

A Vision for a North American Wind Energy Academy

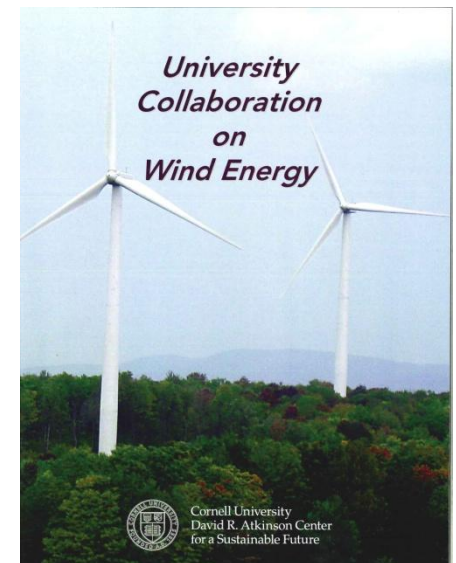
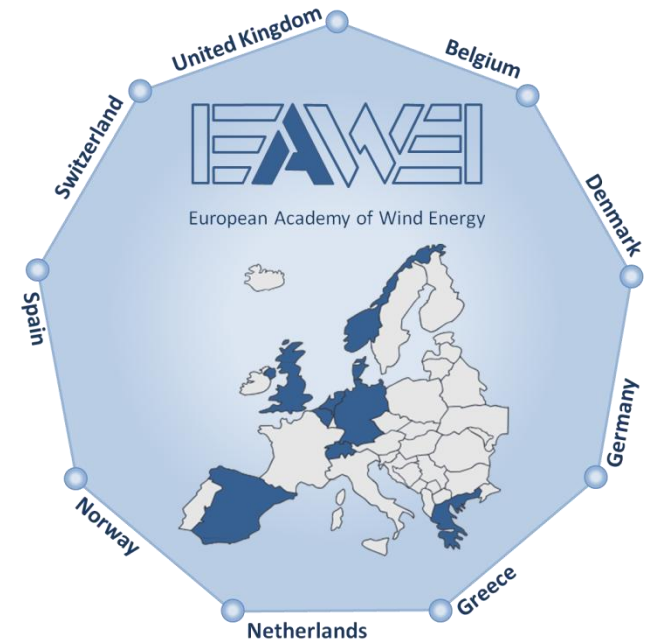
Paul Veers, Chief Engineer

**Robert Thresher, Research Fellow
National Wind Technology Center**

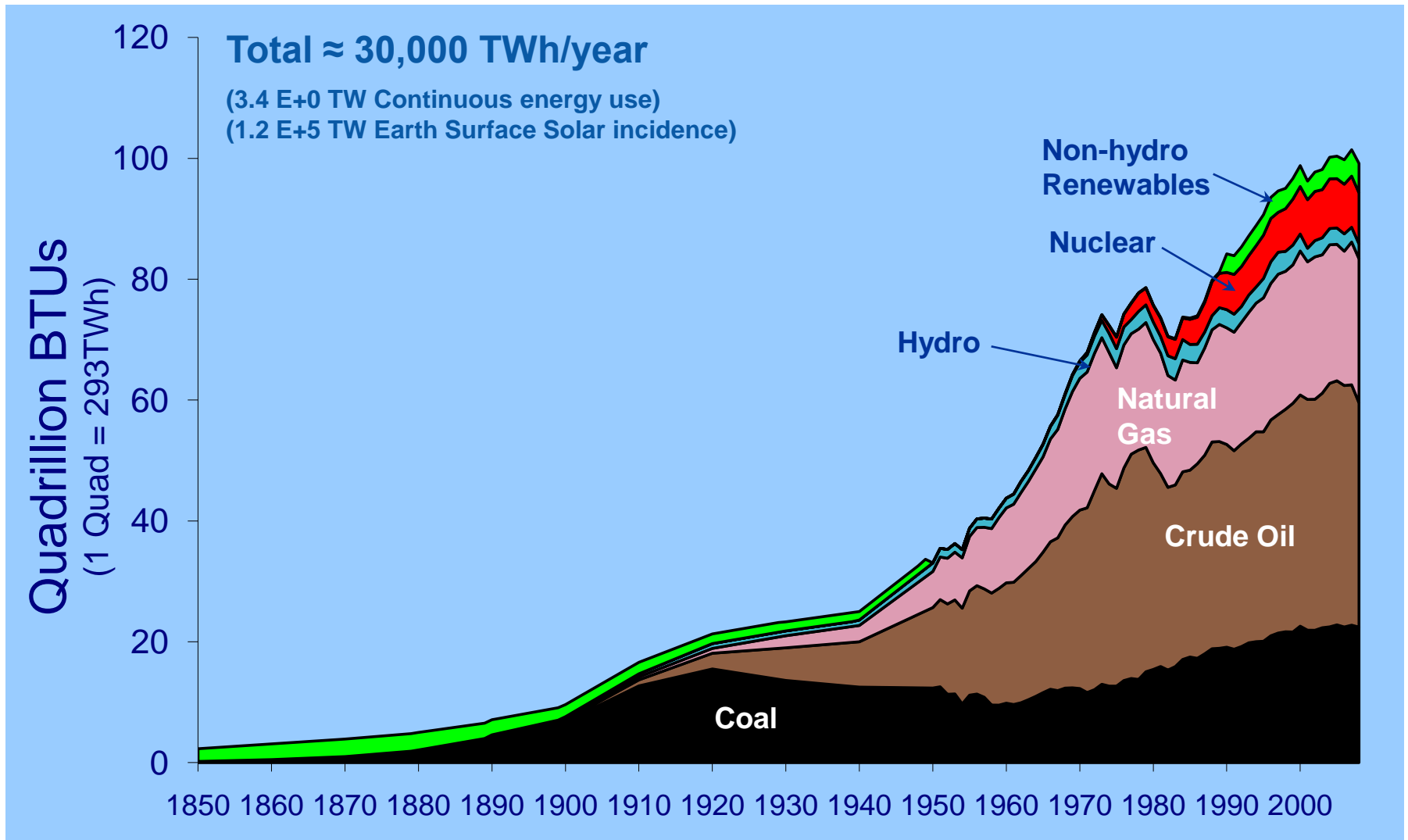


NAWEA is a broadly based initiative

- Inspired by the European Academy of Wind Energy (EAWWE)
- It is National (International?) – and NOT Regional
- An aggregation of initiatives from several US sources:
 - University of Massachusetts (with funds from DOE)
 - Cornell University
 - ASME Wind Energy TC
- RASEI and NREL are acting as facilitators
- The concept is far from fully defined



The U.S. Energy Picture 1850-2008

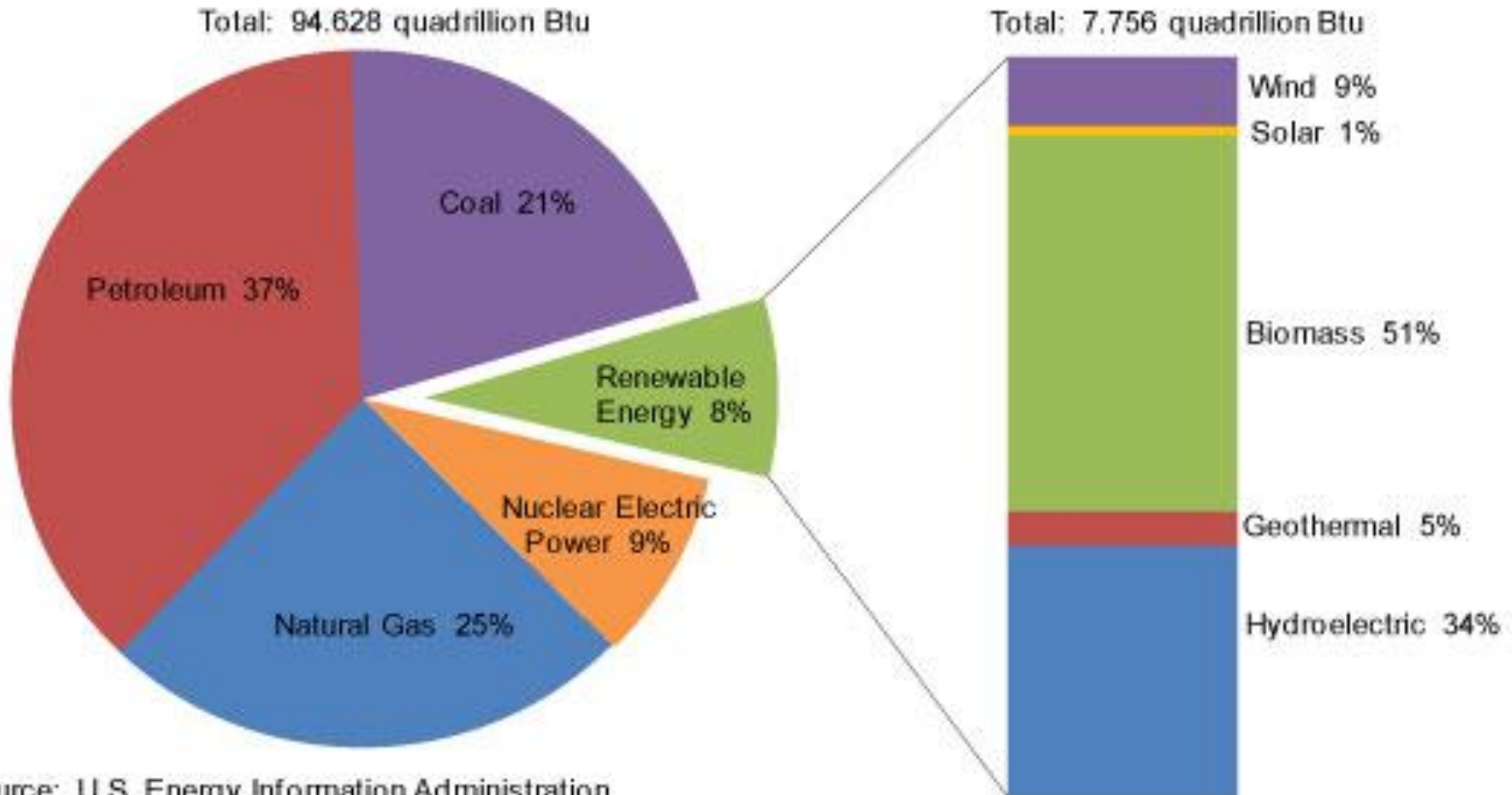


Source: 1850-1949, Energy Perspectives: A Presentation of Major Energy and Energy-Related Data, U.S. Department of the Interior, 1975; 1950-1996, Annual Energy Review 1996, Table 1.3. Note: Between 1950 and 1990, there was no reporting of non-utility use of renewables. 1997-2008, Annual Energy Review 2008, Table F1b.

Energy sources in the United States in 2009

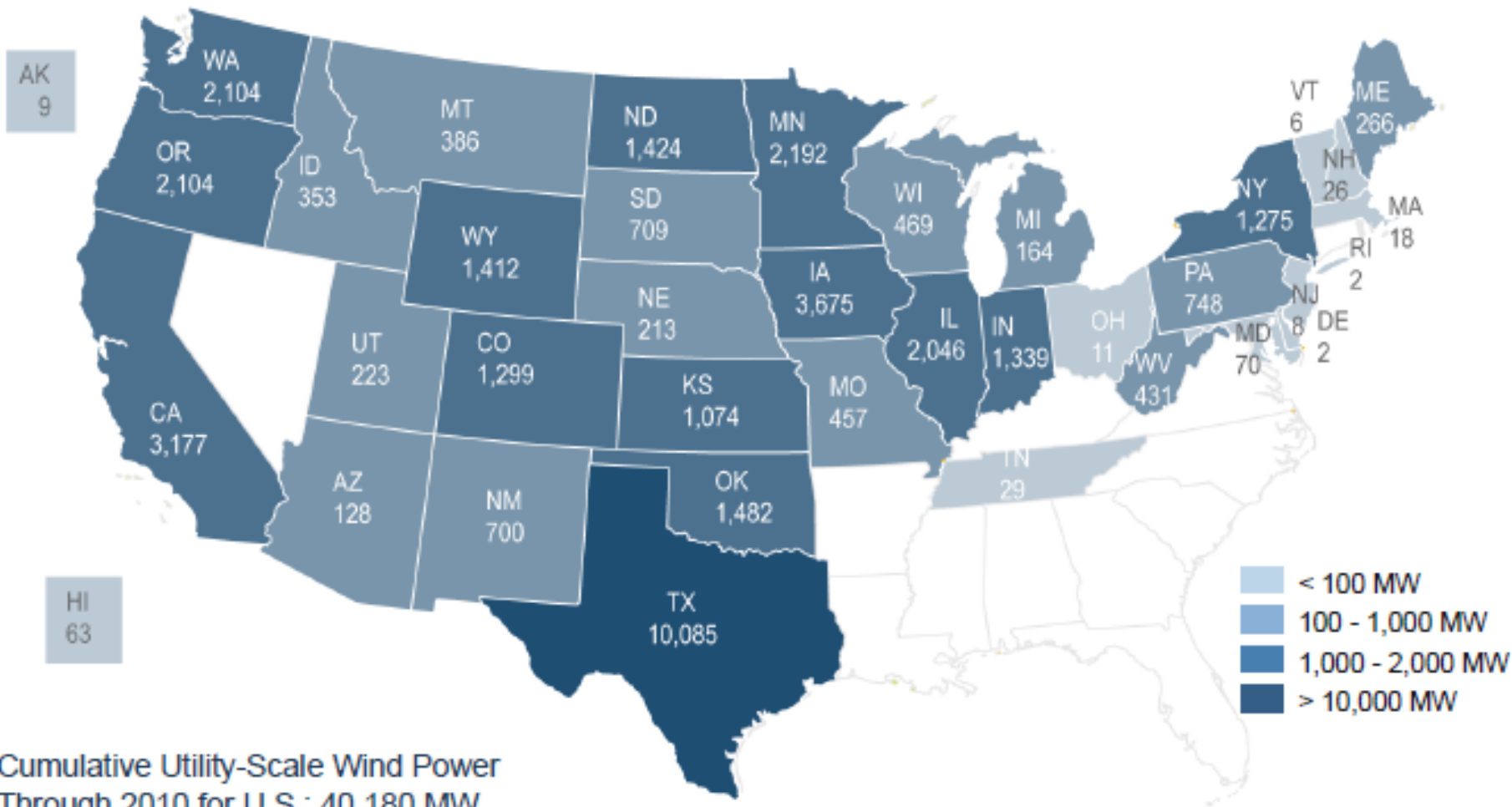
Wind energy contributes about .7 % of total energy

Figure 1.2 Renewable energy consumption in the nation's energy supply, 2009

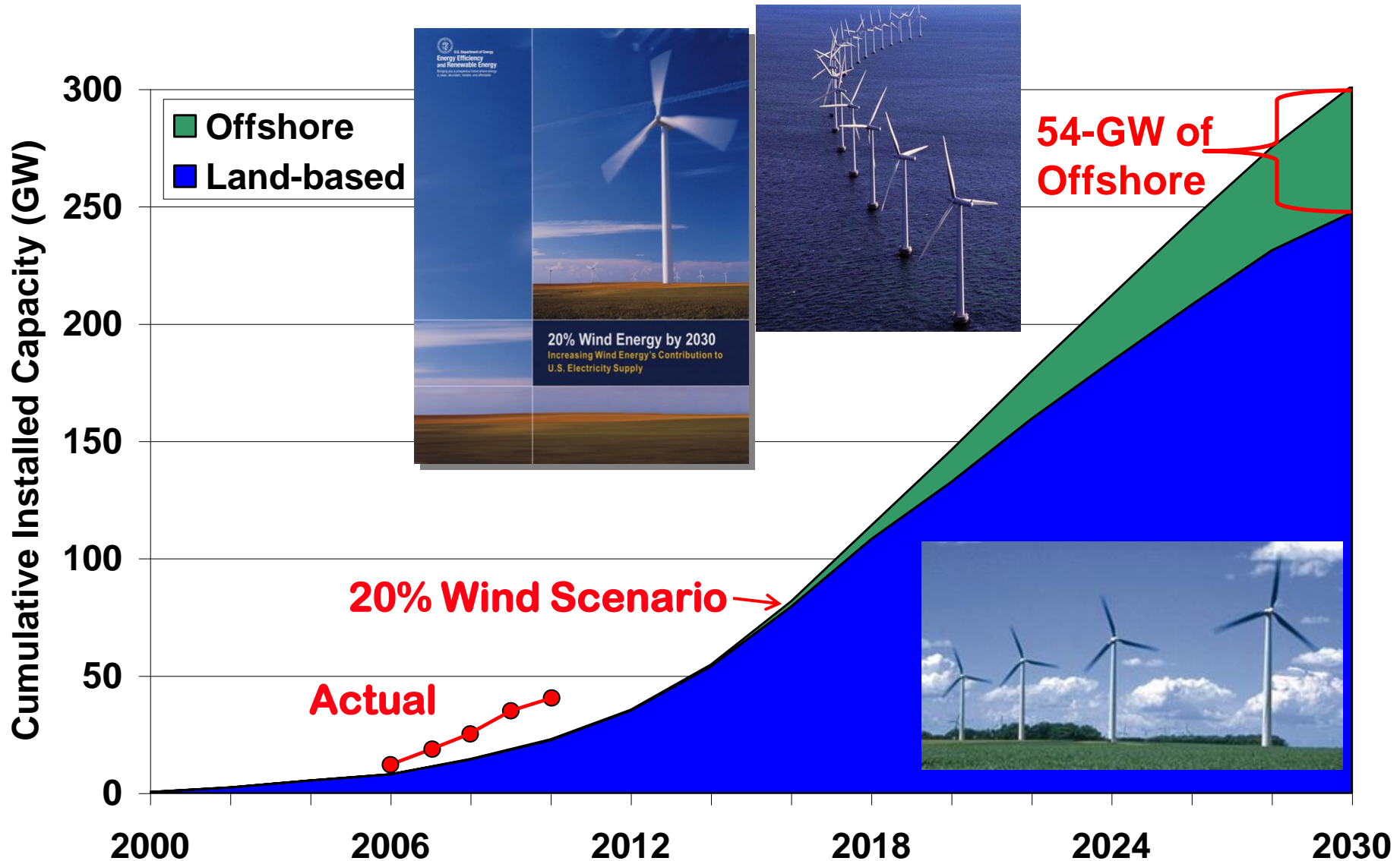


Source: U.S. Energy Information Administration

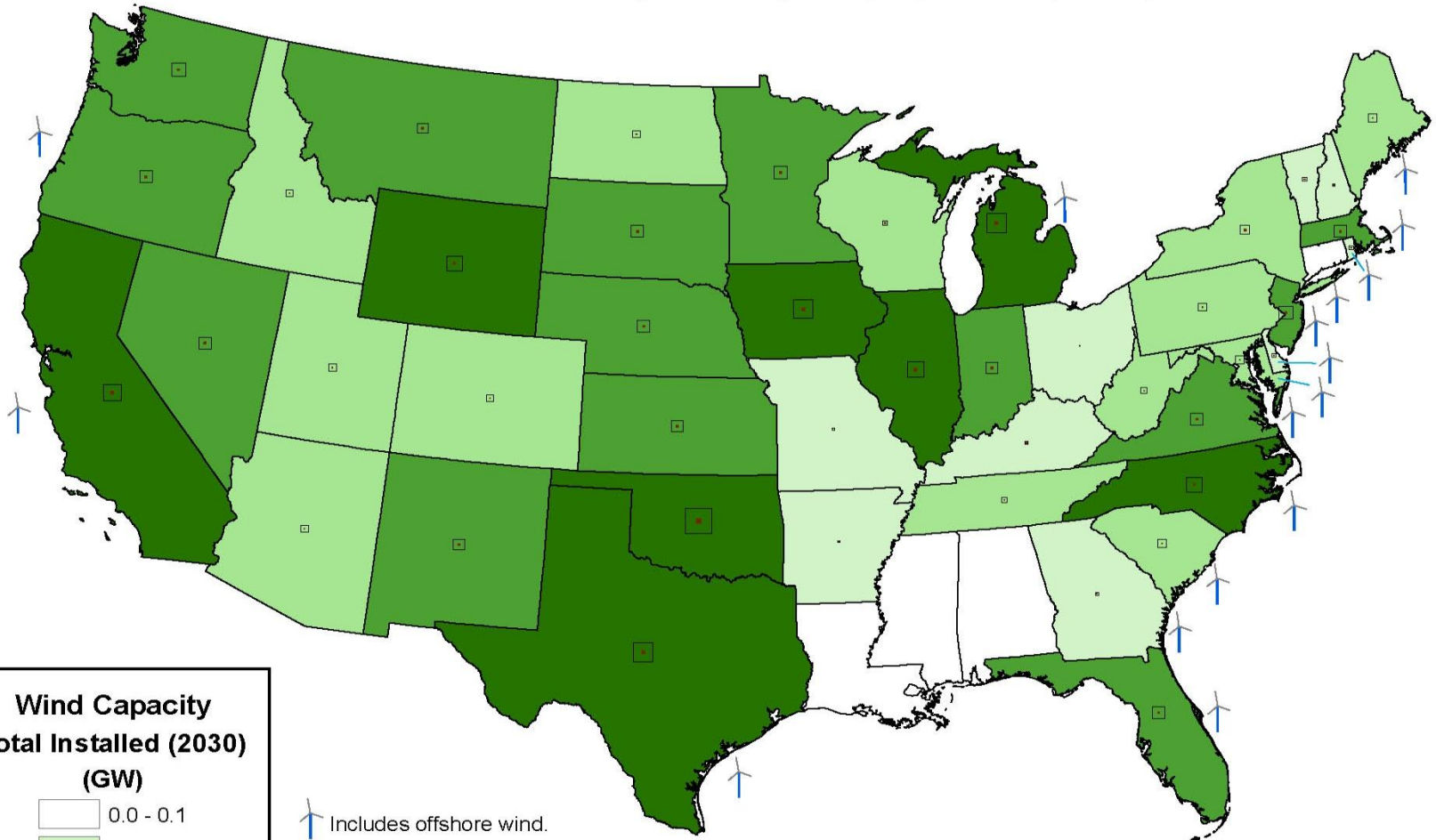
Installed Capacity by State



Path to 20%– On Land & Offshore




Installed Wind Nameplate Capacity by State (2030)



**Wind Capacity
Total Installed (2030)
(GW)**

White	0.0 - 0.1
Lightest Green	0.1 - 1
Light Green	1 - 5
Medium Green	5 - 10
Dark Green	> 10

 Includes offshore wind.

The black open square in the center of a state represents the land area needed for a single wind farm to produce the projected installed capacity in that state. The brown square represents the actual land area that would be dedicated to the wind turbines (2% of the black open square).

Institutions That Play A Role in Wind Energy

Federal Institutions

The U.S. Congress

Research Agencies:

DOE

USGS

NSF

NASA

NOAA

FFRDCs

Regulatory Agencies:

FERC

NERC

BOEMRE

USFWS

BLM

NOAA

EPA

Application Agencies:

DOD

Coast Guard

DHS

USDA



Accelerating the Integration of Wind
Generation into Utility Power Systems

U.S. Industry Groups

- Manufacturers (OEMs)
- Developers
- Consulting Companies
- Equipment Suppliers
- O & M Companies
- Financial Institutions
- Installation Companies
- AWEA
- EPRI

State Agencies

- Economic Development
- Public Utility Commissions
- Departments of Wildlife
- Permitting Authorities
- Energy Siting Authorities

Collaborative Wind Research Organizations

- **NWCC**
- **UWIG**
- **BWEC**
- **AWWI**
- **GLWC**



University Institutions

- Engineering Schools
- Business Schools
- Economics Schools
- Oceanography Schools
- Political Science Schools
- Biology/Environmental Science
- Technical Community Colleges

Non-Government

Organizations

- Union of Concerned Scientists
- Defenders of Wildlife
- The Nature Conservancy
- Clean Energy States Alliance
- Audubon
- The Wildlife Society
- AFWA
- Sierra Club
- Greenpeace

Great Lakes Wind Collaborative

[Wind Atlas](#) | [News Briefs](#) | [Join the GLWC](#)

The Great Lakes Wind Collaborative (GLWC) is a multi-sector coalition of wind energy stakeholders working to facilitate the sustainable development of wind power in the binational Great Lakes region.



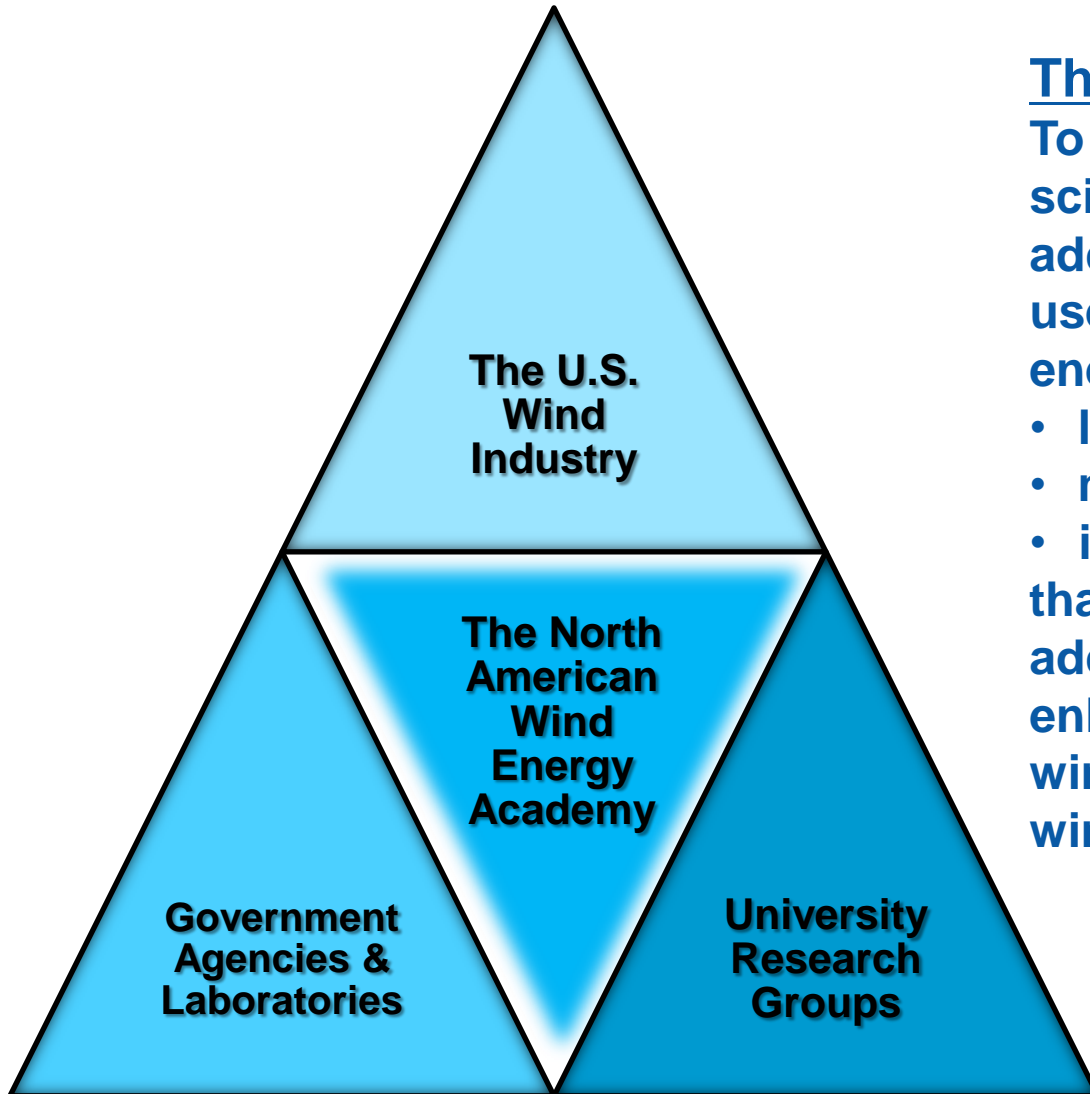
NEW! Great Lakes Wind 2011:
Great Lakes Wind Collaborative
4th Annual Meeting

September 19-22, 2011 • Ypsilanti, Michigan

NEW! Best Practices for Sustainable Wind
Energy Development in the Great Lakes Region

State of the Science Workshop Presentations

The North American Wind Energy Academy Bridges Institutions to Facilitate Research and Education in Wind Energy



The Proposed NAWEA Role

To facilitate high quality national scientific research collaborations to address barriers to the wide-spread use and high penetration of wind energy that are:

- long term high risk focused
- multidisciplinary in nature
- involve multiple institutions that no single institution could fully address alone, and to coordinate enhanced education and training in wind energy at all level to further wind energy deployment and use.

Mission of the North American Wind Energy Academy

It is the mission of the North American Wind Energy Academy to facilitate the formation of high quality national scientific research collaborations to address high risk, multidisciplinary, multi-institutional research problems that present barriers to the widespread use and high penetration of wind energy in North America, and to coordinate enhanced opportunities for the education and training for the needed skilled human resources at all levels to further the application and research of wind energy technologies and applications through collaboration and sharing of knowledge, skills and capabilities among the Academy's members.

NAWEA Proposed Educational Activities

The Academy facilitates the sharing of educational and research capabilities to accomplish its mission as described below:

- **The sharing of curricula and course materials for the development of education and training programs**
- **Sponsoring educational events such as online courses and training programs**
- **Undergraduate, masters level, and PhD exchanges between member organizations to enhance educational opportunities and enrich study programs**
- **Exchange of engineers, research scientists, and faculty between member organizations**
- **Shared membership access to research facilities such as special laboratories, special test equipment and instruments, wind turbine component and system testing facilities, open atmospheric and open water testing facilities, and other related capabilities**

NAWEA Proposed Research

The Academy sponsors the development of long-term high risk, multidisciplinary, multi-institutional research collaborations that no single institution could undertake alone. The scope of these long-term research objectives spans all of the importance barriers for wind energy to facilitate high penetration and wide-spread use. These long-term research objectives will be developed and prioritized in collaboration with the Academy membership, including universities, wind industry members, government agencies, and other research stakeholders.

Examples of some of the important research areas that present barriers to large-scale high penetration deployment of wind energy include:

1. **Wind Turbine and Wind Plant Systems Science and Engineering** - issues of turbine and wind plant analysis, design, control, dynamics, reliability, life-cycle assessment and risk management.
2. **Grid Integration and Transmission Expansion** – issues include permitting, siting, operating, and expanding transmission as well as integrating, dispatching, and forecasting variable energy resources like wind.
3. **Atmospheric Sciences** – atmospheric and ocean inputs and characteristics of importance to the turbine and the turbines influence on ocean and the atmosphere, as well as the turbine design conditions in differing environments.
4. **Policy Barriers** – siting and permitting of wind facilities considering wildlife impacts, radar impacts, public acceptance, and other policy, regulatory and social barriers.
5. **Work Force Education and Development** – the need for training of the workforce to engineer, manufacture, operate and repair wind turbines and facilities.
6. **Other Unidentified Barriers**

NAWEA Objectives and Approach

Academy membership is open to all organizations supporting the NAWEA Mission and able to provide an educational contribution and/or a research contribution.

The Academy will sponsor an annual conference which will provide a forum for the members and stakeholders to:

- present research results and research plans and thereby benefiting from the dialog with other knowledgeable wind researchers and stakeholders at the conference
- sponsor a dialog resulting in a critical review of the barriers to wind energy, and lead the development of coordinated long-term interdisciplinary, multi-institution action plans to perform the critical research needed to address the barriers to the wide-spread use and high penetration of wind energy in North America,
- develop multi-institution agreements to enhance the education and training of the human resources at all levels to further the application and research of wind energy technology and its application in North America.

The Academy is funded through dues, and through sponsored research activities.

The Academy's funded activities may include: specific research projects for sponsors, collaborative projects, research reviews, training courses, webinars, workshops and other related events consistent with the mission.

The Academy is governed by a board elected by the membership, and operated and managed on a day-to-day basis by a director appointed by the board.

Next Step

- A formulating workshop with broad stakeholder participation is scheduled for November 17-18, 2011.
- NREL, RASEI, NOAA, and NCAR have done initial groundwork and are recruiting leaders to facilitate each critical area of potential activity
 - Wind Turbine and Wind Plant Systems Science
 - Grid Integration and Transmission Expansion
 - Atmospheric Sciences
 - Policy Barriers
 - Work Force Education and Development
 - Institution Governance
- The initiative will most likely be launched with signatories from across the nation and from all critical interest groups
 - Industry
 - Government Agencies and Laboratories
 - Universities
 - Other interested parties

NAWEA facilitates going beyond 20% Wind Energy

High value, large scale penetration of wind for electricity requires an effort bigger than any single agency or institution.



Questions?

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