

November 2008

The Wind Energy Center at the University of Massachusetts Amherst: America's Leading University Program in Wind Power Engineering

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UMass Amherst - Wind Energy Center

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UMASS Wind Energy Center

The Wind Energy Center at the University of Massachusetts:

***America's Leading University Program in
Wind Power Engineering***

History, Research, and Training

November, 2008

*College of Engineering
University of Massachusetts at Amherst*





UMASS Wind Energy Center

- Managed within the Mechanical and Industrial Engineering Department (MIE) at UMASS
- Co-directors: Professor Manwell and McGowan
- Other PIs: Department Head Mario Rotea and Assistant Professor Robert Hyers
- About 12 graduate students
- Associate Director: Patrick Quinlan
- Seven other professional staff
- Approximately \$1.5 million in annual activity
- Major sponsors: MRET, Mass. DOER, US DOE



Current Research at the Wind Energy Center

- Wind resource assessment in Massachusetts
- Turbine siting and external design conditions analysis
- Icing research, noise research
- Addressing Massachusetts issues—towns, museums, farmers, students
- Turbine electrical and control issues
- Turbine machine design, structural analysis and materials issues
- Hybrid power systems/distributed generation
- State/federal and international activities
- Offshore wind energy



Graduate Students!

Wind Power Firms: General Electric, Vestas North America, Mitsubishi, Southwest Windpower, US Windpower, ESI, Flowind, Atlantic Orient Corporation, Enertech, Fayette, Carter Wind Systems, Bergey Power, Kennetech, Zond, Enron Wind, Clipper Wind, Northern Power, and Second Wind.

Wind Power Consultants: Garrad Hassan America, Global Energy Concepts, UPC Wind, NEOS Corporation, McNiff Lite Industries, Windpower Associates, Pace Global Energy Services, and GPCo (Canada).

Utilities and Wind Developers: Florida Power and Light, Southern California Edison, Northeast Utilities, Alaska Energy Authority, Ontario Hydro, Tennessee Valley Authority, and Oak Creek Energy Systems.

Universities: MIT, U. Texas/Arlington, Babson College, University of Wisconsin, James Madison University, University of California Davis, and University of Massachusetts.

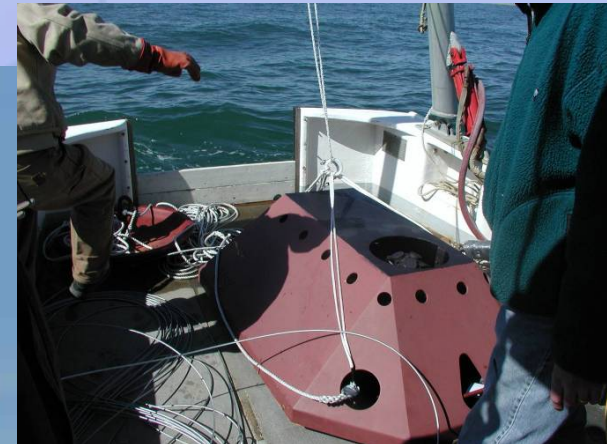
National and State Agencies: White House Office of Science and Technology Policy, US Congress, US Department of Energy, National Renewable Energy Laboratory, Sandia National Laboratory, Massachusetts Department of Energy Resources, New York State Energy Research and Development, and Wisconsin Energy Office.

International Laboratories: Rutherford Appleton Laboratories (UK), Riso National Laboratories (Denmark), TU Delft (Netherlands), and World Institute for Sustainable Energy (India).



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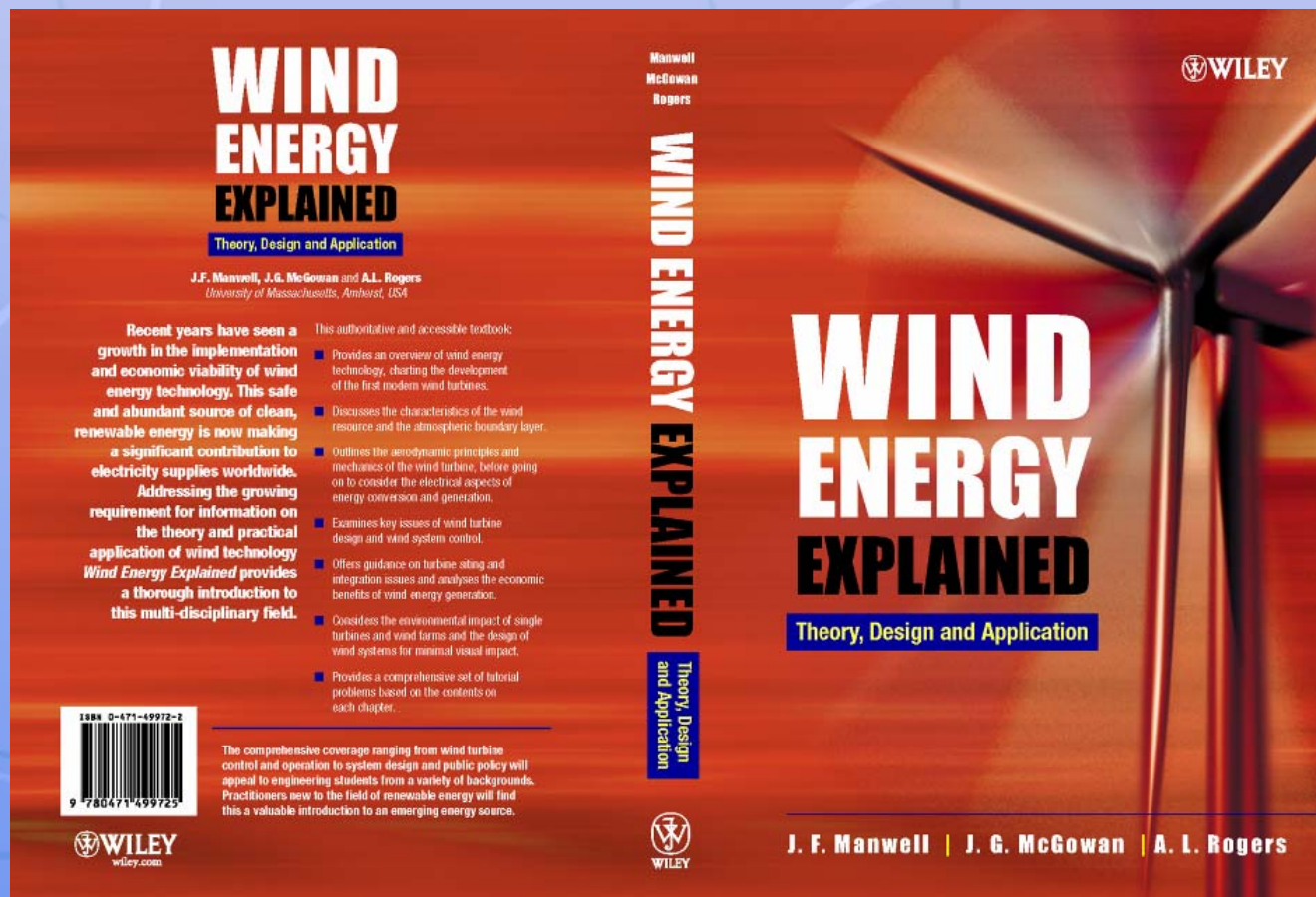
Advanced Remote Data Collection





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Wind Engineering Education: Authors of the Leading College Text on Wind Energy



WIND ENERGY EXPLAINED

Theory, Design and Application

J.F. Manwell, J.G. McGowan and A.L. Rogers
University of Massachusetts, Amherst, USA

Recent years have seen a growth in the implementation and economic viability of wind energy technology. This safe and abundant source of clean, renewable energy is now making a significant contribution to electricity supplies worldwide. Addressing the growing requirement for information on the theory and practical application of wind technology *Wind Energy Explained* provides a thorough introduction to this multi-disciplinary field.

- This authoritative and accessible textbook:
- Provides an overview of wind energy technology, charting the development of the first modern wind turbines.
 - Discusses the characteristics of the wind resource and the atmospheric boundary layer.
 - Outlines the aerodynamic principles and mechanics of the wind turbine, before going on to consider the electrical aspects of energy conversion and generation.
 - Examines key issues of wind turbine design and wind system control.
 - Offers guidance on turbine siting and integration issues and analyses the economic benefits of wind energy generation.
 - Considers the environmental impact of single turbines and wind farms and the design of wind systems for minimal visual impact.
 - Provides a comprehensive set of tutorial problems based on the contents on each chapter.



WILEY
wiley.com

The comprehensive coverage ranging from wind turbine control and operation to system design and public policy will appeal to engineering students from a variety of backgrounds. Practitioners new to the field of renewable energy will find this a valuable introduction to an emerging energy source.

Manwell
McGowan
Rogers

WIND ENERGY EXPLAINED

Theory, Design and Application



WIND ENERGY EXPLAINED

Theory, Design and Application

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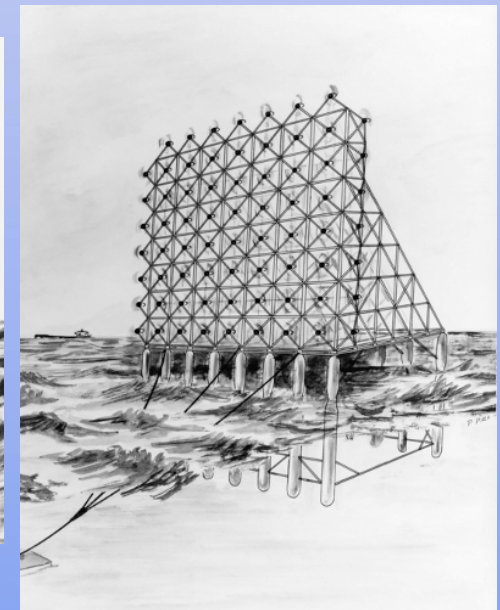
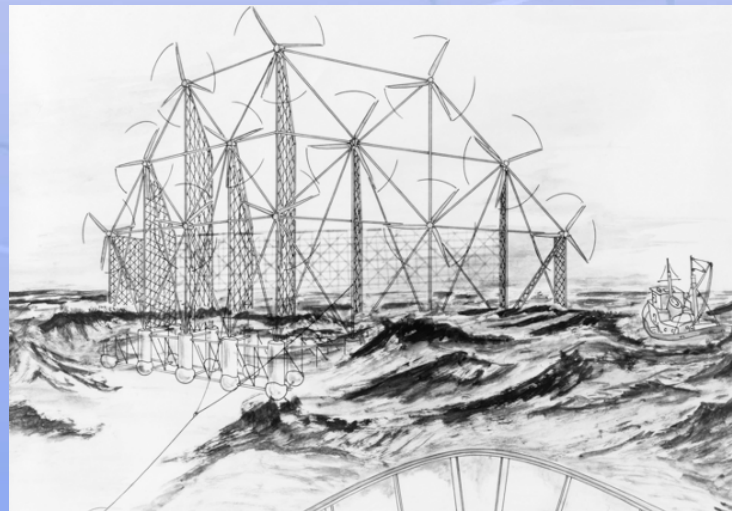
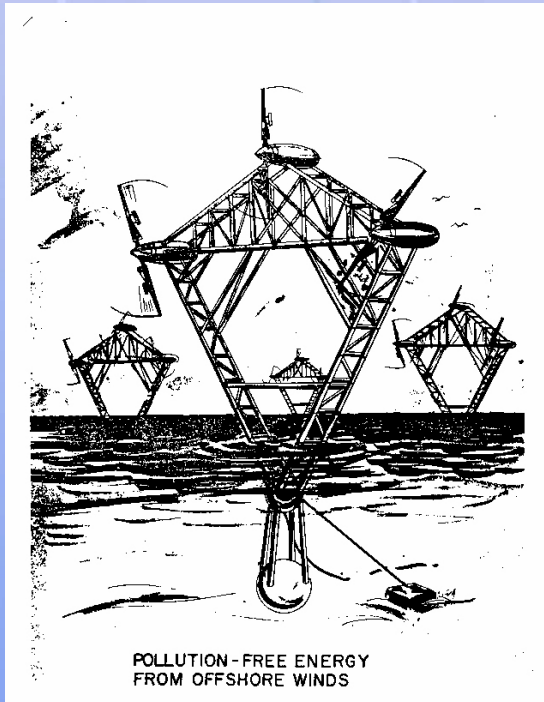




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History: 1970s

Early Conceptual Designs for Offshore Wind in New England



Wind Turbine/ Spar Buoy; Multi Rotor Systems

(Heronemus, UMass, 1973)



History: 1990s

Mt Tom,
Massachusetts
Experimental Test
Site:

ESI 80 WTG:

2 Bladed

Downwind

250 kW

Many Modifications





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History: 2000s Hull, Mass. Wind Turbines

Hull 2- 1.8 MW



Hull 1-660 kW





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Training Programs at the UMASS Wind Energy Center

This year, first-time technician-level certificate-based educational programs sponsored by the Massachusetts Renewable Energy Trust.

- Pilot—meteorological tower installation training
- Following years—data loggers, computer methods, remote sensing
- Potential hybrid on-line on-site format

Next year: wind energy course at Greenfield Community College.

The new Green Jobs Act opens up some funding for our staff and students to share some of our expertise in:

- Wind energy resource assessment tools and techniques, including SODAR (sonic anemometer) and LIDAR (laser anemometer), both of which track wind speed and direction at the "hub height" of modern utility-scale turbines
- Wind turbine site assessment and mapping tools
- Turbine performance monitoring and testing



UMASS Wind Energy Center

Wind Energy Center

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