From Mountaintops to Ocean Floors – and Ceilings: Maine's Offshore Wind Opportunities

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Emerging Issues in Renewable Energy Development



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Vision of the Governor



To achieve energy cost reductions while reducing Maine's dependency on foreign fossil fuel sources in a responsible, enduring manner. This includes pursuit of cost-effective energy efficiency opportunities and renewable, indigenous energy sources.



Office of Energy Independence and Security (OEIS)

- Advise the Governor and Legislature on energy policy and manage energy legislation on behalf of Governor.
- Develop <u>Comprehensive State Energy Plan.</u>
- Conduct studies on energy issues.
- Educate the public about energy issues.
- Serve as the State Energy Office to oversee State Energy Program, American Recovery and Reinvestment Act and other federal and state energy initiatives.
- Assist Maine businesses, non-profits, government entities and citizens to <u>pursue cost-effective federal</u>, <u>state and private</u> <u>energy efficiency</u>, <u>conservation</u>, <u>natural gas</u>, <u>renewable</u> <u>energy and other project opportunities</u>.







Governor's Office of Energy Independence and Security

Facilitating Public and Private Partnerships

State of Maine Comprehensive Energy Plan

- 1. Strengthening Energy Efficiency, Conservation and Weatherization
- 2. Fostering Renewable Energy
- **3**. Improving Transportation and Fuel Efficiencies
- **4.** Upgrading Electricity and Natural Gas Services, Transmission Systems and Infrastructure
- 5. State of Maine Leading by Example
- 6. Energy Emergency Preparedness and Response

Renewable Energy Plan



Regional Electricity Rates



28 coastal and Great Lakes states in continental United States use 78% of nation's electricity while facing higher retail electricity rates than inland neighbors.

- Mid-Atlantic and Northeastern coastal states face dual problem:
 - High electricity costs
 - Dependence on price-volatile supplies of fossil fuels for generation.



New England Energy Generation

- A range of sources including renewables, coal, nuclear, natural gas and oil.
- In-region and imports.
- Higher-thanaverage electricity prices.

New England's Generation by Fuel Type Regional Sources of Energy in the Year 2008





Regional Electric Generation Capacity Total Capacity <u>31,600 MW</u>

	MW	Percentage	
MA	13,300	42%	
СТ	7,900	25%	
NH	4,100	13%	
ME	3,300	10%	
RI	1,800	6%	
VT	1,200	4%	
Total	31,600	100%	





Source: ISO-NE

New England Wind Map (EIA)





Maine's Energy Consumption



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Maine Household Heating Oil (Future Metrics)

- The high percentage of households that use #2 heating oil (75 80% in Maine) drains dollars out of the Region.
- In 2007, 62% of the cost of a gallon was from the cost of crude and 16% from refining. The remaining 22% is for regional and local distribution costs and profits.

In other words, 78% of every dollar spent by the northeast states on heating oil leaves those states forever!

State	Occupied Households	Percent that Use #2 Heating Oil	Average Gallons Used per Year	Average Total Expenditure Per Year (at \$2.80/gal)	Amount that Does <u>not</u> Stay in the States ANNUALY
Maine	542,000	80%	390,240,000	\$ 1,092,672,000	\$ 852,284,000
Vermont	251,000	59%	133,281,000	\$ 373,186,800	\$ 291,086,000
New Hampshire	501,000	58%	261,522,000	\$ 732,261,600	\$ 571,164,000
Total			785,043,000	\$ 2,198,120,400	\$ 1,714,534,000



Options for Northeast to Satisfy Energy Needs

- New conventional power (coal, oil, natural gas, nuclear)
- Distributed Generation
- Energy Storage
- Energy Efficiency and Conservation

New renewable resources and generation



All Energy Sources Beneficial, BUT...



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Low Hanging Fruit – Energy Efficiency

Weatherize by 2030: – 100% of Maine residences - 50% of Maine businesses Achieve energy savings by 2020 of at least: - 30% of electric consumption - 30% of natural gas consumption 20% heating fuels consumption





Maine Renewable Portfolio Standard

Requires 40% renewable power generation...

- ...with 10% new renewable energy resources by 2017.
- Primarily biomass, wind & landfill gas.







Maine's Current Renewable Energy Mix

Maine is already New England's largest renewable energy power producer

- 36% of NE's Hydro-Electric capacity
- 20% of NE's biomass energy
- 95% of NE's operating wind capacity
- 50% of NE's wind projects under development



"It is important that the world knows what's happening here in Maine. Maine isn't playing around, and Maine isn't playing around for second place!" Ken Salazar, U.S. Secretary of Interior, August 2011

Wind Power Development Goals

- At least 2,000 Megawatts (MW) of installed capacity by 2015;
- At least 3,000 MW of installed capacity by 2020, of which there is a potential to produce 300 MW of offshore wind power.
- At least 8,000 MW of installed capacity by 2030, including 5,000 MW from generation facilities located in coastal waters, or in proximate federal waters.
- Passed legislation that streamlined the wind development permitting process.





Wind Projects in Maine

- 1. Mars Hill
- 2. <u>Stetson Ridge</u>
- **3**. <u>Beaver Ridge</u>
- 4. <u>Kibby Mountain</u>
- 5. <u>Number Nine</u>
- 6. <u>Oakfield</u>
- **7**. <u>Rollins</u>
- 8. <u>Kibby Expansion</u>
- 9. <u>Highland</u>
- 10. <u>Record Hill</u>
- 11. <u>Black Mountain</u>
- 12. <u>Stetson II</u>
- 13. <u>Vinalhaven</u>
- 14. Spruce Mountain
- 15. <u>Saddleback Ridge</u>
- 16. <u>Bowers Mountain</u>
- 17. <u>Bull Hill</u>
- 18. <u>Fletcher Mountain</u>
- 19. <u>Bingham</u>



Source: Natural Resources Council of Maine

Land-Based Wind Development Progress



- 6 large scale wind projects operating with total capacity 265.5 MW
- 2 large scale under construction with potential total of 115MW
- 3 projects permitted w/ 102 MW
- 7 projects under development with potential 533.50 MW
- Maine has met 13.28% of 2015 goals and significantly higher if all in development are constructed and operated



Land-Based Wind Benefits

- Reduction of dependence on fossil fuels
- Creation of jobs and other economic benefits, especially in rural areas
- Generation of renewable, sustainable energy
- Reduction of greenhouse gas emissions and industrial pollution



Land-Based Wind Issues

- Noise and visual standards
- Health impacts and setback requirements
- Property values, tangible benefits & community benefit packages
 - Construction-related employment
 - Local purchase of materials
 - Operation and maintenance employment
 - Reduced property taxes
 - Reduced electricity rates
 - Natural resource conservation
- Small community-based wind





Status of Off-Shore Energy

- Generation of electricity from off-shore wind in R&D phase and not reached commercial application.
- Current electricity costs for offshore wind reflect:
 - Installed costs per MW \$5-6 million range (generation cost app. 27 cents/kWh) based on European data
 - High project capital costs

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- Relatively high financing costs due to risk, new industry, recovering financial sector conditions
- Full-scale floating commercial project could be in 2017-20 timeframe.
- Extensive R&D and pilot scale work to prove floating designs can be functional and financially competitive.
- Currently more than 830 offshore bottom-mounted wind turbines installed in Europe, totaling more than 2 GW in 39 wind farms in 9 European countries.



Key Challenges of Offshore Wind

- Relatively high cost
- Technical challenges of installation and grid interconnection
- Infrastructure challenges
- Permitting challenges related to lack of site data and lack of experience with permitting processes
- Shortage of critical data on installation, operations and maintenance of turbines
- Financing charges roughly half of cost





National Offshore Wind Strategy

- 54 GW of offshore wind generating capacity by 2030 at a cost of \$0.07 per kilowatt-hour (kWh) (interim 10 GW by 2020 at \$0.10/kWh)
 - Equivalent of 10,000 15,000 wind turbines (compared to zero today)
- Objectives: Reduce cost and deployment timeline.

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- Increased use of offshore wind for home heating and transportation
- Focus Areas: Technology development, market barrier removal, advanced technology demonstration.
- Smart from the Start: Streamline approval process of individual projects, expedite leasing, process transmission applications
- <u>http://www.doi.gov/news/pressreleases/Salazar-Chu-Announce-Major-Offshore-Wind-Initiatives.cfm</u>

Maine Ocean Energy Strategy

- On-going efforts to form working relationships among federal, tribal and state government officials regarding environmental permitting and leasing of renewable ocean energy development in federal waters off Maine's coast.
- MPUC request for proposals for sale of renewable ocean energy.
- Ongoing efforts to inform key ocean users and stakeholders.
 Three sites chosen for offshore wind: Boon Island, Monhegan Island and Damariscove Island.
- Goal of 5 GW of <u>energy</u> generation from facilities located in coastal waters by 2030.



Ocean Energy Task Force (2009)

- Identify economic, technical, regulatory and other obstacles to grid-scale offshore wind resources.
- Promote R&D to facilitate siting.
- Foster in-state businesses.
- Encourage tidal and wave energy development.





Offshore Energy Law

Public Law 2009, chapter 270

- Streamlines state permitting of offshore wind and tidal energy demonstration.
- Public Law 2009, chapter 615
 - Sets wind goals
 - Streamlines permitting and leasing
 - Directs MPUC to issues RFP for price-capped, longterm contracts for up to 25 MW of deep-water offshore wind power and 5 MW of tidal power.





Millions in Federal dollars have been secured.

- Environmental research
- Workforce development
- Proof-of-concept testing on 100 kW wind turbine mounted on floating deep water platform.
- Goal is to design and test large scale, floating, offshore wind platforms.

If off-shore wind can become cost-competitive, Maine could be industry leader in R&D, manufacture, fabrication and construction.



DeepCwind Consortium

- Establish the State of Maine as a national leader in <u>deepwater</u> offshore wind technology.
- Research initiative funded by the <u>U.S. Department of Energy</u>, the <u>National Science Foundation</u>, and others.
- Includes universities, nonprofits, and utilities; a wide range of industry leaders in offshore design, offshore construction, and marine structures manufacturing; firms with expertise in wind project siting, environmental analysis, environmental law and energy investment; and education and tech transfer entities
 - U. Maine; Reed & Reed; Island Institute; Gulf of Maine Research Institute; National Renewable Energy Lab; Cianbro; Bangor Hydro; CMP; others.
 - http://www.deepcwind.org/



Maine Offshore Wind Plan

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MPUC Long-Term Contract



Proposals from energy developers to

- Supply up to 25 MW of energy from one or more deep-water offshore wind energy pilot projects and up to 5 MW from tidal energy demo projects;
- At a location 300 feet or greater in depth;
- No less than 10 nautical miles from any land area of the State, including inhabited islands.
- Opportunity for energy developer to get a long-term contract for its power to help secure funding needed to build the project.
- Sets a cap on the price that a developer may be paid under the long-term power contract to minimize the additional, related cost to electric ratepayers while helping to jump-start Maine's ocean wind industry.
- http://www.maine.gov/mpuc/electricity/rfps/standard_offer/deepwater2010/



MPUC Long Term Contract Criteria

- Quantified tangible economic benefits to State, including goods/services to be purchased and use of local suppliers, contractors and others during contract term.
- Demonstrated experience in construction of floating wind turbines.
- Potential to construct deep-water offshore wind project of 100MW or greater at reduced rates.
- Demonstrated commitment to invest in manufacturing facilities in Maine applicable to component, turbine, blade, foundation or maintenance facilities.
- All federal support for the project to be included in bid price.

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Mitigated impact on ratepayers by using lease revenues, providing an "ocean wind green power" option and other funding sources.



BOEMRE – Maine Renewable Energy Task Force

- Bureau of Ocean Energy Management, Regulation and Enforcement (BOEMRE) – lead federal agency for environmental review and leasing for renewable ocean energy projects on the OCS.
- Consultation with state, federal, Indian and local governments non-regulatory.
- Identify potential issues, areas and information needs and how to work efficiently to streamline review process.
- www.boemre.gov/offshore/renewableenergy/stateactivitiesprojects.h tm.
- www.maine.gov/spo/specialprojects/renewableoceanenergy/



Governor's Off-Shore Wind Policy

- Reduction of electricity prices
- Lowering overall costs of energy
- Environmentally responsible and sustainable resources
- Achieve economic development through R&D and manufacturing of emerging technology
- Ensure that development costs do not become a burden to Maine ratepayers





Public/Private Partners

Federal

- Department of Energy
- Department of Interior
- Maine Congressional Delegation

State

- Office of Energy Independence and Security
- State Planning Office
- Economic and Community Development
- Conservation
- Marine Resources
- Inland Fisheries and Wildlife
- Environmental Protection
- Maine Legislature

University of Maine



- Regional
 - ISO New England
 - New England and Mid-Atlantic States
 - Eastern Canadian Provinces
 - National Association of State Energy Officials
 - New England Governors' Renewable Energy Blueprint
 - Eastern Interconnection States' Planning Council
- Businesses
- Non-Profits

Regional Partnerships

- Expand cooperation on energy development and trade.
- Accelerated commercialization of on- and off-shore renewable energy resources:
 - In the Northeast AND
 - In Eastern Canada.
- States, utilities, grid operators, and others prepare for future growth in energy demand, renewable energy sources, and Smart Grid technologies.





New England Governors' Renewable Energy Blueprint



Working to Serve New England with Low Carbon, Secure, Cost-Effective Energy Resources September 15, 2009

Maine/Nova Scotia Ocean Energy Development MOU (2010)

- Share information on renewable electricity
- Focus on ocean tidal energy and offshore wind energy
- Explore opportunities to bring together tidal energy academics, researchers, policy makers and private sector developers from





U.S. Congress

- Production and Investment Tax Credits
- Loan guarantees
- Transmission planning framework
- Renewable energy provisions
- Tax Credit bill on offshore energy





Other Maine Renewable Electricity Initiatives

- Central Maine Power (CMP) Transmission Line Expansion/Maine Power Reliability Program (MPRP)
- Renewable Portfolio Standard
- Long-Term Contracting
- Smart Grid Investments
- Development of Energy Infrastructure Corridors
 - Establishes the use of state-owned lands or assets for energy infrastructure corridors
 - Dedicates funding for energy efficiency, renewable energy and efficient transportation.

Regional Greenhouse Gas Initiative (RGGI)

HAINE

Integration of Energy, Economic Development & Environmental Policies

Economic Development

- Provide jobs
- Invigorate Maine industry
- Energy Security
 - Get off oil!
 - Energy efficiency and conservation
 - Indigenous, renewable resources
- Environmental Quality
 - Decrease air pollutants



Governor's Office of Energy Independence and Security Facilitating Public and Private Partnerships



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