Envisioning Wind Energy for Massachusetts Communities

Proceedings of the panel discussion held at the Massachusetts State House on June 21, 2006

Recorded by Christina Lanzl, UrbanArts Institute at Massachusetts College of Art

On Wednesday, June 21, 10:00 am - noon, at the Massachusetts State House, a panel of experts discussed "Envisioning Wind Energy for Massachusetts Communities," exploring the state's opportunity to establish a national leadership position in the field of wind and other renewable energy technologies.

The event, hosted by Representatives Frank I. Smizik (moderator), Jim Marzilli, and Matthew C. Patrick in partnership with the Boston Society of Architects (BSA) and the UrbanArts Institute, featured panelists Dr. James Manwell, Director of the UMass Amherst Renewable Energy Research Laboratory; Rep. Matthew Patrick; William Reed, President of Integrative Design Collaborative; and Greg Watson, Vice President for Sustainable Development and Renewable Energy at the Massachusetts Technology Collaborative. Topics covered included the state's current efforts and future opportunities to foster the development of wind energy projects for the benefit of its communities and electricity ratepayers, economy, and environmental quality. The panel was organized in conjunction with the exhibition of WINDSCAPE, the BSA ideas competition envisioning renewable energy for Cape Cod, which was on view at the State House's Doric Hall from June 12-30.

Summary of Outcomes and Action Steps

- Explore the potential of municipal and collaborative ventures for smaller-scale, onshore locations for wind farms along the Massachusetts coast and inland, considering particularly brownfields and siting in communities that would reap benefits from new economic stimulus.

- Reduce energy consumption of electrical equipment, such as air conditioning and appliances in households and all other sectors.

- Garner the support of the political leadership and introduce laws that stimulate renewables energy growth, e.g. the discussion of creating a new cluster economy around wind energy.[1]

- There is a need to allocate resources for renewables education to share benefits and impacts with constituencies.

- State collaborators such as the Massachusetts Technology Collaborative need to play a larger role in the political process.

- A healthy balance of renewables, environment, and the economy is key to foster sustainable, more autonomous energy supply in the state of Massachusetts.

Background

Committee co-chair Kathy Wislocky introduced WindScape committee members, Marcell Graeff, Tom Collins and collaborator, Christina Lanzl of the UrbanArts Institute at Massachusetts College of Art. The WindScape ideas competition was conceived in response to the intense public and political discussion that has unfolded in response to the proposed wind farm in Horseshoe Shoal off the Massachusetts Cape Cod coast. The competition was conceived as an exercise to think creatively about wind farms in our built environment. Its purpose was to discover new opportunities involving

[1] Since the year 2000, the state of Massachusetts has passed only two energy bills, one of which concerned energy efficiency requirements. Other states are leading by example. Pennsylvania governor Edward Rendell has made a commitment to install 400 MW of wind power during his legislature. In New York state, governor George Pataki is pursuing a goal of 20% renewables by 2020.

renewable energy. The winning entries and selected competition proposals are traveling to venues in Massachusetts and in Europe (Netherlands, Germany, England) in 2006 and 2007.

The panel discussion at the Massachusetts State House is intended to broaden the conversation and discuss further opportunities that exist for renewable energy in Massachusetts. The forum was convened to address the existing political and social barriers and provide insight on how we can overcome the hurdles towards achieving implementation of renewable energy in Massachusetts communities.

Panel moderator Rep. Smizik thanked the panel organizers and the sponsors for their commitment to improving the world we live in. While proposed wind energy creation on Cape Cod has been delayed for five years, the future of U.S. and Massachusetts energy is in renewables. Studies for implementation in Massachusetts state buildings are in process.

Broad Based Systems Thinking

In his overview of energy generation and consumption, William Reed emphasized the interrelationships and interconnectivity of energy thinking from a systems perspective. He recommends the following strategies for decision makers and consumers:
1. demand reduction
2. explore passive and active renewable resources
3. implement efficient technologies in certain sectors

Mr. Reed noted that many opportunities and ways to engage people are missed, if we simply address renewable energy sources in isolation from our way of life and the health of all living systems. The relationships between energy, habitat, soil health, water use, water treatment, air quality, interior building quality, transportation, accessible cities, agriculture, consumption patterns, community vibrancy, and quality of life are essential to understand in order to take advantage of the synergies, and potential public support, when we address "the whole".

When considering the appalling state of worldwide environmental pollution and, as a result, countries in turmoil because of this condition, the need for reduction of demand is clear as a means to increase health and energy security.

Simple recommendations for increasing efficient use of energy:
1. Water use: the U.S. spends 7% of its national energy consumption on water supply.
2. Light disruption, e.g. reduce lighting of building signage
3. Meadows and hardy plants are preferable to traditional lawns, which absorb water and energy
4. Plant trees to keep cites cool
5. Keep roofs cool by applying good insulation and implementation of green roofs
6. Eat local foods: at present, in the US foods travel an average 125 miles before reaching the consumer
7. Ride bicycles to reduce oil consumption

Consider energy consumption of electrical equipment, such as air conditioning and appliances in households and all other sectors: popular since only the 1950s, AC consumes large amounts of energy and has become a drug in our society. In New England's temperate climate (ceiling) fans are entirely adequate. Overall, appliances and electrical equipment need to be more efficient. Parasitic loads of electrical equipment, such as remote controls and LED displays amount to a full 7% of the national consumption

Systems thinking is crucial. Energy Design Lab, the winner of the WindScape competition not only addressed design, but also energy consumption. Consumers and residents need to unite for a

comprehensive environmental perspective on our lived environment - water[2], energy, habitat, flora and fauna, materials and food,

Call for Political Leadership

Rep. Matt Patrick addressed political climate and leadership. During his last two terms as State Representative for the district where the first Massachusetts offshore wind farm was proposed, he has been intimately involved with the subject and politics of wind energy. Rep. Patrick supports wind energy and prior to entering political office, he installed solar energy systems for five years and ran a non-profit energy organization for fifteen years. The public receptivity to the project has shifted dramatically in the last three years from less than favorable to favorable. At the heart of the shift is a growing public understanding of the benefits of renewable energy. What is needed is the development of a process that can lead to the successful implementation of green energy projects. To this end, it is crucial to engage the public, i.e. a deliberative polling process that begins before the environmental review starts, public information sessions, etc.

Public benefits of a wind farm would be enormous, considering that 60% of jobs on Cape Cod earn $20,000 and less, mostly in the tourist industry. Investment in renewable energy could serve as an economic and educational booster. It is noteworthy that community opposition to the proposed Cape Cod wind farm mostly revolved around perceived aesthetic shortcomings in the pristine marine landscape. Potent images of rusted windmills were circulated in the media, followed by opposition of the tourism industry as well as the wealthy and politically connected. In the 2002 elections, Cape Wind became a major hot ball on Cape Cod. Rep. Patrick was demanded to retract his support of wind energy and ended up winning the election by a margin of 17 votes in a recount.

Polls conducted before his last election in 2004 showed that 35% of voters in Rep. Patrick's Cape Cod district supported wind energy, 33% were indifferent, and 32% opposed. A very recent poll conducted by the Civil Society Institute shows that statewide, 81% of Massachusetts residents and 61% Cape Cod-wide are supporters. Only 14% oppose statewide and 36% oppose on the Cape and Islands - download polls at http://www.resultsforamerica.org/calendar/files/6.7.06_news_release_final2.pdf. This shift can be attributed to increased public awareness of renewable energy and environmental issues, influenced by the global warming discussion. Consider also that the price of $0.25 per KWH for electricity in Massachusetts represents the highest rate in the continental U.S., because virtually all energy is imported from other states.

Advocacy and public outreach on wind energy are crucial. The state of Texas recently permitted its first offshore wind farm and provides a model for success. The state took initiative to develop this renewable energy source and began with a public survey, which was followed by direct communication with a subgroup to discuss issues and concerns. The Texas public utilities commission moved forward with wind farm projects after successfully completing its public process.

Leading by Example: Wind Energy in the Town of Hull

Lessons can be learned from the town of Hull. According to historic records, a windmill operated in town as early as 200 years ago. Located at the entry channel to Boston Harbor, Hull installed its first municipal Hull wind turbine in 2001, after a short four-year development phase. Hull Wind II[3] went online in May 2006. The turbine is located on the closed town landfill, which was difficult to achieve,

[2] Case in point: Brockton, MA has proposed to build a $18 million desalination plant (project on hold). There is a need to rethink priorities, cause and effect. Currently, large water quantities flow into the Atlantic due to run-off. Large paved areas need to become permeable surfaces so that run-off can contribute to rebuilding groundwater resources.

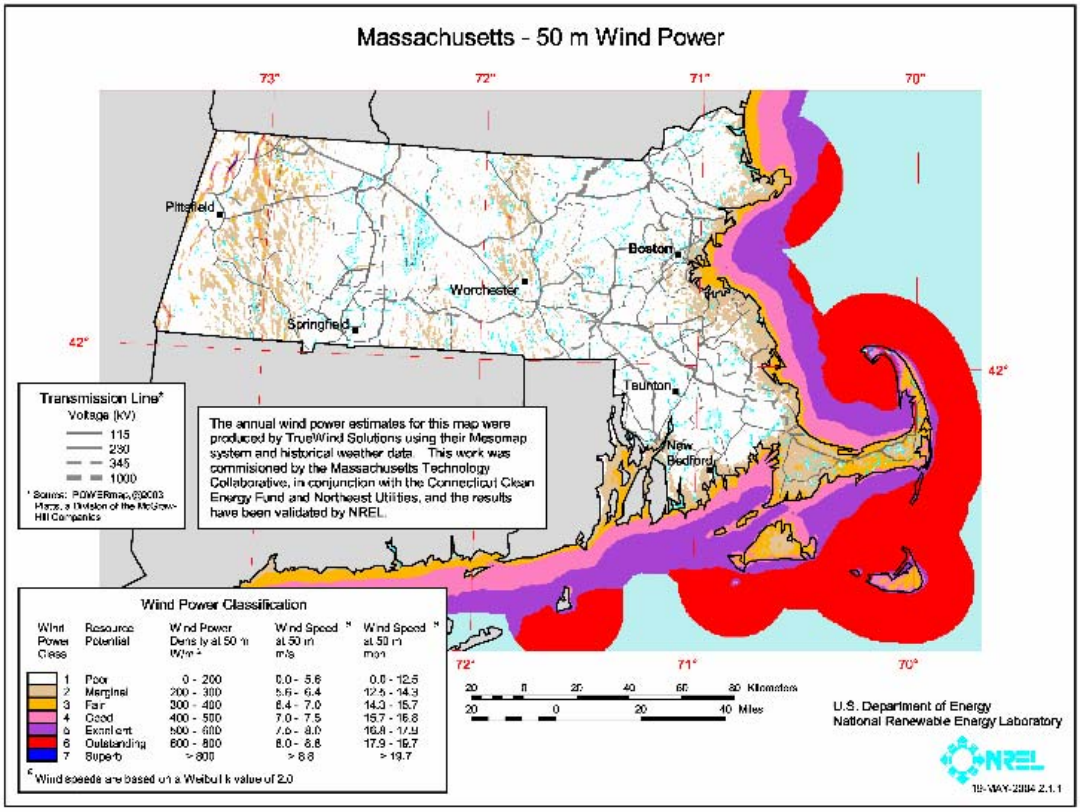
[3] Model: 1.8 MW Vestas V80, 262' rotor diameter, 200' High; one of the largest turbines in the US, imported from Denmark.

because of unstable terrain, because pilings had to be driven through landfill into the bedrock. Total project budget of Hull Wind II was $3 million. While this seems costly, the turbine is an efficient investment, because Hull is operating as municipal electric supplier. Hull Wind I[3] supplies 3% of Hull's electricity and the second turbine supplies an additional 9% of Hull's electricity. Hull's next wind project is a community scale offshore wind plant. Project cost is expected to be higher than for the previous installations, because of the offshore location, but return is expected to offset the initial investment quickly.

Global Trends and Local Opportunities

Dr. James Manwell, technical adviser to the community of Hull, outlined the trends that contextualize the use of wind energy in Massachusetts. The context consists of the interrelated issues of increasing worldwide use of fossil fuels, impending decrease in oil supplies, climate change due to fossil fuel use, and geopolitical instability. This is exacerbated by the global population growth and a projected rise of +50% in global energy consumption by 2020. Clearly, new generation capacity growth points towards the need to diversify the energy portfolio. This trend is global: the fastest growing source of energy growth today is in wind energy.

This background creates an impetus for greater use of renewable energy and energy efficiency. Because of its geographic location, wind energy is the most suitable source in Massachusetts and has the advantage that the initial investment needed is moderate. The Massachusetts wind resource map shows where ideal wind conditions exist. The highest winds exist offshore, along coastal sites, on mountain tops and at greater heights.



[3] Model: Vestas V47, 660kW, 47 m diameter, 150' High

Although one of the best options for Massachusetts is wind energy, the process to increase the amount of wind generation in Massachusetts has proven to be difficult. There are a significant number of barriers that must be overcome. The town of Hull, MA, however, has been able to circumvent many of these barriers. Hull's success originates primarily in its forward acting municipal electric company. The lessons learned from Hull's experience can be used to guide future activities elsewhere in the Commonwealth.

The key to success in wind energy implementation are:
- consideration of the concept of municipal electric companies, requiring a familiarity with electricity. Great advantage lies in the sense of ownership developed by the community.
- guaranteed and adequate value of energy
- adequate wind resource and location of the rotors at sufficient height above ground
- understanding of the public benefit and opportunities for meaningful public input
- non-restrictive regulations
- qualified partners

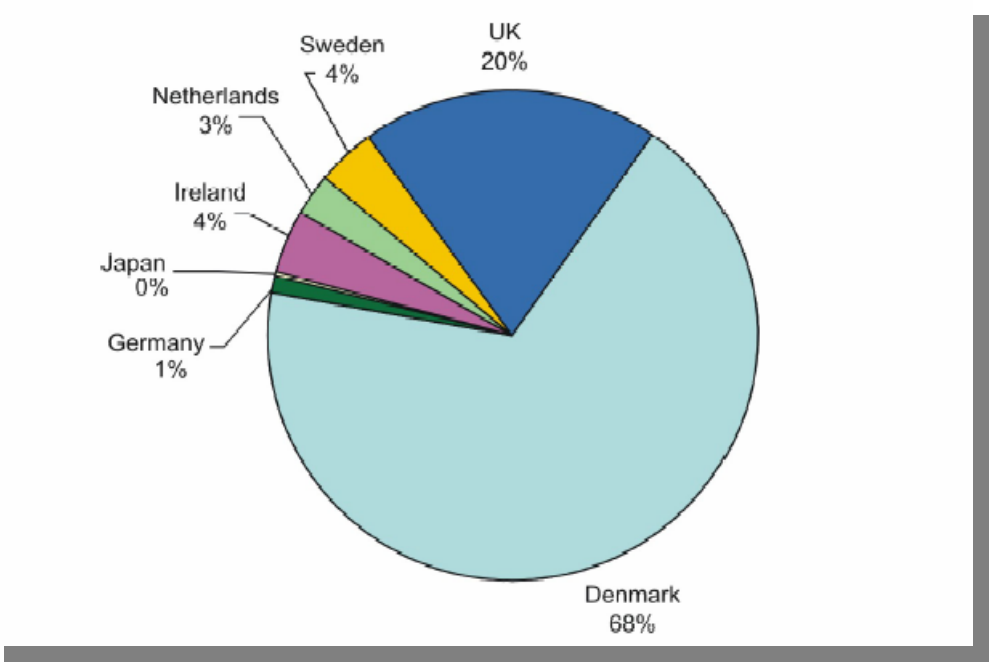
Opportunities for Massachusetts communities lie in a wind energy development plan with a coordinated approach. Political, public and economic leadership need to decide to actively promote wind energy, followed by supportive regulations, incentives, education and outreach. Who are the bodies to push for implementation of wind energy? In Massachusetts, public agencies, such as DOER, MTC, UMASS, EOEA, MMWEC, DTE, DOE, municipal electric companies, and co-ops are needed to take the next step.

The Massachusetts Offshore Wind Collaborative (OWC)

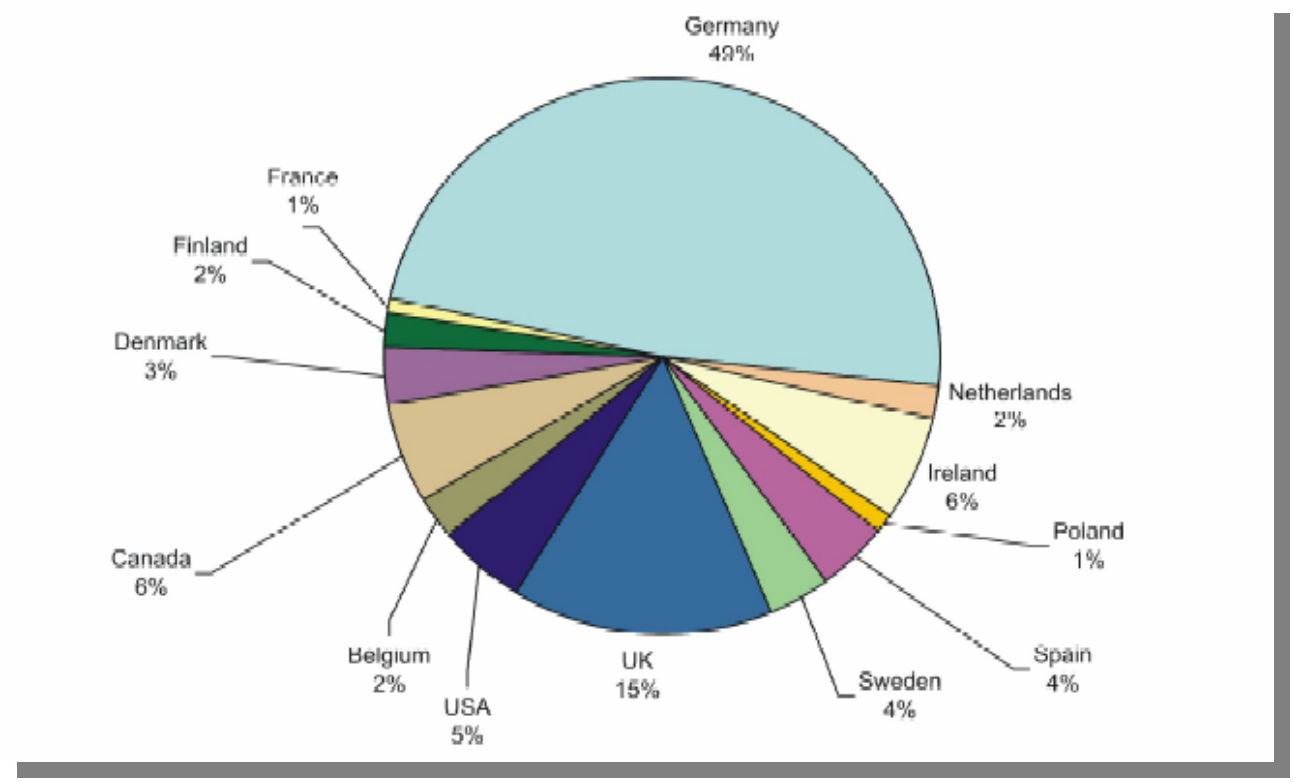
At the state level, **t**he Offshore Wind Collaborative (OWC), comprised of the Massachusetts Technology Collaborative (MTC), the U.S. Department of Energy (DOE) and General Electric (GE) is charting a path for green energy and new jobs. A principal focus of the Offshore Wind Collaborative is to broaden the wind resource potential through exploration of deep water and far offshore technologies. The goal is to overcome the barriers to generating and delivery of electricity of U.S. offshore plants.

Greg Watson of the MTC reported that the U.S. Department of Energy (DOE) estimates there are more than 900,000 MW of potential wind energy off the coast of the United States, in many cases relatively near major population centers. The strongest and most consistent winds prevail over waters where the environmental conditions are beyond the reach of current technology. The goal of OWC is to convene offshore wind energy stakeholders representing a broad spectrum of interests and expertise to craft a research and policy agenda designed to establish U.S. leadership in the development and deployment of the next generation of offshore wind energy systems that will allow us to sustainably harvest our vast ocean wind resource.

Achieving this goal within a fairly aggressive timeframe will provide Massachusetts with the opportunity to diversify its energy portfolio with an inexhaustible source of indigenous clean energy and to create a variety of new jobs in the process. In the U.S., GE has invested in a 10 MW turbine concept with 180 m rotor diameter. Worldwide leaders in offshore wind energy planning are currently the UK and Denmark, where 22 projects are in the pipeline, totaling 11,455 MW of new capacity through 2010 (see chart). In the U.S., Cape Wind is projected to generate 420 MW. This would meet 75% of Cape Cod's annual electricity.

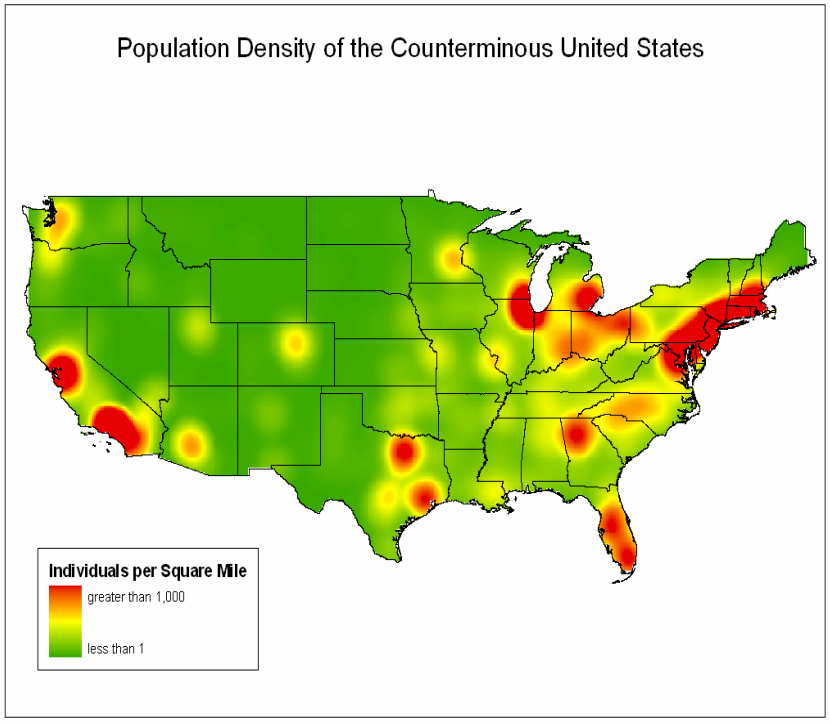


Current State of Offshore Wind



11,455 MW proposed offshore wind energy generation through 2010

Why is it advantageous to go offshore?
• windy land is not always near load centers
• grid is not set up for long interstate electric transmission
• load centers are close to the ocean.



The east coast generates 25% of U.S. energy consumption. Massachusetts imports all but one percent of its energy, relying on natural gas and environmentally problematic coal. New England has an abundant natural resource off the coast of Massachusetts that could be tapped for energy needs and economic development. According to David Garman, Under Secretary of the U.S. Department of Energy, there may be, conservatively speaking, more than 100 gigawatts of capacity just off the coast of New England. There are roughly 900 gigawatts of potential wind energy TOTAL off the coast of the United States. This is equal to the country's total installed electric generating capacity.

The technological challenges offshore wind generation faces are based on the key differences between onshore and offshore:
• hydro-dynamic loads and wind loads
• highly corrosive salt-laden air
• dehumidification required to prevent equipment deterioration
• remote, difficult access makes autonomous operation essential

Offshore wind energy calls for a broad based focused coordinated approach to planning research and policy development. This begins with the jurisdiction of state and federal waters. In early 2004 Greg Watson's MTC office of Sustainable Development and Renewable Energy and partnering organizations issued a collaborative framework (download at http://www.masstech.org/renewableenergy/owec.htm), followed by a 2005 framework that recommends the organization's structure, funding levels and sources, and human resources necessary to implement the framework and realize its potential. Process is crucial. OWC is consulting with key parties to identify key issues. Greg Watson's expected outcomes: "Do it right. Do it responsibly. Do it the right way."

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PRESENTER BIOGRAPHIES

Dr. James Manwell
Director, UMASS Amherst Renewable Energy Research Laboratory

Prof. Manwell is on the faculty of the Department Mechanical and Industrial Engineering at the University of Massachusetts in Amherst and is the Director of the Renewable Energy Research Laboratory (RERL) there. He has been working in field of wind energy for over 25 years, where his research interests have focused on wind resource assessment, hybrid power system design, and offshore wind energy. Beginning in the 1980's and continuing up to the present he has been active in the design and modeling of hybrid power systems, including the development of the Hybrid2 computer code. Hybrid systems include multiple types of generators, electrical loads, storage units and control systems. Under his direction, the Renewable Energy Research Laboratory installed in 1994 the first utility scale (250 kW) wind turbine in Massachusetts. This turbine forms an integral part of the research and education program at the University. More recently, he has assisted the Town of Hull in acquiring a 660 kW wind turbine in 2001 (the largest in New England at that time), followed by a 1.8 MW wind turbine in 2006 (again, the largest in New England). He is an author of a textbook on wind energy: Wind Energy Explained: Theory, Design and Application. Prof. Manwell also provides assistance to the Massachusetts Technology Collaborative (MTC) the Commonwealth of Massachusetts' Division of Energy Resources (DOER) and the to facilitate the introduction of renewable energy to the state. Currently he is the U.S. representative to the International Electrotechnical Commission's program (IEC TC88 WG3) to develop design standards for offshore wind turbines. He is also a member of the International Science Panel on Renewable Energy. Jim Manwell received his Ph.D. in Mechanical Engineering from the University of Massachusetts in 1981.

Rep. James Marzilli, Jr., 23rd Middlesex District

Jim Marzilli is in his eighth term in the Massachusetts House of Representatives, representing Arlington and West Medford. He is one of the state's leading advocates for working families, for progressive tax reform, and for an environmentally sound energy policy. He is one of the Legislature's experts in parliamentary procedure. He has a strong background in coalition building among non-governmental organizations and citizen participation, the media and political campaigns. Jim was named "Legislator of the Year" by the Environmental League of Massachusetts in 2001 for his groundbreaking work in linking energy consumption and tax policy. His Green Building Tax Credit will provide tax incentives to builders who use environmentally sound building practices. He is active in international circles on sustainable economic development. He represents Arlington and Medford at the International Council on Local Environmental Initiatives (ICLEI) and attended the 2005 round of negotiations at the United Nations Framework Convention on Climate Change (UNFCCC/COP8) in Montreal, Canada. Jim currently serves as co-chair of the Council of State Governments Eastern Regional Conference Energy and Environmental Committee.

Rep. Matthew Patrick, Falmouth, Third Barnstable District

Before becoming a State Representative, Matt Patrick's career in energy spanned solar hot water system installer to head of the Cape and Islands Self-Reliance. Under Matt's leadership the non-profit Self-Reliance provided 3,600 families with over $17 million in energy efficiency loans. He secured private funding to create the Barnstable County Energy Management Plan and the pioneering concept of municipal aggregation that manifested itself in the creation of the Cape Light Compact representing all 20 towns on Cape Cod and Martha's Vineyard. The concept also passed in several states due to

Patrick's outreach. Patrick barely survived a close election in 2002 because redistricting gave him two new precincts that strongly opposed the Cape Wind Project which he strongly supported. He is running unopposed this year. Rep. Patrick served in Ghana with the Peace Corps in 1977.

William G. Reed, AIA, **LEED**
President, Integrative Design Collaborative, Arlington, MA

An internationally recognized proponent and practitioner of sustainability and regenerative design Bill is an architect who works with building design and community planning in concert with ecological system design. His firm is a consulting organization with a mission of lifting design practices to be fully integrated with living systems and catalyzing the health of these systems. His work centers on creating the framework for and managing the integrative, whole-system design process. He served as co-chair of the LEED Technical Committee from its inception in 1994 through 2003; is a founding Board Member of the US Green Building Council; and served on the national executive committee of the AIA Committee On The Environment. He currently serves on the NESEA Board and as an advisor to *Environmental Building News*.

Rep. Frank Smizik
Chair of the Joint Committee on Environment, Natural Resources and Agriculture

Representative Frank Smizik is a graduate of the University of Pittsburgh and Duquesne University School of Law. He served for twenty-five years as a legal services lawyer addressing housing and other civil issues facing low income persons. He was also involved in landmark litigation creating rights for persons displaced by urban renewal and developed state and federal, as well as litigation strategies, to avoid homelessness. Representative Smizik served the Town of Brookline in many capacities; as a member of the Democratic Town Committee, a Town Meeting member, the Commissioner and Chairman of the Housing Authority, and as Vice Chair of the School Committee prior to being elected in 2000 as the Representative from the 15th Norfolk District. Representative Smizik became Chairman of the Committee on Environment, Natural Resources, and Agriculture last year. His priority is to bring more public awareness to the link between public health and the environment, focusing on toxics in our air and water.

Greg Watson
Vice President for Sustainable Development and Renewable Energy, Massachusetts Technology Collaborative

In October 1999 Greg Watson was named the first program director for the Massachusetts Renewable Energy Trust. Created by the1997 law restructuring the electric utility industry, the Trust will have $150 million over the next five years – and $20 million a year after that -- to accelerate the use of cleaner sources of electricity and invest in the development of renewable energy industry in the Commonwealth. He served in that role until 2001. As MTC Vice President for Sustainable Development and Renewable Energy, Watson is currently directing the Cape & Islands Offshore Wind Public Outreach Initiative and MTC's Offshore Wind Energy Collaborative (OWC). From 1995 to 1999 Watson served as executive director of the Dudley Street Neighborhood Initiative (DSNI), a resident-driven community planning organization in Roxbury, Massachusetts. Prior engagements include leadership positions with Second Nature, The Nature Conservancy's Eastern Regional Office and the Commissioner of the Massachusetts Department of Food and Agriculture. Mr. Watson formerly chaired the science department of Charles River Academy and taught environmental science at the Thompson Island Education Center. He is an advisor to The *Buckminster Fuller Institute* and serves on the Board of *Ocean Arks International.*