

**DAN SAGE**

ASSISTANT ADMINISTRATOR

**DEBORAH ERWIN**

PROGRAM AND PLANNING ANALYST

**PUBLIC SERVICE COMMISSION  
OF WISCONSIN**



# Wind on the Water

Presentation to  
**Great Lakes Wind Energy Institute**

January 30, 2009

# Public Service Commission of Wisconsin



The Public Service Commission (PSC) is an independent state agency that oversees more than 1,100 Wisconsin public utilities that provide electricity, heat, water and telecommunication services.



**Chairperson  
Eric Callisto**



**Commissioner  
Mark Meyer**



**Commissioner  
Lauren Azar**

# Governor's Task Force on Global Warming



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



# Governor's Task Force on Global Warming



## RECOMMENDATION:

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



# Governor's Task Force on Global Warming



## RECOMMENDATION:

Adopt legislation establishing an enhanced Renewable Portfolio Standard including:

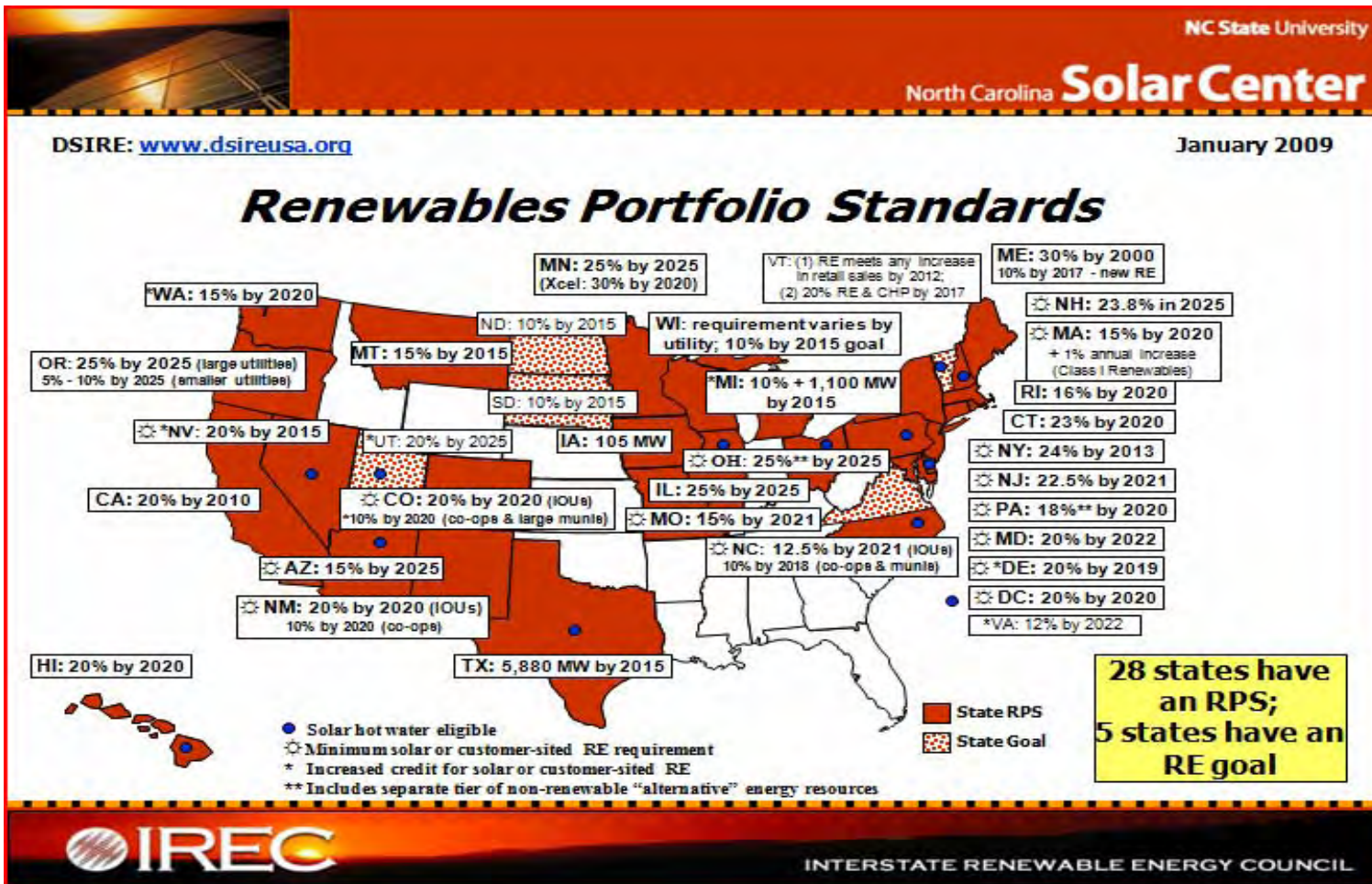
Move current 2015 requirement up to 2013 (10%)

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



# States with Renewable Portfolio Standards





# Commission Docket 5-EI-144



## Investigation to Assess Wisconsin's Potential for the Development of Wind Energy Resources in Lake Michigan and Superior



# Wind on the Water Study Group



**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>



# Wind on the Water Work Groups



**The Wind on the Water Study Group formed four Work Groups to conduct the investigation:**

- ❖ Engineering and Economics
- ❖ Human Environment
- ❖ Legal Considerations
- ❖ Community Involvement



# Wind on the Water Work Groups



## Work Group Membership consisted of:

- ❖ Members of Study Group
- ❖ Subject area experts from Study Group member organizations
- ❖ Interested public, including:
  - ❖ Municipalities
  - ❖ Environmental organizations
  - ❖ Wind advocates
  - ❖ Tribal organizations
  - ❖ Affected industries



# Engineering and Economics Work Group



- Foundations

- Turbines

- Construction

Equipment and Techniques

- Transmission

- Physical Conditions of

Building on the Great Lakes

- Costs and Financing



# Human Environment Work Group



- Birds and Bats
- Fisheries and Aquatic Resources
- Human Welfare and Health
- Cultural and Traditional Resources
- Boating
- Communications



# Legal Considerations Work Group



- State Laws
- Federal Laws
- Tribal Laws and Consultation
- PSCW and Other State Agency Jurisdiction
- Local Units of Government

**Table 6.1: Generation Facilities 100 MW or Larger<sup>138</sup>**

Regulatory Requirement	Primary Agency	Project Proponent		
		Non-Utility Local Government	Private Non-Utility	Public Utility
Approval of electric generation facilities	PSCW	Wis. Stat. § 196.491	Wis. Stat. § 196.491	Wis. Stat. § 196.491
Approval for placement of lakebed structures (non-transmission)	WDNR	Wis. Stats. §§ 30.025 and 30.12, 13.097, or 24.39	Wis. Stats. §§ 30.025 and 30.12	Wis. Stats. §§ 30.025 and 30.21 or 30.12
Approval for placement of underwater transmission lines	WDNR and PSCW	NA	NA	Wis. Stats. §§ 30.025, 182.017 and 196.491
Clean Water Act Section 404 permit	USACE	Yes	Yes	Yes
Rivers and Harbors Act Section 10 permit	USACE	Yes	Yes	Yes
WEPA review	PSCW	Wis. Admin. Code § PSC 4.30 (EIS)	Wis. Admin. Code § PSC 4.30 (EIS)	Wis. Admin. Code § PSC 4.30 (EIS)
NEPA review	USACE	EIS or EA	EIS or EA	EIS or EA
CZMA consistency	WCMP	Yes	Yes	Yes



# Community Involvement Work Group



- Outreach Effort
- Lessons Learned from Previous Efforts/Proposed Projects
- Sample Community Involvement Plan





# 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



# Visual Impacts of Off-Shore Turbines



Photo courtesy of P.S.E.G.





# ECONOMI CS

Costs are very difficult to estimate

There was some disagreement with respect to estimations of construction costs for potential offshore wind projects



Source: Blue H Group



# Economics



- 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)



# Financing Options



- Cost-sharing or grants
- Tax or credit-based incentives
- Favorable regulatory treatment
  - Benefits of a particular incentive will depend on the type of electricity provider developing or owning an offshore project
  - Most offshore European projects have utilized cost-sharing and grants
  - Currently, there are no state or federal cost-sharing or grants for offshore wind



# 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



# Illustration of a Jack-up Barge



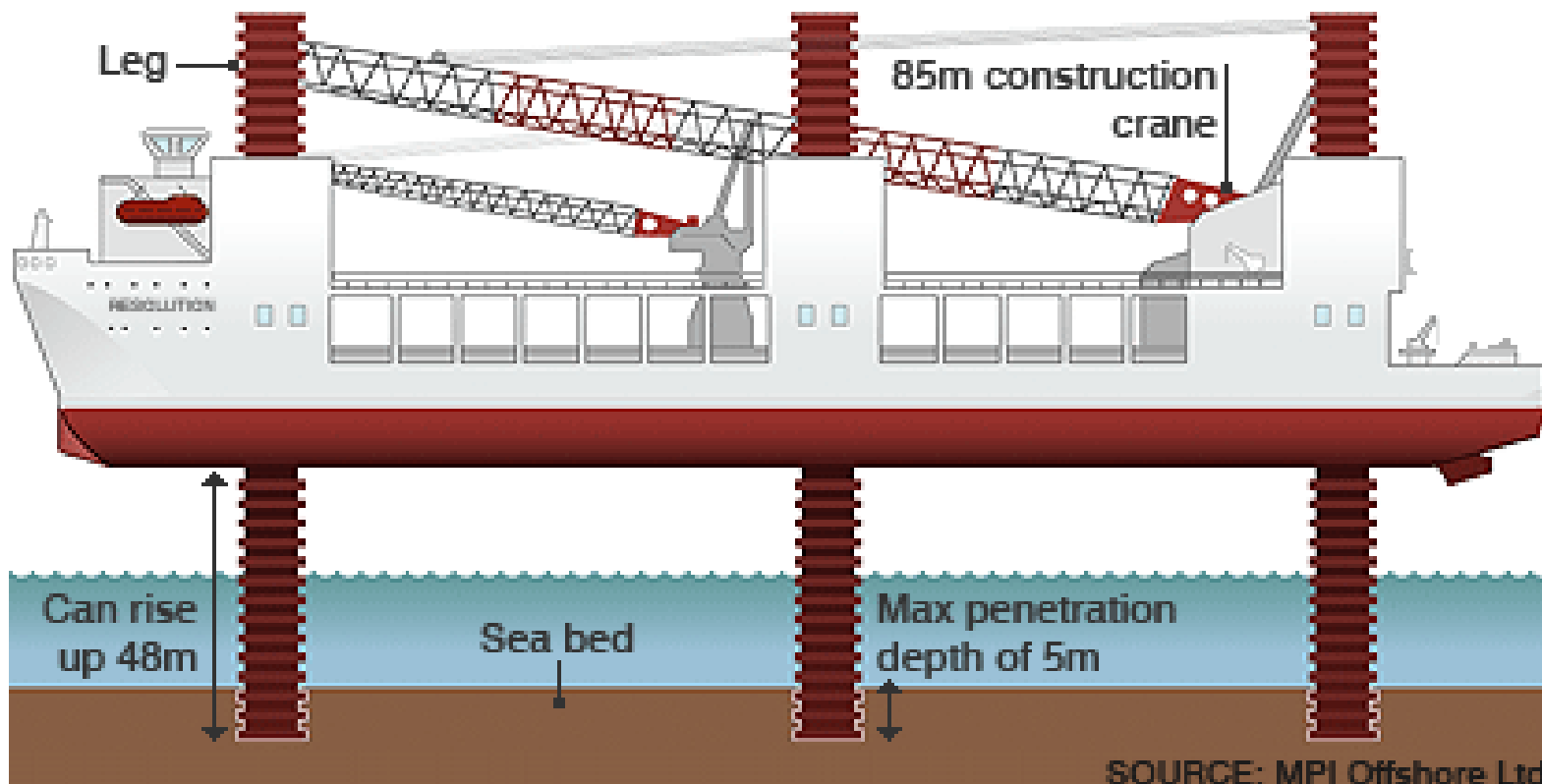
## RESOLUTION: WIND TURBINE INSTALLATION BARGE

Width: 38m

Vessel legs: 6

Gross weight: 14,085 tonnes

← Length: 130m →



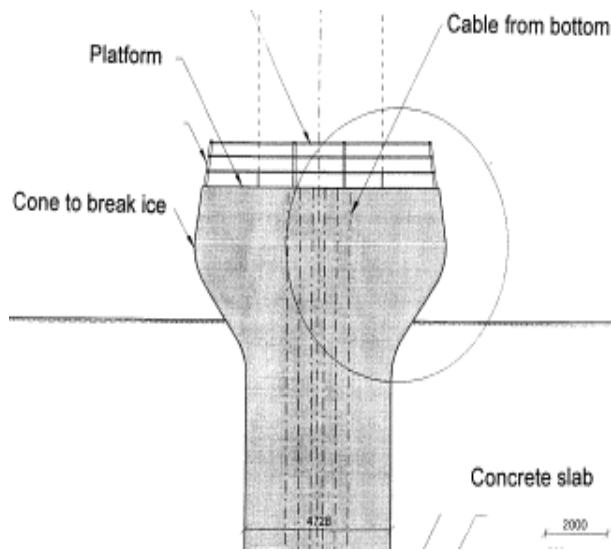
SOURCE: MPI Offshore Ltd

# 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
- PSCW 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 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 [pscrcs@psc.state.wi.us](mailto:pscrcs@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.

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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/05El144/documents/WOWreport11509.pdf>





# Questions?



Dan Sage, Assistant Administrator

[Dan.Sage@psc.state.wi.us](mailto:Dan.Sage@psc.state.wi.us)

Deborah Erwin, Program & Planning Analyst

[Deborah.Erwin@psc.state.wi.us](mailto:Deborah.Erwin@psc.state.wi.us)

