-shore v. Terrestrial Wind, Environmental Aspects



## **Differences:**

- Fisheries and aquatic life
  - Commercial, tribal and recreational fishing should all be considered
- Shadow flicker and turbine noise will likely not be an issue for offshore wind projects
- Many types of sites to avoid
  - Navigation channels
  - Areas reserved for military purposes
  - Environmentally, historically and culturally sensitive or protected areas



# Economics



- Costs are very difficult to estimate; there was some disagreement with respect to estimations of construction costs for potential offshore wind projects
- Costs may be higher for wind projects in the Great Lakes than projects onshore in Wisconsin due to:
  - Expected higher construction costs
    - ✦ Specialized vessels & equipment
    - ✦ Potential delays due to weather conditions – wind, waves, lightning
  - Expected higher operations and maintenance costs
    - ✦ Specialized personnel and equipment
    - ✦ Insurance costs
    - ✦ Additional time and potential hazards involved in servicing offshore facilities



# Economics



- High costs may be mitigated for wind projects in the Great Lakes compared to onshore projects due to:
  - Economies of scale due to potentially larger projects – more and/or larger turbines
    - Fewer turbines to operate and maintain
    - Potential for more electricity production – size and wind resource
  - More consistent wind speeds may result in more efficient operation (higher capacity factor)



# Information Gaps/Unknowns



## **Technical:**

- Lack of consistent, reliable wind speed data for wind over the Great Lakes
- Deep water foundations are in demonstration and prototype phases
- Specialized vessels needed for construction are in high demand worldwide, and there are no such vessels currently operating in the Great Lakes



# Information Gaps/Unknowns



## **Technical:**

- Existing off-shore projects are located in saltwater, not freshwater
- Ice is a concern for Great Lakes sites, however, current technology can deal with the potential effects of moving ice (ice floes) and ice formation
  - Ice cones and ice collars break up floating ice at the point of contact
  - Special coatings can be used to prevent buildup of ice
  - Offshore transmission substations may be needed



# Information Gaps/Unknowns



## **Technical:**

- Substantial transmission upgrades are likely for large scale off-shore wind projects in the Great Lakes
- Transmission lines needed for a large offshore wind project would likely also have benefits for the larger transmission system
  - Regional transmission planning efforts will need to be considered



# Information Gaps/Unknowns



## **Environmental:**

- Many potential concerns have been identified, but actual impacts are unknown
- Need to perform additional research, studies
- Decommissioning is something of an unknown – no offshore project has yet been decommissioned

## **Costs:**

- How accurate are cost estimates?
- What can we extrapolate from existing projects, and what will not translate?



# Information Gaps/Unknowns



## **Legal:**

- Complicated state and federal review process
  - Many approvals needed, multiple state and federal agencies involved
  - Tribal rights and interests
- Unclear whether existing regulatory authority is sufficient to authorize the placement of infrastructure on the lakebed
- PSC may not have the authority to review and approve an offshore project smaller than 100 MW that is not proposed by a utility
- Some statutory changes may be beneficial or desirable
- Federal authority exists to enact additional legislation that could affect Great Lakes wind development



# Wind on the Water Final Report



- Final Report presented to the PSC January 15, 2009
- Commission adopted the report, noting:
  - Lack of wind data needs to be addressed
  - R & D regarding foundations should be pursued
  - Generic EIS may mitigate risk to developers
  - Statutory changes are desirable
  - Federal agency coordination is needed
  - Transmission planning should recognize possibility of Great Lakes wind



# For More Information:



- Find all documents regarding the Wind on the Water Study on the PSC website: **psc.wi.gov**
- Electronic Regulatory Filing System (ERF): Docket # 5-EI-144

## Search ERF

Electronic records are available for inspection and copying through this website. If you are unable to find the document you want, or need copies made, or have other questions, please contact the [PSC Records Management Unit](#) by e-mail at [pscsecs@psc.state.wi.us](mailto:pscsecs@psc.state.wi.us) or by phone at (608) 261-8524

All Orders and Notices issued on or after January 1, 1998, and most new dockets started after January 1, 2004 are included in this search. Descriptions of all confidential filings are also included, although the documents themselves are not available to the public.

[Search Tips](#)

[View Documents filed in the last 2 days](#)

PSC REF#

## Detailed Search (Specify one or more search criteria)

Utility/Docket:	<input type="text"/> <input type="text"/> <input type="text"/> <a href="#">Don't know the utility ID?</a>
Keyword / Phrase	<input type="text"/> This option does not work on some scanned documents.
Document Type	-- Select Document Type --
Industry Type	<input type="text"/>
Date Range (mm/dd/yyyy)	<input type="text"/> <input type="text"/>
<input type="button" value="GO"/> <input type="button" value="Clear Search Criteria"/>	



# Additional Resources:



**Find the Governor's Task Force on Global Warming  
Final Report at:**

[http://dnr.wi.gov/environmentprotect/gtfgw/documents/Final\\_Report.pdf](http://dnr.wi.gov/environmentprotect/gtfgw/documents/Final_Report.pdf)

**Find the Final Report to the Commission at:**

<http://psc.wi.gov/globalwarming/05EI144/documents/WOWreport11509.pdf>

**Deborah Erwin, Program & Planning Analyst**  
[Deborah.Erwin@psc.state.wi.us](mailto:Deborah.Erwin@psc.state.wi.us)

