

JW Great Lakes Wind



AEE NORTHERN OHIO CHAPTER
November 13, 2008

Dale Veres, juwi US Wind Corp

AEE NORTHERN OHIO CHAPTER

Meeting Outline

- Company Background
- Wind Energy Basics / Wind Development Process
- US Trends
- Wind Energy Outlook
- GLWEC Feasibility Study
- Wind Issues And Opportunities
- Q&A Open Forum





AEE NORTHERN OHIO CHAPTER

Presenter Background

Professional Experience:

- Professional experience of 28 years.
- Primarily energy, including renewable wind energy.

Background Expertise:

- Strategic Planning
- Strategic Ventures / M&A
- Financial Analysis / Modeling
- Change Management
- Business Intelligence
- Benchmarking

Education:

- Washington & Jefferson
BA – Economics
- University Of Pittsburgh
MBA – Finance

11/13/08



AEE NORTHERN OHIO CHAPTER

Helpful Wind-Related Web Sites

ORGANIZATION	WEB LINK
American Wind Energy Association	http://www.awea.org/
A Listing Of State And Local Sites	http://www.eere.energy.gov/RE/wind-state.html
Your Region And State Wind Energy Potential	http://www.nrel.gov/wind/
Database Of State Incentives For Renewable Energy	http://www.dsireusa.org/
US State Energy Profile	http://www.eia.doe.gov/emeu/states/_states.html
National Renewable Energy Laboratory	http://rredc.nrel.gov/wind/pubs/atlas
National Climatic Data Center	http://www.ncdc.noaa.gov
British Wind Energy Association	http://www.bwea.com/
Danish Wind Industry Association	http://www.windpower.dk/
European Wind Energy Association	http://www.ewea.org
Green Energy Ohio	http://www.greenenergyohio.org
Ohio Wind Working Group	http://www.ohiowind.org

Source: American Wind Energy Association, February 2008.

11/13/08

4

AEE Northern Ohio Chapter

Company Background



AEE NORTHERN OHIO CHAPTER Company Background – juwi International

- German-based renewable energy firm established 1996.
- Co-founders / Co-owners: Fred Jung and Matthias Willenbacher.
- Launched first wind power project in Germany in 1996.
- Currently operates more than 450 MW of wind farms.
- Currently has over 700 solar installations.
- Grown steadily – international operations in 14 countries.
- Annual revenues of more than USD 600 million.

AEE NORTHERN OHIO CHAPTER

Company Background – Wind Portfolio



❖ **Approximately 52**
LOCATIONS WORLDWIDE

❖ **Roughly 300**
WIND TURBINES

❖ **Over 450 MW**
MW INSTALLED

AEE NORTHERN OHIO CHAPTER

World's Largest Photovoltaic Plant

Near Leipzig in Eastern Germany

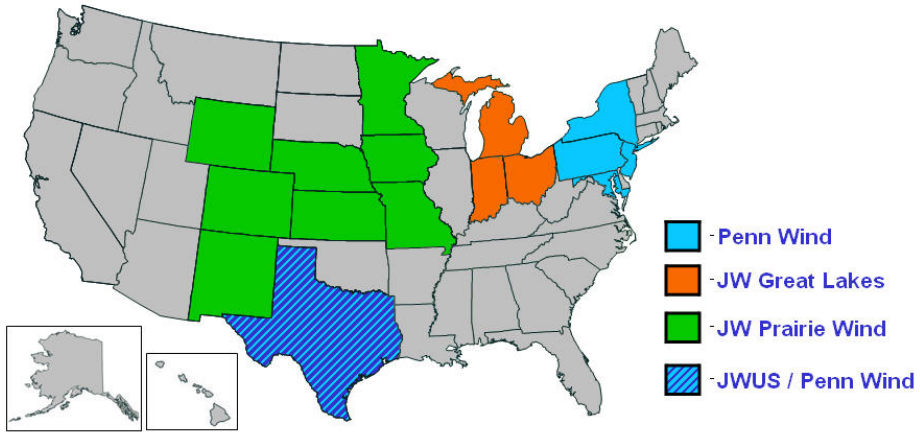
Building permit obtained on January 2007

Surface Area: About 200 Soccer Fields!



Brandis – Former Military Airfield – 40 MW

AEE NORTHERN OHIO CHAPTER
juwi US Operational Footprint



9/1/13/08

9

AEE Northern Ohio Chapter
Wind Energy Background



11/13/08

10

AEE NORTHERN OHIO CHAPTER

Basics Of Wind Energy

- Wind energy is, in reality, a converted form of solar energy.
 - Sun's radiation heats different parts of the earth at different rates, most notably during the day and night
 - Different surfaces (e.g. water and land) absorb or reflect at different rates.
 - In turn portions of the atmosphere warm differently.
 - Hot air rises, reducing the atmospheric pressure at the earth's surface, and cooler air is drawn in to replace it.

✓The result is wind.

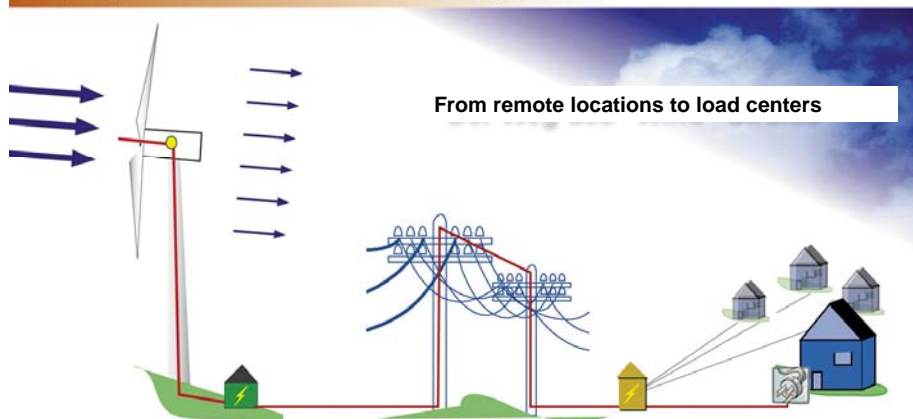
AEE NORTHERN OHIO CHAPTER

Basics Of Wind Energy

Rotor blades of wind turbine convert kinetic energy of the wind into rotation energy. The generator converts the rotational energy into electrical power.

Wind turbine is connected to the transmission grid. Power flows via transmission or distribution lines to load centers.

One 1.5 MW turbine is able to produce as much power as 400 households need over one year.



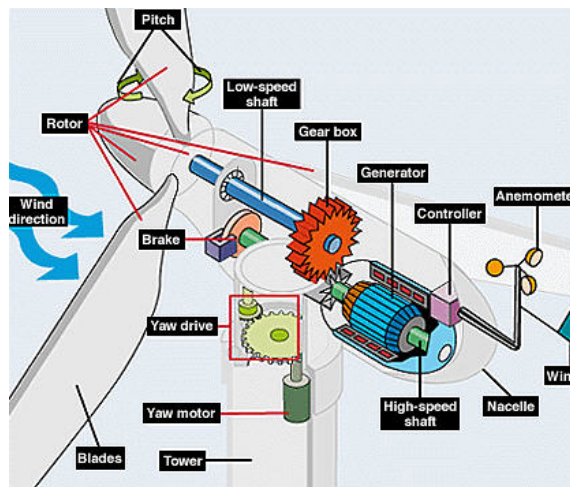
AEE NORTHERN OHIO CHAPTER

Basics Of Wind Energy – Power

- Power = Density Of Air x Swept Area x Velocity Cubed.
- Formula is $P = \frac{1}{2} \cdot \rho \cdot A \cdot V^3$
 - P is power in watts (W)
 - ρ is the air density in kilograms per cubic meter (kg/m^3).
 - A is the swept rotor area in square meters (m^2).
 - V is wind speed in meters per second (m/s).
- Wind turbines rated in kilowatts (kW) or megawatts (MW).
 - 1 kilowatt = 1,000 watts.
 - 1 megawatt = 1,000 kilowatts.

AEE NORTHERN OHIO CHAPTER

Wind Turbine Design

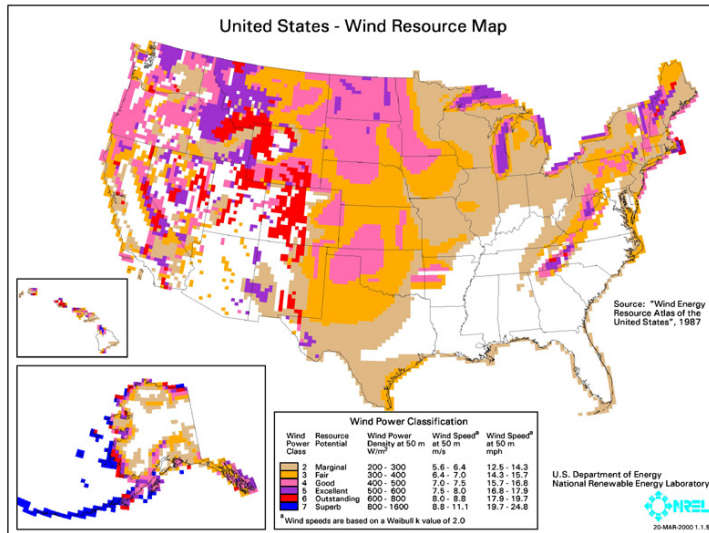


SOURCE: American Wind Energy Association

- Turbine Subsystems:
 - Rotor or blades – convert the wind's energy into rotational shaft energy.
 - Nacelle (enclosure) containing the drive train – usually includes a gearbox and generator.
 - Tower to support the rotor and drive train.
 - Electronic equipment – controls, electric cables, support equipment, and interconnect equipment.

AEE NORTHERN OHIO CHAPTER

US Wind Resource Map

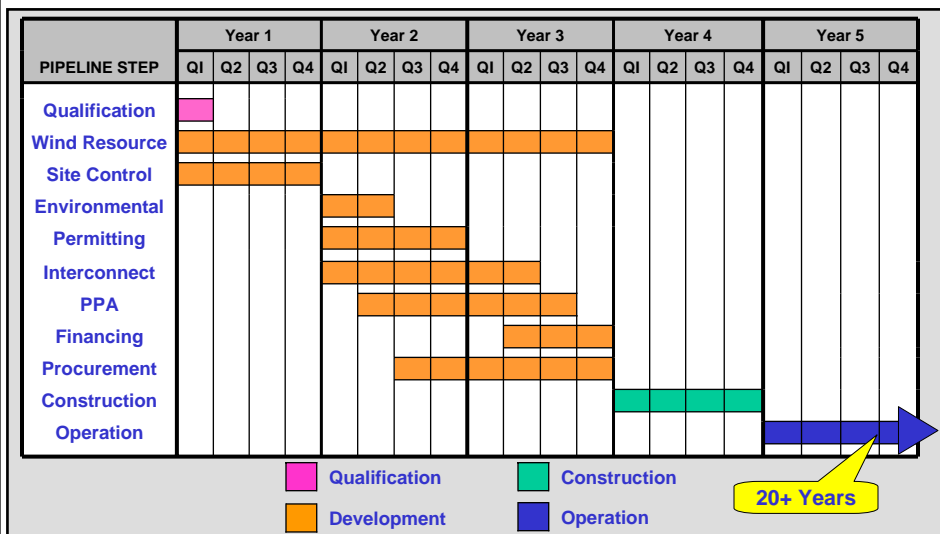


11/13/08

15

AEE NORTHERN OHIO CHAPTER

Wind Energy Project – Timeline



11/13/08

AEE NORTHERN OHIO CHAPTER

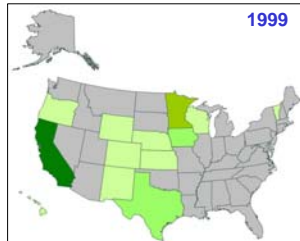
Key Elements Of A Wind Energy Project

- Important factors impacting cost and the viability of wind farms are:
 - Size and siting of the wind farm.
 - Wind speed at the site.
 - Pre-construction costs, such as access road construction.
 - Construction cost, such as cost of installing the turbines.
 - Transmission interconnection cost.

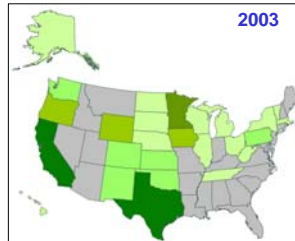
AEE Northern Ohio Chapter

Overview Of US Trends

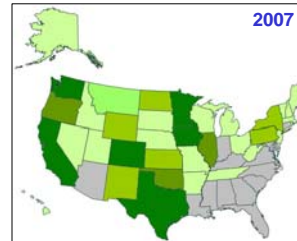
AEE NORTHERN OHIO CHAPTER US Year-End Installed Wind Capacity



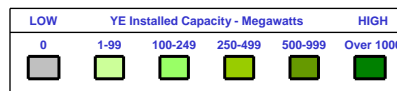
- ✓ 2,500 MW installed
- ✓ 14 states with installations
- ✓ California alone is 66 percent of total capacity



- ✓ 6,374 MW installed
- ✓ 26 states with installations
- ✓ California and Texas are number 1-2 respectively



- ✓ 16,819 MW installed.
- ✓ 36 states with installations
- ✓ Texas top state; 6 states with over 1000 MW installed

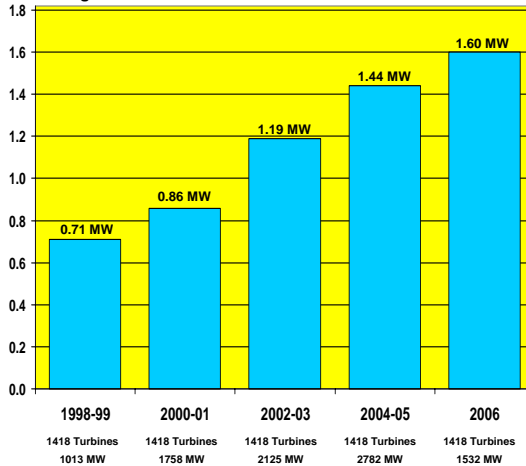


11/13/08

19

AEE NORTHERN OHIO CHAPTER Size Distribution For US Turbines Over Time

US Average Turbine Size – MW



KEY FINDINGS

- Average turbine size continues to increase.
 - In 1998-99 timeframe over 99 percent of turbines under 1 MW.
 - In 2006, roughly 89 percent of turbines over 1 MW.
 - In 2006, about 17 percent of turbines over 2 MW.

11/13/08

SOURCE: DOE Annual Report On US Wind Power Installation, Cost, and Performance Trends: 2006 – Released May 2007

20

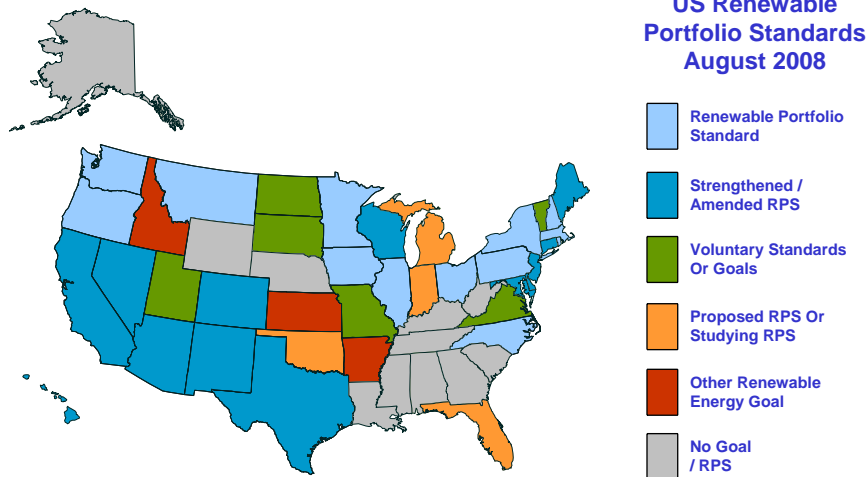
AEE NORTHERN OHIO CHAPTER

US Regulation Favorable To Wind

- The US is showing growing support for renewable energy through favorable policies such as:
 - Renewable Portfolio Standards (RPS).
 - Tariffs favorable to renewable powered electricity.
 - Tax incentives.
 - Investment grants.
 - Carbon credit mechanisms.

AEE NORTHERN OHIO CHAPTER

US Renewable Portfolio Standards



AEE NORTHERN OHIO CHAPTER

US Renewable Portfolio Standards – 2007 Review

- Renewable Portfolio Standard requires a percent of energy sales or installed capacity to come from renewable resources.
 - 26 states and DC have a RPS.
 - Five passed a RPS in 2007: Illinois, Minnesota, New Hampshire, North Carolina, Oregon.
 - Eight amended an RPS: Colorado, Connecticut, Delaware, Maine, Maryland, Massachusetts, New Mexico, Texas.
 - Indiana, Michigan, and Ohio proposed RPS legislation in 2007. Florida and Oklahoma actively studying a RPS.

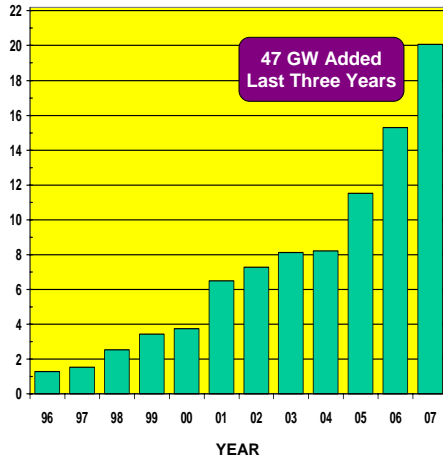
AEE NORTHERN OHIO CHAPTER

Overview Of Federal Production Tax Credit

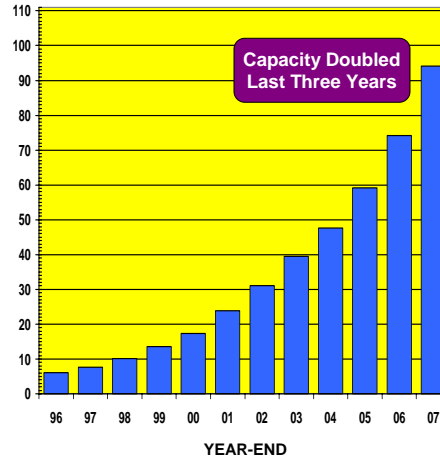
- Federal Production Tax Credit:
 - Per kilowatt-hour production tax credit for wind energy.
 - Included in Energy Policy Act of 1992.
 - Applies to first 10 years of wind plant's operation.
 - Began at 1.5 cents per kWh and escalates yearly.
 - 2008 credit slightly over 2.0 cents per kWh.
 - PTC presently scheduled to expire December 31, 2009.

AEE NORTHERN OHIO CHAPTER Global Installed Wind Energy Capacity

ANNUAL INSTALLED CAPACITY – GW



YEAR-END INSTALLED CAPACITY – GW

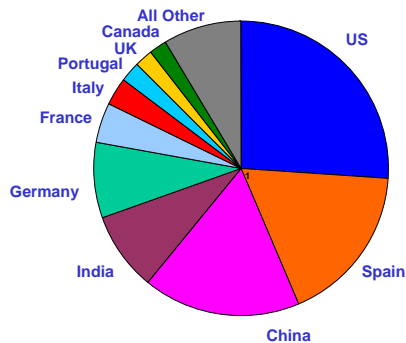


GLOBAL LOOK

11/13/08

25

AEE NORTHERN OHIO CHAPTER Global Installed Wind Energy Capacity – Annual 2007



Rank	State	MW	Percent
1.	United States	5,244	26.1
2.	Spain	3,522	17.5
3.	China	3,449	17.2
4.	India	1,730	8.6
5.	Germany	1,667	8.3
6.	France	888	4.4
7.	Italy	603	3.0
8.	Portugal	434	2.2
9.	United Kingdom	427	2.1
10.	Canada	386	1.9
	All Other	1,723	8.6
	Total	20,073	100.0

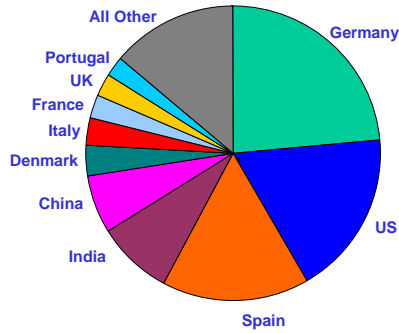
Source: Global Wind Energy Council, February 6, 2008.

11/13/08

26

AEE NORTHERN OHIO CHAPTER

Global Installed Wind Energy Capacity – 2007 YE



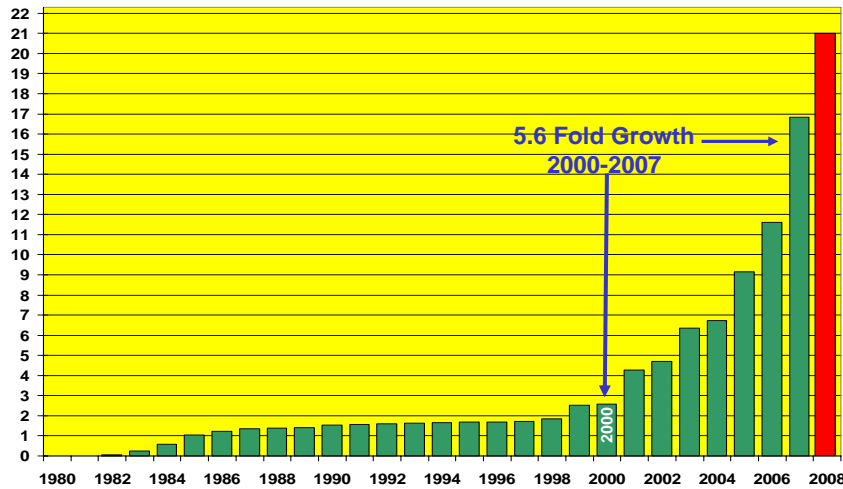
Rank	State	MW	Percent
1.	Germany	22,247	23.6
2.	United States	16,818	17.9
3.	Spain	15,145	16.1
4.	India	8,000	8.5
5.	China	6,050	6.4
6.	Denmark	3,125	3.3
7.	Italy	2,726	2.9
8.	France	2,454	2.6
9.	United Kingdom	2,389	2.5
10.	Portugal	2,150	2.3
	All Other	13,008	13.8
	Total	94,112	100.0

Source: Global Wind Energy Council, February 6, 2008.

AEE NORTHERN OHIO CHAPTER

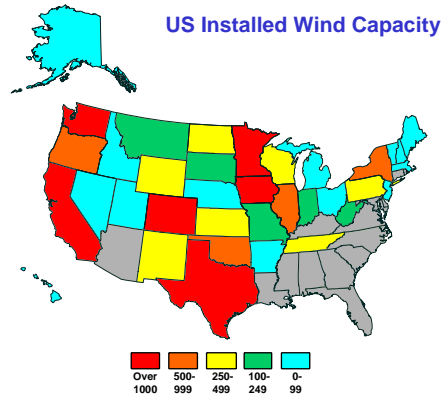
US Wind Projects – Actual To Date Installations

US INSTALLED WIND GENERATION CAPACITY – GW

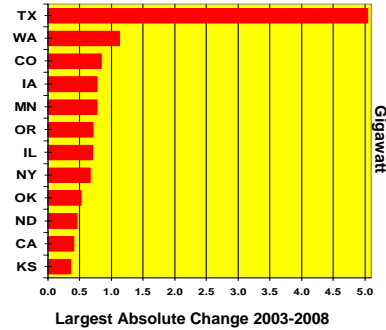


AEE NORTHERN OHIO CHAPTER

US Wind Energy – Current Status 2008



- 2008 Q3 installed capacity totals 21,017 MW.
- Total of 4,199 MW has come online in 2008 YTD – 25 percent increase since 2007 YE.
- 35 of 50 states have at least some installed wind energy as of 2008 Q3.



- Total added capacity totals 14.3 GW over the 2003-08 timeframe.
- 2008 Q3 installed capacity was 3.3-times the installed capacity at 2003 YE.

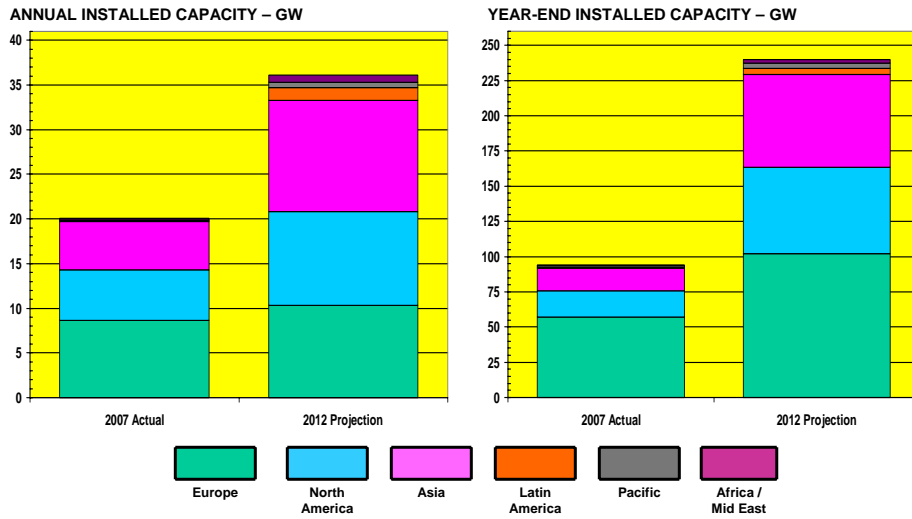
AEE NORTHERN OHIO CHAPTER

Present Outlook For US Wind Projects

- Presently 8,584 MW of capacity under construction.
 - Texas leads with 2,470 MW under construction.
 - Iowa has 1,480 MW under construction, more than double what is online at 2007 YE.

AEE NORTHERN OHIO CHAPTER

Future Outlook For Global Wind – GWEC



AEE Northern Ohio Chapter

Great Lakes Offshore Wind Feasibility Project

AEE NORTHERN OHIO CHAPTER

Status Of Offshore Wind Energy

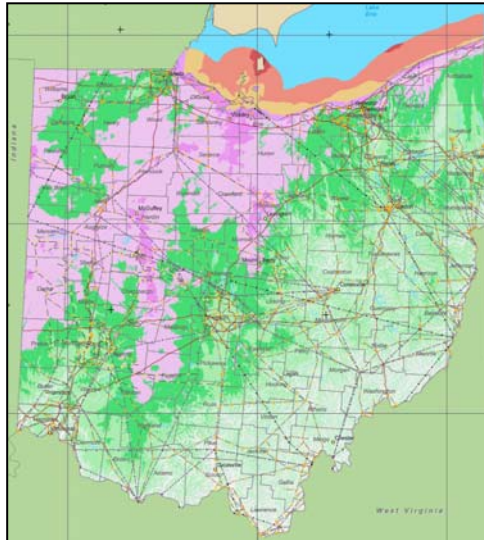
- Offshore Wind Energy Projects:
 - 25 projects in 5 European countries, totaling 1,100 MW.
 - No projects built in the US, but several planned: Cape Wind, Delaware, New Jersey, New York, Rhode Island
 - Ontario, Wisconsin, Michigan, Ohio exploring possible projects in Great Lakes

AEE NORTHERN OHIO CHAPTER

GLWEC – Scope Of Feasibility Study

- Work began in March 2008.
 - Evaluate the technical, regulatory, economic, environmental feasibility of the Great Lake Wind Energy Center.
 - Pilot wind energy project.
 - Plan: 2-10 turbines, 5-20 MW.
 - Test Center.
 - Certification Center.
 - Applied Research and Development Center.
- ✓ **Final Report to be issued April 2009.**

AEE NORTHERN OHIO CHAPTER
Ohio Wind Map



- Best wind resource offshore

Mean Speed at 100 m			
mph	m/s		
< 12.3	< 5.5	15.7 - 16.8	7.0 - 7.5
12.3 - 13.4	5.5 - 6.0	16.8 - 17.9	7.5 - 8.0
13.4 - 14.5	6.0 - 6.5	17.9 - 19.0	8.0 - 8.5
14.5 - 15.7	6.5 - 7.0	19.0 - 20.1	8.5 - 9.0
		20.1 - 21.3	9.0 - 9.5
		> 21.3	> 9.5

Map Source: AWS Truewind

11/13/08

AEE NORTHERN OHIO CHAPTER
Offshore Feasibility Study - Deliverables

- Wind Resource Report
- Icing, Wind, Waves Desktop Study
- Geological Desktop Study
- Initial Ecological Assessment
- Market Research / Demand
- Preliminary Site Review
- Photo-simulations
- Conceptual Design
- Interconnection /Cabling Design
- Economic Assessment
- Legal and Finance Structure
- Avian Risk Assessment
- Regulatory Framework
- Final Feasibility Report

11/13/08

36

AEE NORTHERN OHIO CHAPTER

GLWEC – Project Team

▪ Team:

- Black & Veatch – Electrical Engineering, Interconnection.
- Brown Flynn – Communications And Outreach.
- Curry and Kerlinger – Avian Analysis.
- DLZ Ohio, Inc. – Engineering.
- Econnect – Offshore Cabling.
- Germanischer Lloyd – R&D, Engineering.
- JW Great Lakes – Project Lead / Project Manager.

AEE NORTHERN OHIO CHAPTER

GLWEC – Project Status

- Comprehensive data collection and evaluation.
- Three reports final and public:
 - Wind Resource Assessment.
 - Initial Ecological Assessment.
 - Geological Desktop Study.

AEE NORTHERN OHIO CHAPTER

GLWEC – Current Study Findings

- Two year average wind speed 7.35 meters/second (16.5 mph) at 50 meters (166 feet).
- Excellent wind resource compared to Ohio onshore sites.
- At this time, no ecological “red flags” that would limit construction.
- Impacts to marine life likely minimal and temporary, sub-surface structures may provide marine habitat long-term.
- Lakebed consists of sand, muddy sand, glacial deposits.
- Geotechnical borings required for design – monopile foundation a likely candidate.

AEE NORTHERN OHIO CHAPTER

Opportunity For Region

- Become leader in offshore wind energy development in the Great Lakes.
- Become a “hub” for offshore wind in the US.
- Capitalize on / enhance Ohio’s existing manufacturing base.
- Job creation.
- Research and development.
- Improved local air quality.
- Stabilized energy costs on a 20-year basis.

AEE Northern Ohio Chapter

Wind Opportunities And Issues

AEE NORTHERN OHIO CHAPTER

Wind Energy Outlook – Value Proposition

- Economic Value Of Wind Energy Today:
 - Environmentally friendly – non-polluting energy.
 - Free fuel – price stability compared to competing fuels.
 - US has good wind resource areas – relatively untapped.
 - Distributed form of electrical generation.
 - Lessens dependency on foreign oil and other forms of energy.
 - Creation of new jobs.

AEE NORTHERN OHIO CHAPTER

Wind Energy – Challenges

- Wind generation is intermittent in nature.
- Supply chain bottlenecks of wind turbine manufacturers.
- Growing political support, but varies state-to-state.
- Risk of withdrawal of incentives / increased government regulatory pressures.
- Credit crunch may lead to reduced sector investment.
- Wind must ultimately compete with other energy sources on an economic basis.

AEE NORTHERN OHIO CHAPTER

Energy Demand Structural Shift

- Energy demand has witnessed a structural shift towards renewable energy due to certain key factors such as:
 - Fuel prices volatility.
 - Increasing concerns around environmental impact.
 - Energy security.
- ✓ Wind energy – while unlikely to be the dominant source of electricity – is well positioned for solid long term growth.

AEE Northern Ohio Chapter



AEE NORTHERN OHIO CHAPTER

Contact Information



Dale E. Veres

juwi US Wind Corp.

1900 Superior Avenue – Suite 333

Cleveland Ohio 44114

Phone: 216-344-9305

Mobile: 216-659-7574

Email: veres@juwi-international.com