



ENERGY

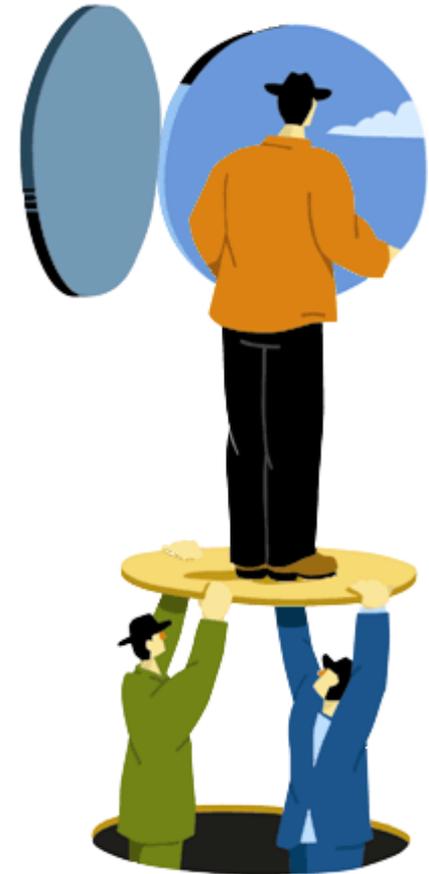
Offshore Wind Policy

U.S. Offshore Wind Market and Economic Analysis 2014

Presented by Michael D. Ernst, Esq.
Tetra Tech , Inc.

National Renewable Energy Laboratories
Offshore Wind Webinar
July 16, 2014

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Offshore Wind Market and Economic Analysis

Annual Market Assessment

Prepared for: U.S. Department of Energy

Annual Reports Published in 2012, 2013 and Fall 2014

Offshore Wind Supply Chain Report Published in 2012

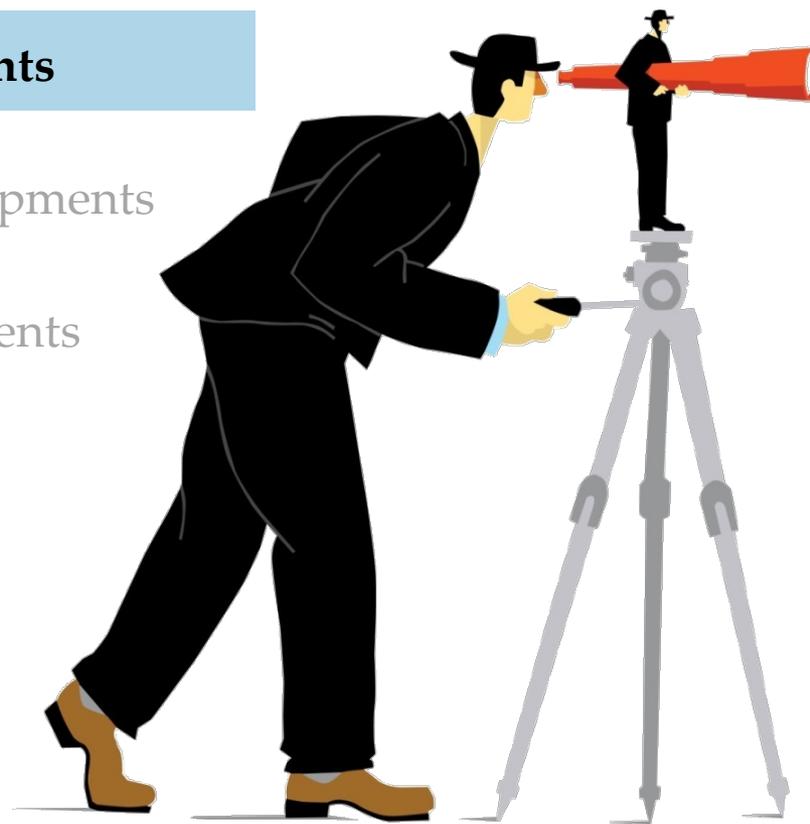
- » Navigant Consortium Member Organizations & Key Contributors
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 - Tetra Tech, Inc.: Michael D. Ernst, Esq.
 - American Wind Energy Association: Jeff Anthony and Chris Long
 - Great Lakes Wind Collaborative: John Hummer and Victoria Pebbles
 - Green Giraffe Energy Bankers: Marie DeGraaf, Jérôme Guillet, and Niels Jongste
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1 » U.S. Policy Developments

2 » European Policy Developments

3 » Asian Policy Developments



Basis for Federal & State Policies

- » Concern for Environmental, Public Health and Climate Impacts from Fossil Fuel Plants
 - Acid Rain
 - Mercury poisoning of freshwater fish
 - Asthma and other health impacts (Harvard & BU Public Health estimate costs of 9-27 c/kwh)
 - Global Warming, severe storms, and sea level rise
- » State Environmental Goals
 - State Renewable Portfolio Standards – 29 States: 16 to 40% Renewables by 2030
 - Greenhouse Gas Reductions – Regional Greenhouse Gas Initiative in Northeast
- » Federal Environmental Laws
 - Clean Air Act Regulation of NO_x, SO_x, VOCs, Particulates, CO₂
- » Policies to Achieve Goals
 - Federal
 - Production and Investment Tax Credits
 - Accelerated Depreciation Deduction
 - Grants & Loan Guarantees
 - EPA Regulation of Fossil Emissions
 - State
 - Renewable Energy Credits & Ocean RECs
 - RPS Alternative Compliance Payments & Grants
 - Mandatory Long Term Contracts for Renewables

U.S. Federal Policies for Offshore Wind

DOE National Offshore Wind Strategy

- DOE Offshore Wind Initiative
- Advanced Technology Program & Grants
- DOE Guaranteed Loan Program

Federal Tax Credits & Deductions

- Production Tax Credit
- Investment Tax Credit
- Accelerated Depreciation Deduction

Bureau of Ocean Energy Management Initiatives

- Smart from the Start
- Rules Revisions
- Research Studies
- Competitive Auction Lease Process

DOE Offshore Wind Initiative

- » 2008 DOE Target: 10 GW by 2020 and 54 GW by 2030 (20% of U.S. Generation)
- » 2014 Draft DOE Wind Vision Report will update projections and provide new roadmap
(Final targets are not yet public, but are tentatively lower while still substantial)
- » Technology Development
 - 41 Offshore Wind Grants for \$43 Million in 2011
 - Massachusetts Blade Testing Center
 - Clemson Turbine Test Center
- » Market Barrier Removal
 - Navigant-led US Market & Economic Analysis Studies 2012-14
 - Navigant-led US Supply Chain Study – 2012
- » Advanced Technology Demonstration
 - DOE announced 7 Technology Development Partnerships
 - Achieve large cost reductions over existing technologies
 - Initial Funding: \$4 million granted in 2012 for 7 project s' engineering & site studies
 - Additional Funding: \$47 million granted in May 2014 over 4 years for design, fabrication, and deployment for commercial operation of 3 projects by 2017 plus \$3 M for two projects

Federal Tax Credits & Deductions

- » Production Tax Credit
 - 2.3 cents per kWh of electricity generated and sold by utility-scale wind turbines (indexed for inflation)
 - Extended to December 31, 2013
 - Commence Construction
 - Start physical work of a significant nature (foundation excavation, the setting of anchor bolts into the ground, or the pouring of the concrete pads of the foundation); OR
 - Incur 5% of total project cost; to be claimed by Cape Wind & Deepwater Wind Block Island

- » Investment Tax Credit
 - 30% of value of investment at time of investment (more helpful to OSW with long lead times)
 - Extended to December 31, 2013
 - Bi-Partisan Proposal to extend for 3000 MW or conventional extension in 2014
 - Major tax reform effort for 2014 has faltered so renewed focus on tax extender bill approved by Senate Finance Committee in March 2014

- » Modified Accelerated Cost-Recovery System (MACRS)
 - Depreciation deductions over 5-years
 - Deadline for 50% 1st-year bonus depreciation placed in service by 12/31/13.

- » Master Limited Partnerships
 - Extend MLP multi-investor eligibility from fossil fuel plants to renewable energy plants

BOEM Guidance

- » BOEM Guidelines
 - Avian Study Guidelines
 - Benthic Habitat Guidelines
 - Spatial Data Guidelines
 - Guidelines for Providing Geological and Geophysical, Hazards, and Archaeological Information
 - These and more Guidelines available at <http://www.boem.gov/National-and-Regional-Guidelines-for-Renewable-Energy-Activities/>
- » BOEM Workshop: Offshore Wind Energy Development Site Assessment and Characterization: Evaluation of the Current Status and European Experience: <http://www.boemwindworkshop2.com/>
- » Fishing/Offshore Wind Mitigation Measures Development Workshops (Winter 2012)
- » Multi-purpose Marine Cadastre - GIS Database
- » BOEM leadership in negotiations with vessel owners and USCG on shipping lanes (Atlantic Coast Port Access Routes Study ongoing)

BOEM Offshore Wind Competitive Lease Process

- » State Task Forces Identify Constraints and Computing Uses & Identify Initial Call Area
- » BOEM Call for Information and Nominations & Environmental Assessment
- » Determination of Competitive Interest
- » Determination of Wind Energy Area boundaries
- » Proposed Sale Notice
- » Final Sale Notice & Environmental Assessment
- » Legal, Technical and Financial Qualification of bidders
- » Competitive Auction
- » Negotiate Lease
- » Site Assessment Plan for Meteorological Facilities
- » Construction and Operations Plan & EIS
- » Certified Verification Agent approves Design & Construction Plans

Federal Approvals

- » CZMA Consistency Determination for SAP and COP (State Agency)
- » NOAA Letter of Concurrence to support Geophysical surveys activities
- » USACE Section 10/404 Permit
- » NOAA Incidental Harassment Authorization/Incidental Take (IHA/ITS) Permits under ESA and Marine Mammals Protection Act
- » EPA Air Permit (construction vessel emissions)
- » USFW Consultation and possible Incidental Take Permit under ESA for Eagles or EFH for endangered species, and Migratory Bird Treaty Act
- » Advisory Council on Historic Preservation & SHPO Consultation under NHPA
- » Dept. of Defense Consultation for military practice areas and defense radar
- » USCG Private Aid to Navigation (PATON) and Local Notice to Mariners (LNM)

Typical State and Local Approvals

- » State Siting Board for Transmission Interconnection
- » State Submerged Lands Easement (state waters)
- » State Tidal and Freshwater Wetlands Permits
- » Coastal Erosion Permit
- » 401 Water Quality Certification
- » NPDES Stormwater Construction Permit
- » State Highway Construction Permit
- » State Environmental Protection Act, if applicable

- » Local zoning and building code approvals for interconnections & substations

- » STEEL IN WATER!!

Overcoming Significant Environmental Issues

- » Birds & Bats – 2 years of pre-construction studies + post construction studies – focus on migratory, threatened and endangered species
- » Shipping routes – Negotiate shipping lane buffers & warning devices (Atlantic Coast Port Access Route Study)
- » Commercial Fishing – Avoid or accommodate within wind park
- » Marine Mammals – Independent observers & protection measures
- » Cultural Issues – Archeological studies – GGARCH Guidelines
- » Military Practice Areas - Negotiate with DOD
- » Radar Interference – Negotiate with DOD & FAA
- » Visibility from Sensitive Viewpoints – Minimize by siting further offshore: 12 – 20 miles
- » Icing – Foundation skirts & equipment protection

Status of BOEM Competitive Auction Processes

- » Rhode Island/Massachusetts
 - 2 Lease Areas capable of hosting 3,400 MW of OSW
 - Deepwater Wind wins both auctions for \$3.8 million & signed lease September 12, 2013
- » Virginia
 - 1 Lease Area capable of hosting over 2000 MW 25 miles off Virginia Beach
 - Dominion wins for \$1.6 million & signed lease October 22, 2013
- » Maryland
 - Final Sale Notice in July 2014 for Auction August 19, 2014
 - 2 Lease Areas capable of 850 to 1450 MW total 10 miles off Ocean City, MD
- » Massachusetts
 - Proposed Sale Notice June 2014
 - 4 Lease Areas capable of hosting over 1000 MW of OSW each 12 miles south of Martha's Vineyard
- » New Jersey
 - NREL to propose 2 to 3 Lease Blocks to auction for up to 3100 MW total capacity
 - Developing ORECs since 2011; rejected two Fishermen's Energy OREC requests
- » New York
 - Call for Information & Nominations in May 2014 for NYPA/LIPA/ConEd site 12 miles South of Long Island
 - NY studying boundaries of larger WEA outside NYPA site

State Offshore Wind Policies & Development Process Status

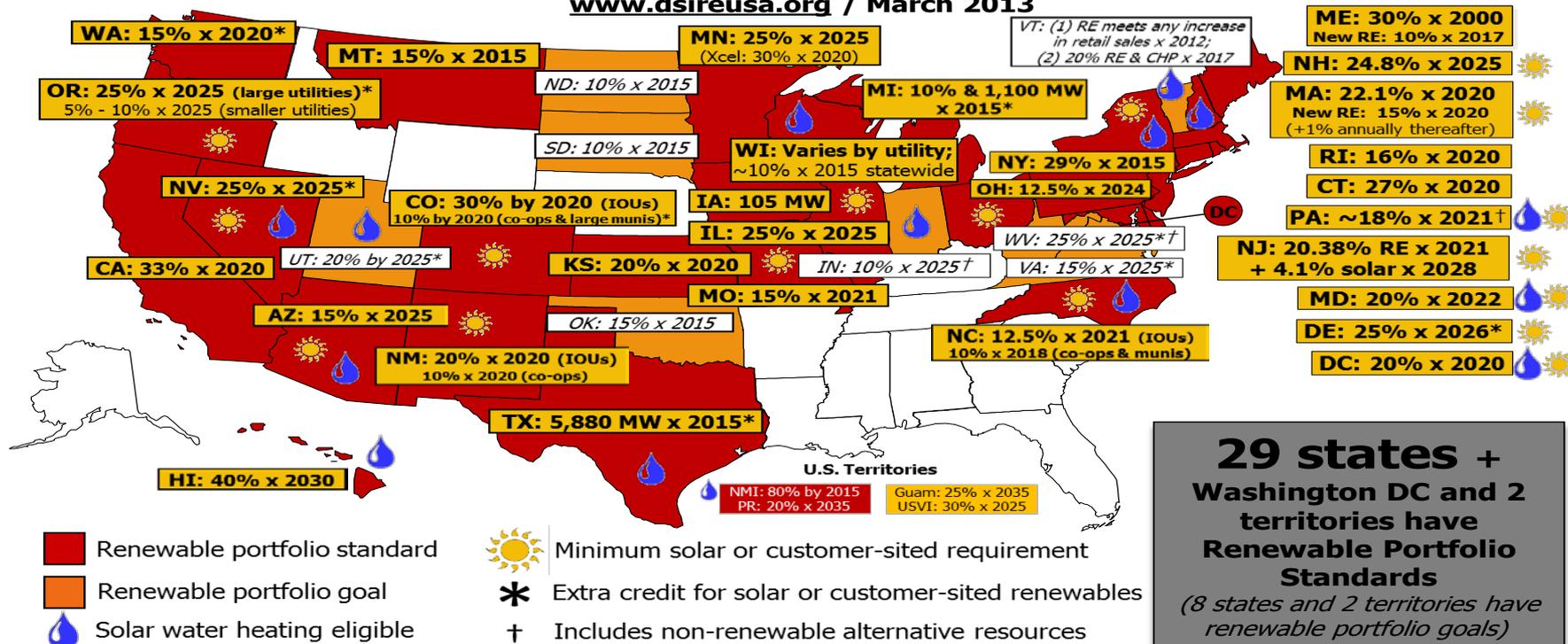


State Renewable Portfolio Standards



Renewable Portfolio Standard Policies

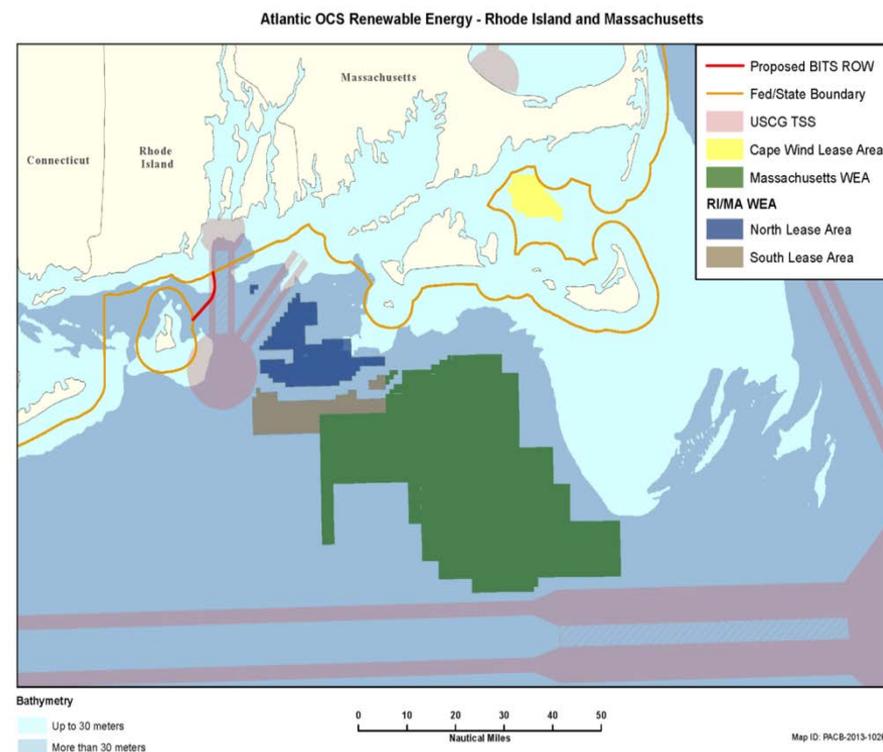
www.dsireusa.org / March 2013



29 states + Washington DC and 2 territories have Renewable Portfolio Standards
(8 states and 2 territories have renewable portfolio goals)

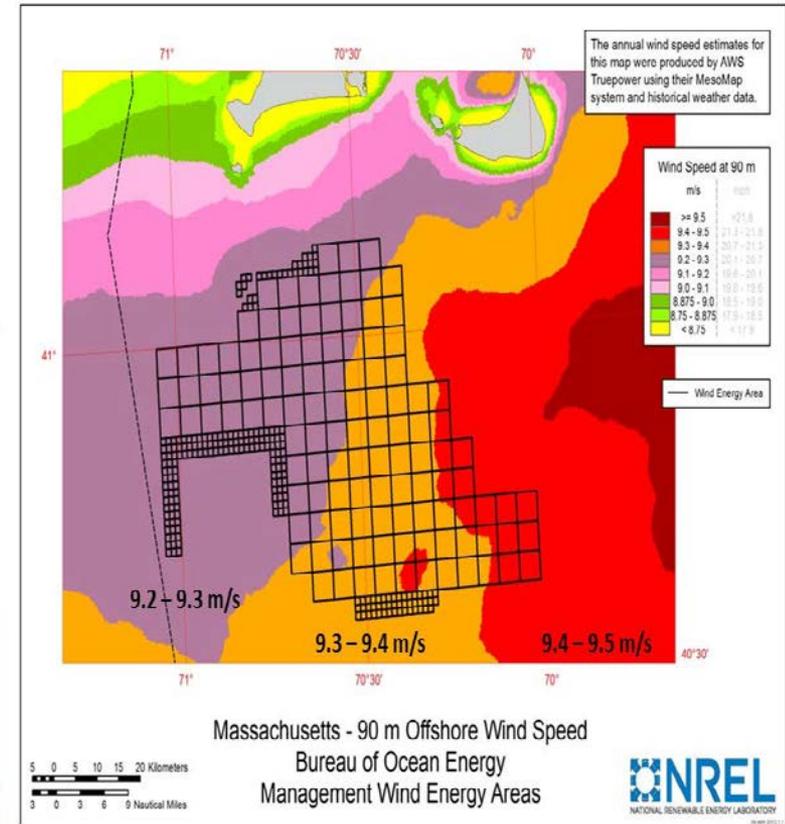
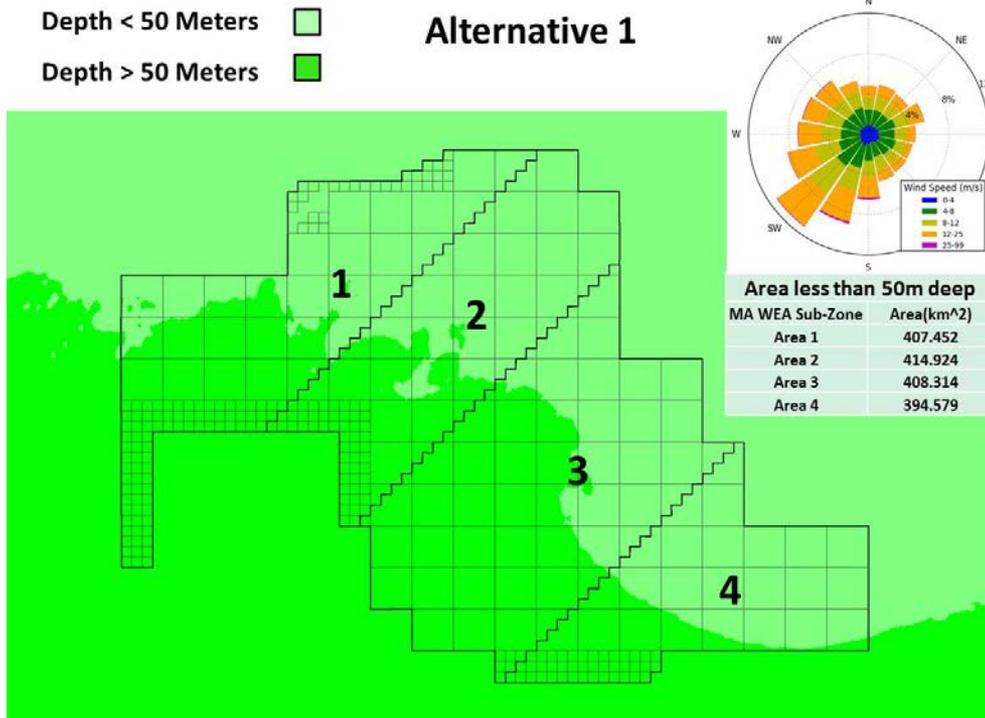
Massachusetts

- » Green Communities Act
 - 15 Year Contracts for 7% of all generation for renewables by 2015
 - Cape Wind PPAs with National Grid & NSTAR for 363 MW (77.5% of the full potential output)
 - 18.7 cents/kWh plus inflation
 - Independent analysis: peak demand coincident wind energy price suppression could exceed \$7 billion lifetime
- » BOEM Lease Process
 - Cape Wind Lease granted 2011
 - Resolution of litigation expected in 2014 (26 so far)
 - Final geotechnical surveys and financing in 2014
 - \$1.4 billion debt financing announced of \$2.6 B
 - Construction planned to commence 2015
 - Massachusetts Wind Energy Area
 - Proposed Sale Notice for Auction Late 2014
 - NREL proposes 4 areas totaling ~5000 MW
- » \$100M New Bedford Marine Terminal Grant
- » 3600 MW Coordinated Competitive Bid in New England for Renewables & Hydro proposed for 2014 (ME, VT, NH, MA, CT, RI)



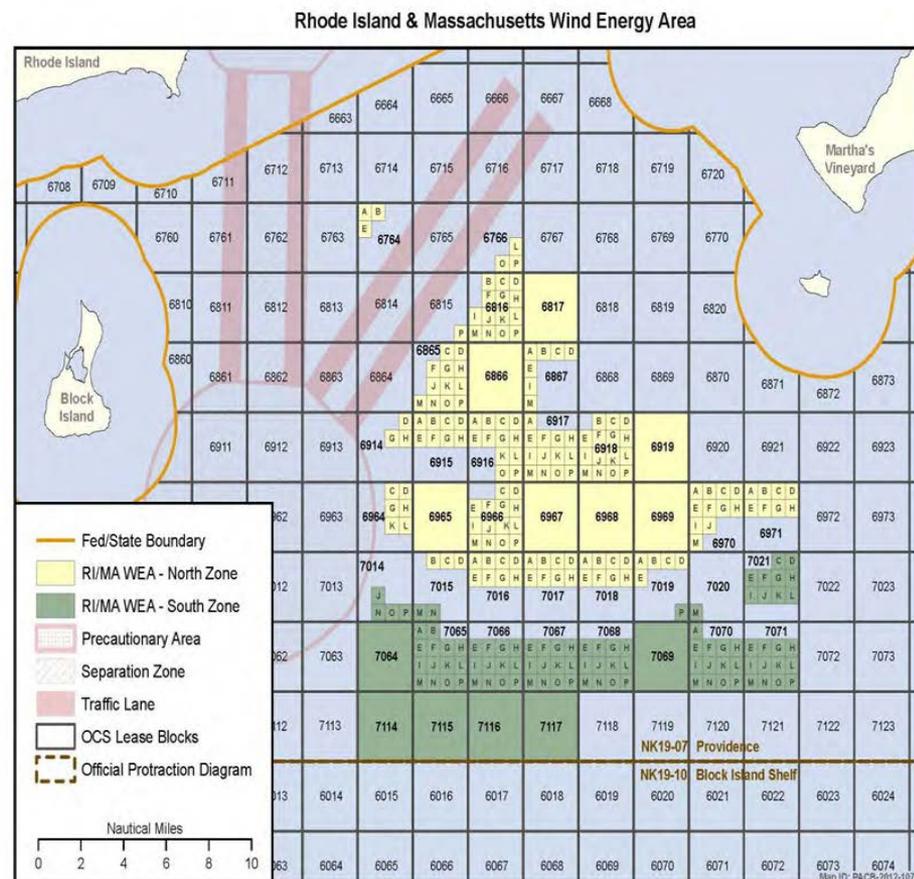
Massachusetts

- » Massachusetts Wind Energy Area
 - Proposed Sale Notice June 2014
 - NREL proposes 4 or 5 bid areas totaling ~5000 MW
 - Auction planned for late 2014 for 4 areas



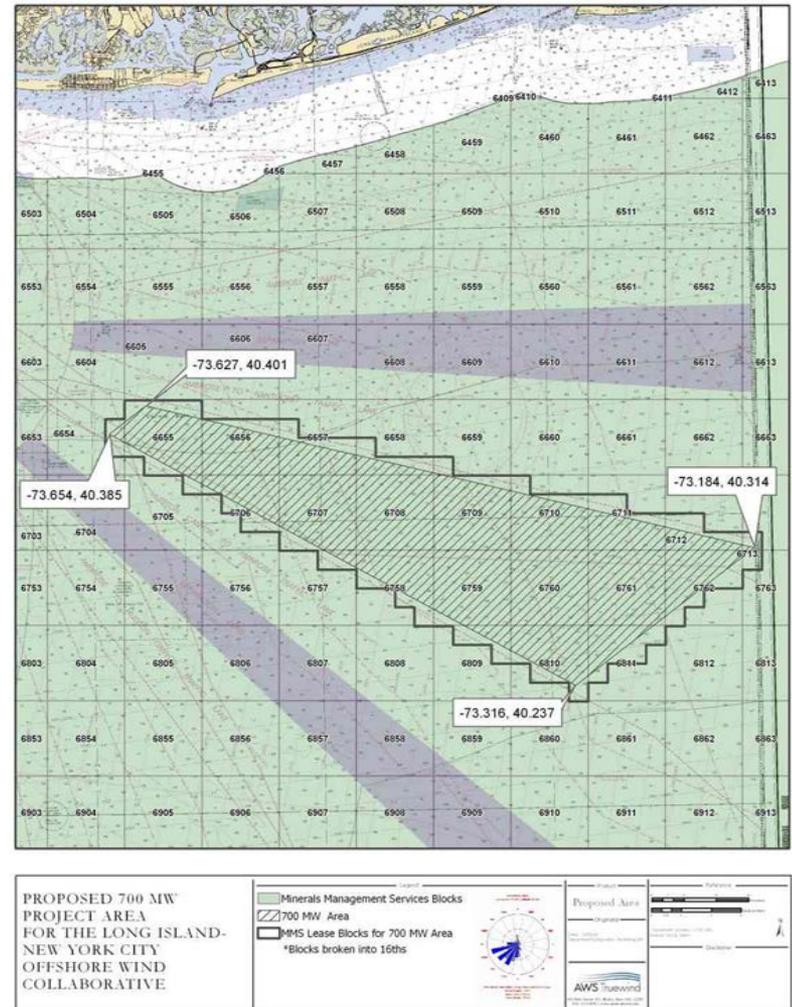
Rhode Island

- » 2008 RFP Identified Deepwater Wind as Preferred Offshore Developer
- » Special Area Management Plan identified preferred offshore sites
- » Deepwater Wind Block Island Wind Farm
 - National Grid signed 15-year PPA with for 30 MW at 24.4 cents/kwh
 - Rhode Island Legislature broadened “commercially reasonable” for PUC and Supreme Court approvals
 - Met 5% ITC/PTC requirement in Dec. 2013
- » Rhode Island and Massachusetts Joint Area of Mutual Interest
 - BOEM conducted first-ever federal OSW auction in July 2013
 - o Two zones auctioned within the WEA: 97,500 acres (1,955 potential MW) and 67,250 acres (1,440 potential MW)
 - o Deepwater Wind was the winning bidder, with a bid of \$3.8 million for the two sites.
 - Final approvals expected in 2014 to build cable in 2015 and wind farm in 2016



New York

- » 2008 LIPA Long Island Offshore Wind Park RFP
- » 2010 NYPA Great Lakes Offshore Wind RFP
- » 2012 NY Energy Blueprint: Explore Offshore Wind
 - State funded environmental and economic studies
- » 2012 NYPA, LIPA & Con Ed Unsolicited Lease Nomination
 - 2013 Request for Interest
 - o Fishermen’s Energy & EMI (Cape Wind) expressed interest in site
 - BOEM issued Call for Nominations June 2014
- » NY Offshore Task Force & Lease Auction
 - NY issued Offshore Atlantic Ocean Study in October 2013 to help identify Wind Energy Areas
 - BOEM to issue Call for Information and Nominations for large WEA off NY

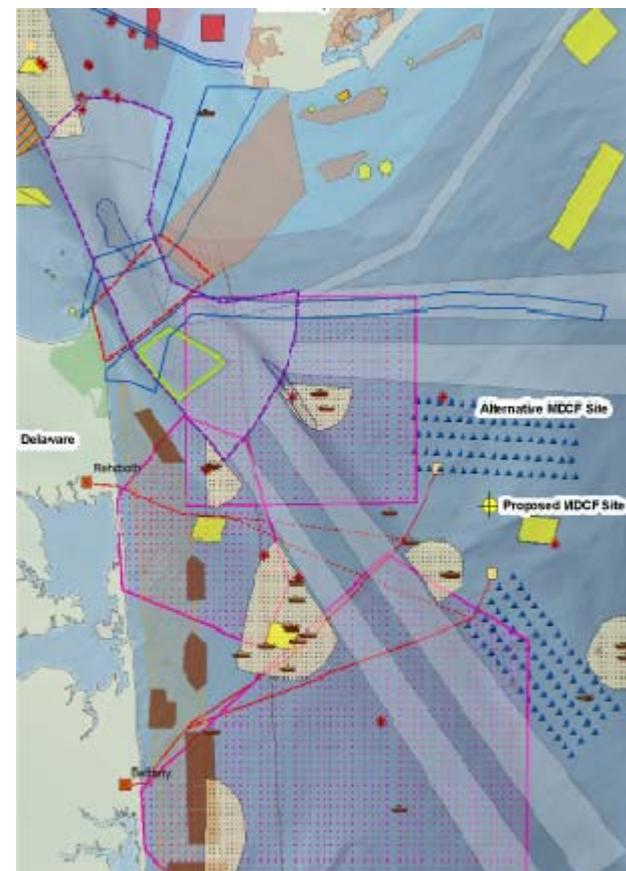


New Jersey

- » Competitive RFP Selected 3 Preferred Developers
 - State Grants Offered for \$4 Million for Met Systems
 - BOEM Interim Policy Leases for Site Assessment
- » Offshore Wind Economic Development Act – 2010
 - Ocean Renewable Energy Credits
 - 1100 MWs of Long Term Contracts for ORECs
 - Must meet broad cost : benefit test
 - Board of Public Utilities setting regs: 2010-2014
- » Fishermen's Energy 30 MW Pilot off Atlantic City in State Waters
 - State Permits granted in 2012
 - DOE Grant for \$4 Million
 - Request to Board of Public Utilities for ORECs at 19.9 cents/kwh denied
 - Fishermen's announced plans to appeal
- » BOEM Process
 - BOEM Call for Information 2012
 - NREL Determining 2-3 Lease Blocks for competitive auction
 - Proposed Sale Notice planned in 2014

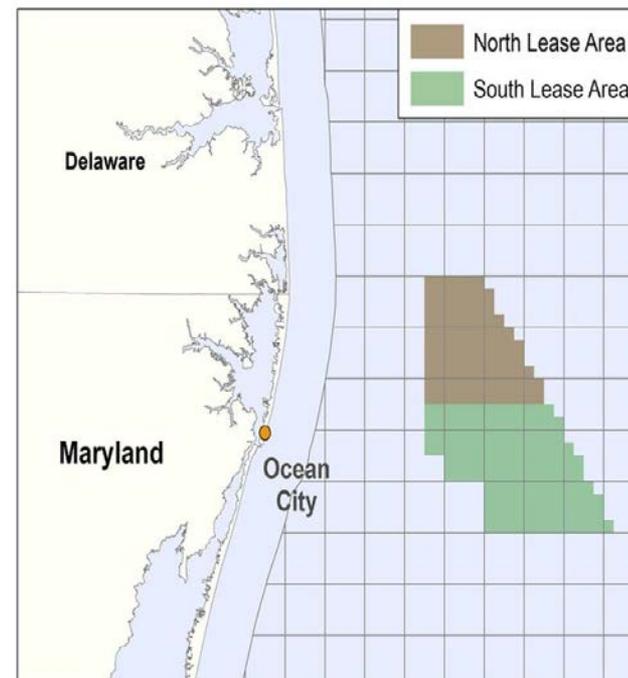
Delaware

- » 2007 RFP Selected Bluewater Wind 350 MW Wind Farm
 - DelMarva signed 25-year PPA for 200 MW in 2009
 - BOEM determined No Competitive Interest 2011
 - NRG/Bluewater Wind withdrew from PPA in 2012
 - BOEM grants lease in 2012
 - NRG reported to be seeking partner or sale of lease
 - SAP to be filed with BOEM in 2014



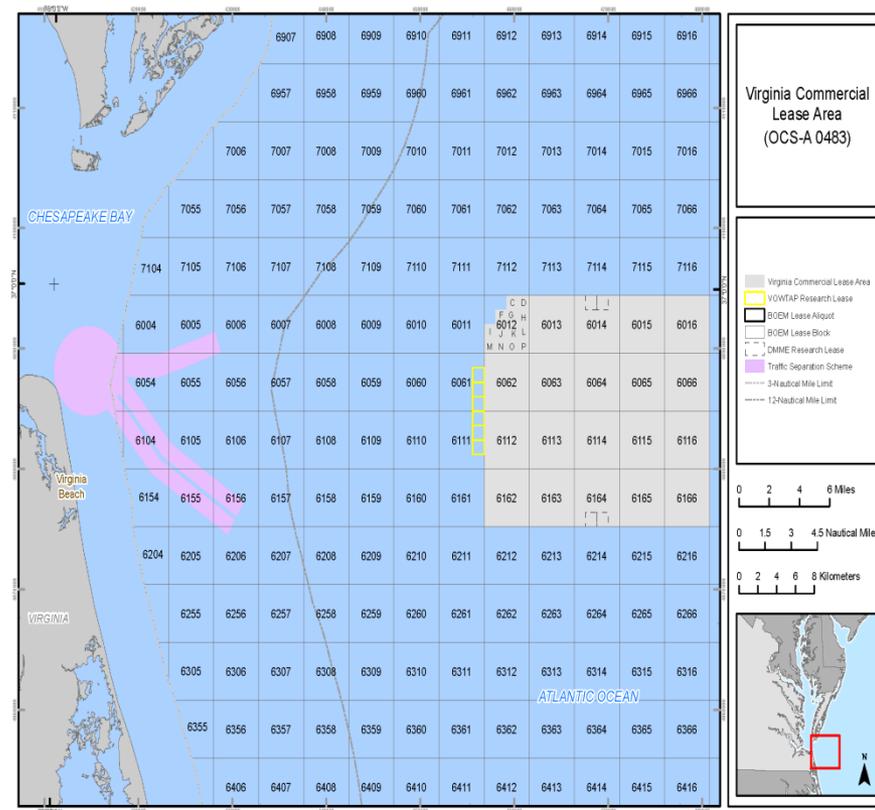
Maryland

- » Maryland Offshore Wind Energy Act of 2013
 - Requires 2.5% of generation from Offshore Wind by 2017
 - Established ORECs for 200 MW offshore wind
 - Authorizes up to 19 cents/kwh for offshore wind
 - Maximum rate impact of \$1.50/month per ratepayer
 - Consultants supporting development of OREC regulations
- » BOEM Process
 - WEA reduced to 9 Lease Blocks due to conflicts and constraints
 - Call for Nominations in 2012 – 6 lease nominations
 - BOEM planning competitive auction
 - BOEM Proposed Sale Notice December 2013
 - Public Sale Seminar January 2014
 - 16 bidders prove technical, legal and financial qualifications
 - Final Sale Notice July 2, 2014 for Auction August 19, 2014
- » Maryland Studies
 - Maryland has conducted geophysical, geotechnical and ecological surveys in WEA
 - Maryland Energy Administration issued Request for Information on meteorological surveys options



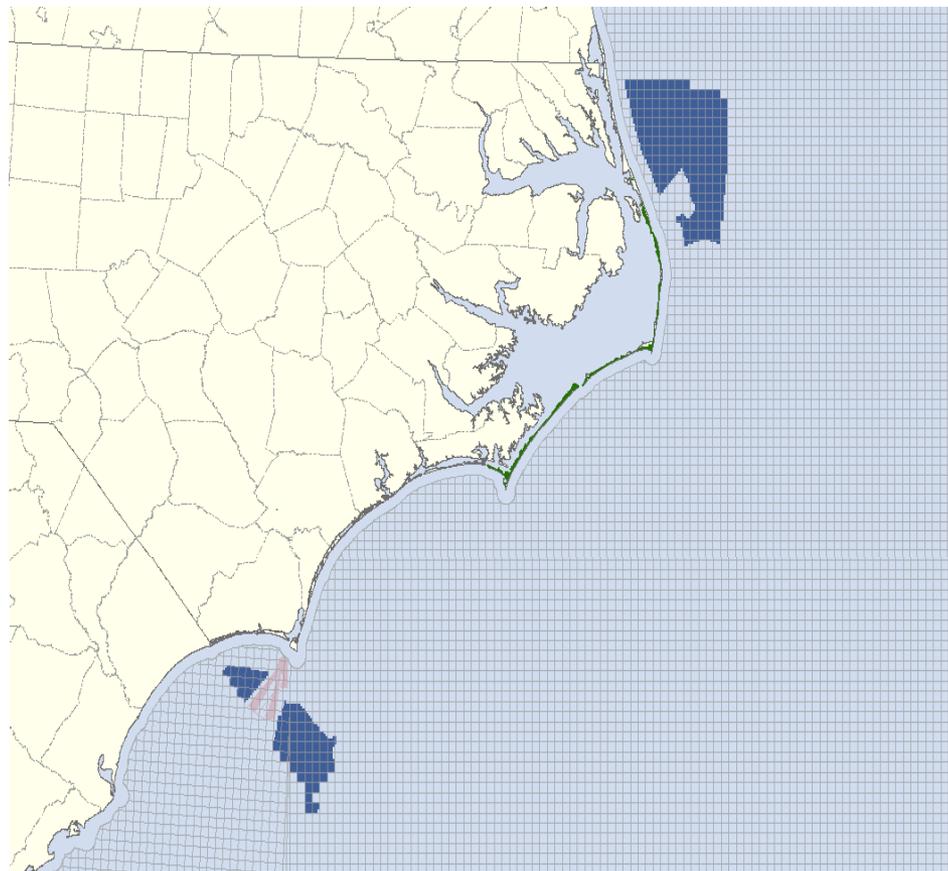
Virginia

- » Virginia Electric Power (Dominion) Pilot Project
 - 2 6-MW Turbines on Twisted Jacket Foundations
 - Adjacent to VA WEA east border
 - DOE \$4 M Grant
- » State leasing 2 sites on north & south WEA borders for met systems
- » BOEM auction in September 2013
 - Single 112,800-acre site in WEA with potential for over 2,000 MW
 - Dominion Virginia Power was the winning bidder at \$1.6 million & signed lease
- » Submitted Research Activities Plan (RAP) in February (like General Activities Plan)
 - BOEM issued NEPA EA NOI on March 13 with public scoping meeting on April 4
 - BOEM RAP approval target is Q1 2015
- » Construction commencement target Q1 2017
- » VA PUC could allow construction work in progress payments prior to wind farm completion



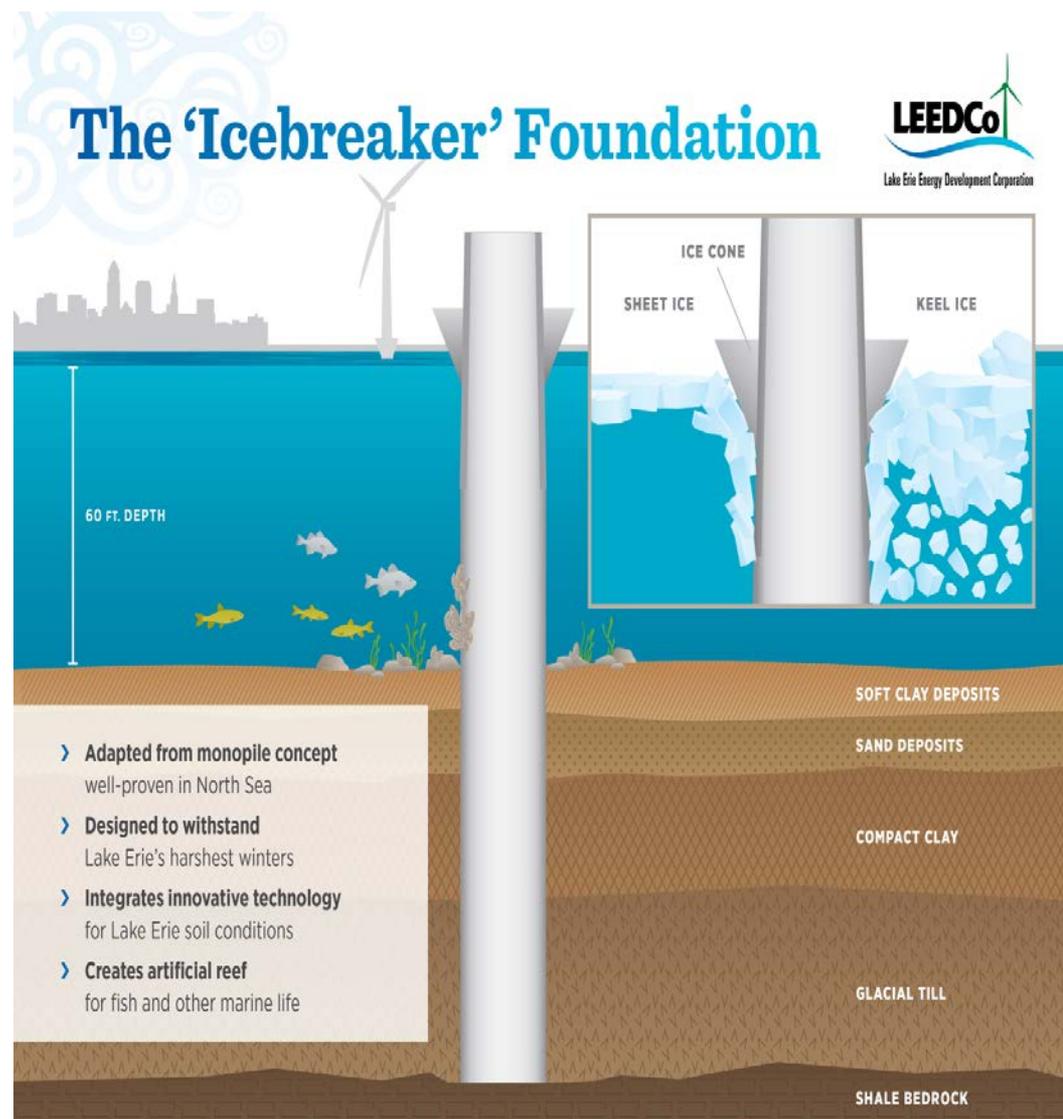
North Carolina

- » New Republican Governor Pat McCrory announced support for offshore wind and BOEM leasing process; drafting legislation
- » BOEM Call for Nominations in December 2012
 - 3 WEAs
 - 5 lease nominations
 - Major constraints
 - Visibility from National Seashores
 - Major shipping routes through WEAs
 - Commercial Fishing
 - Finalizing WEA after consultations with shippers, Coast Guard, military and fishermen with major revisions likely
 - Proposed Sale Notice in late 2014 or 2015



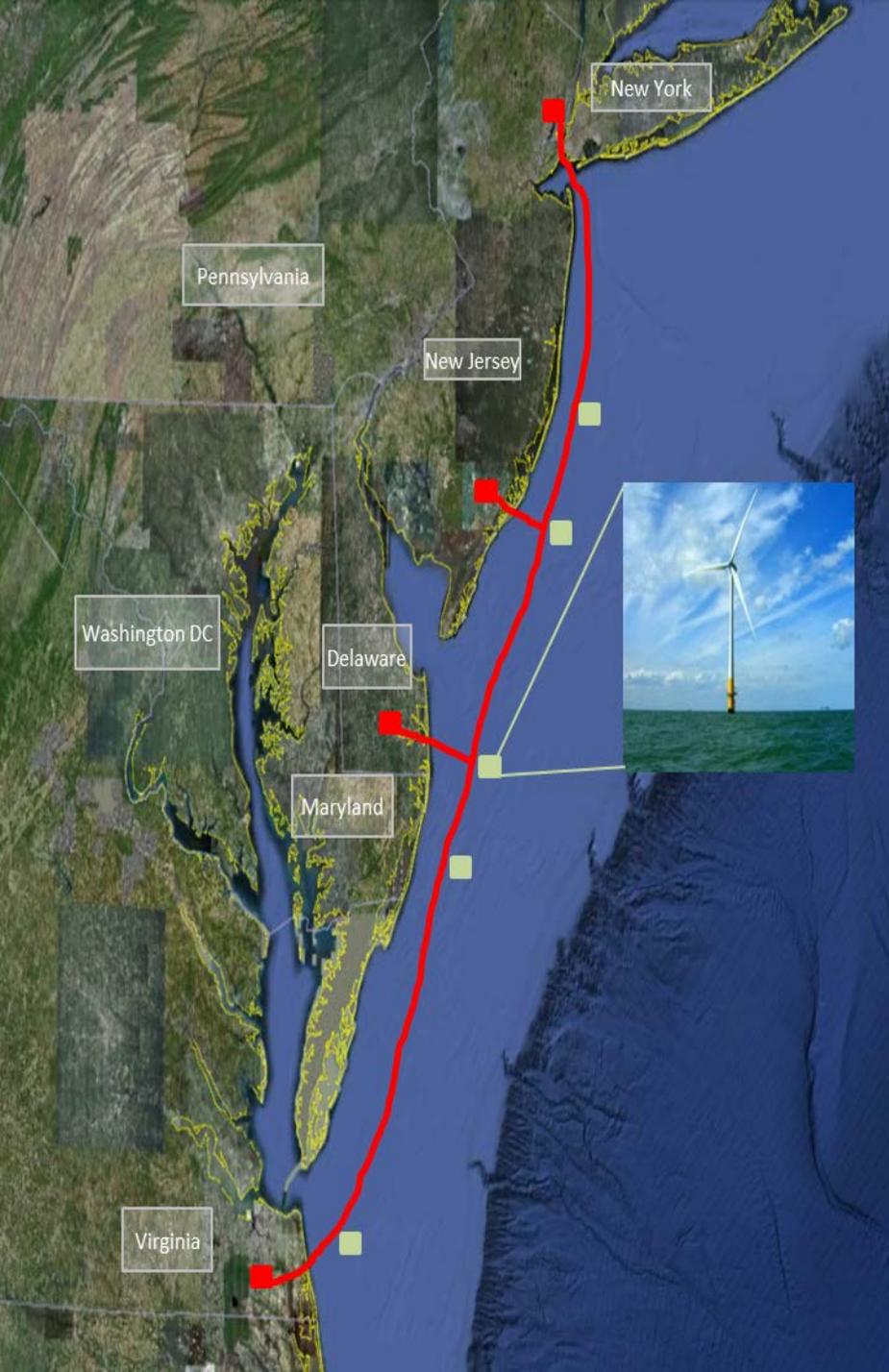
Ohio

- » Lake Erie Economic Development Corporation Offshore Pilot
- » Project partnership: Ashtabula, Cuyahoga, Lorain and Lake counties, City of Cleveland, The Cleveland Foundation and NorTech
- » 6 3-MW direct drive turbines on “ice breaker” monopiles
- » 7 miles off Cleveland shoreline
- » Received additional \$3 million investment from the U.S. DOE
- » Avian surveys since 2010 from water outfall structure



Atlantic Wind Connection New Jersey Energy Link

- 10 year plan to build 350 mile subsea HVDC transmission system off mid-Atlantic states in 5 phases
- Enables up to 7,000 MW of offshore wind to be developed with 4 onshore cable interconnections – not 10 or 12
- Reduces environmental impact of interconnection cables at coast
- Helps make offshore wind affordable
- Enables replacement of 5 coal plants – 16 million tons of CO₂
- Is buildable because it can be permitted
- Makes the PJM grid more robust
- \$43 billion in benefits from transmission and offshore wind
- Private venture – Google et al
- Seeking PJM and NJ PUC (BPU) OK for ratepayer funding



Summary of State Policies that Promote Cost-Competitiveness of OSW

- » Renewable Portfolio Standards
 - ME, MA, RI, CT, NY, NJ, PA, DE, MD, NC, MI, WI, IL, IN, OH, CA, OR, WA
 - Set minimum acquisition requirements for all renewables despite current costs
 - Carve-outs such as ORECs (NJ, MD) require OSW acquisition
- » Long Term Power Contracts (ME, MA, RI, DE)
 - Accommodate up-front capital costs of renewables and likely increase of fossil fuel prices
 - Provide revenue stream to enable financing of billion dollar offshore wind farms
 - Construction Work in Progress rate surcharges phase in costs to ratepayers during construction and spreads total cost over greater period of time for reduced impact
- » Broad Definition of Benefits for Rate Recovery (ME, MA, RI, NJ, MD)
 - Incorporation of new jobs, economic and environmental benefits into cost benefit analysis
 - Inclusion of peak demand coincident wind energy price suppression into cost benefit analysis recognizes simultaneous real savings to ratepayers from OSW (\$7 billion price suppression in New England for Cape Wind capital cost of ~\$2.6 billion) (MA)
 - Limits on monthly ratepayer impacts from OSW PPAs prevent excessive currently overmarket average prices being passed onto ratepayers to maintain balance between promoting clean new technologies and economic development potential (ME, NJ, MD)

Benefits of Offshore Wind

- » Why should anyone pay an average of 19 cents/kwh for offshore wind when new onshore wind and natural gas generation is currently less than half that average cost?
- » \$2.6 B Cape Wind operation during summer & winter peak demand could result in wholesale price suppression totaling \$7 billion in lifetime savings to all ratepayers in New England (Charles River Associates Study, 2012).
- » PJM Renewable Integration Study concluded all renewable energy would provide “production cost savings” (i.e., “sum of Fuel Costs, Variable O&M Costs, any Emission Tax/Allowance Costs, and Start-Up Costs – adjusted by adding Imports Costs and subtracting Export Sales”) of 14-30 percent on the PJM grid or 5.6 c/kWh-7.4c/kWh. (GE Energy Consulting, 2014: <http://www.pjm.com/~media/committees-groups/committees/mic/20140303/20140303-pris-executive-summary.ashx>)
- » Health studies by Harvard and Boston U. Schools of Public Health: costs of fossil fuel generation range from 9-27 c/kwh
- » Secondary economic benefits:
 - \$18 billion in fossil fuel costs (out of \$24 billion in annual energy costs) in Massachusetts go out of state instead of to local investment and re-investment in state.
 - \$100 million invested in upgrading New Bedford Harbor for offshore wind development
 - \$50 million Charlestown turbine blade testing facility

U.S. Market & Economic Analysis Study Policy Findings

Effective Federal Policies

- Extend Investment Tax Credits: Extended Years or 3000 MW
- Provide Lower Cost Financing
 - Loan Guarantees/Tax Exempt Bonds:
 - Approve Cape Wind, Deepwater Block Island, Fishermen's NJ
 - Master Limited Partnerships extended to Wind Generation
- Streamline Leasing & Permitting
 - Successful Competitive Auctions in RI/MA & VA

Effective State Policies

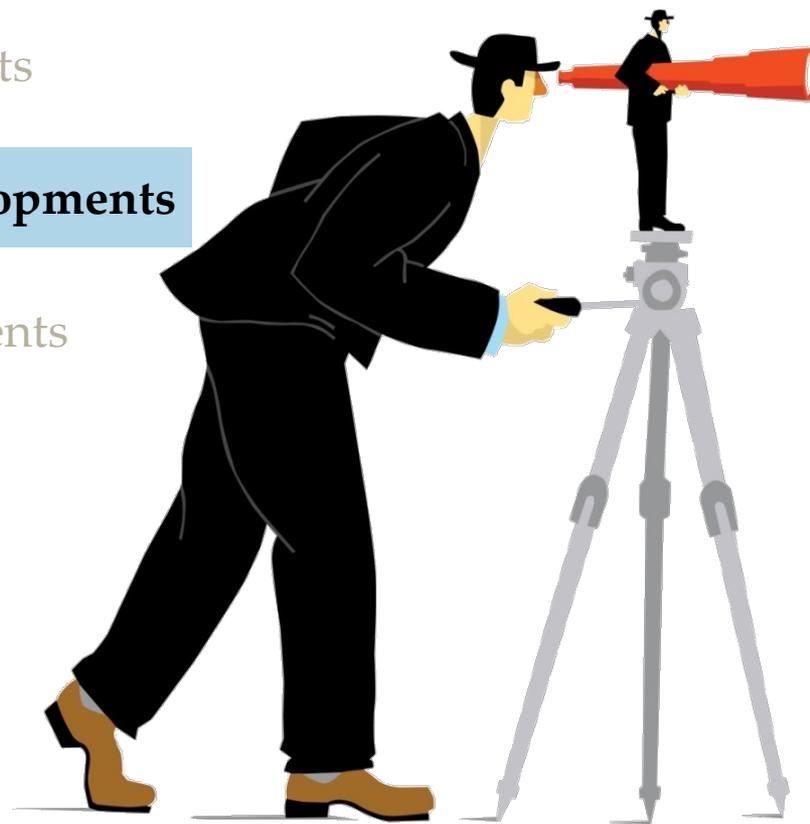
- Strengthen Renewable Portfolio Standards -- Offshore Wind Carve Outs
 - Ocean Renewable Energy Credits (NJ, MD – issue regulations & ORECS)
- Long Term Power Purchase Agreements (RFPs in MA, RI, NY)
- Coordinated Competitive Procurement (New England States: RFP in 2014)
- Expand Transmission/Interconnection Incentives
 - Offshore Submarine Backbones (Atlantic Wind Connection to file GAP)
 - Broaden Transmission Cost Allocation (FERC Order 1000)

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2 » European Policy Developments

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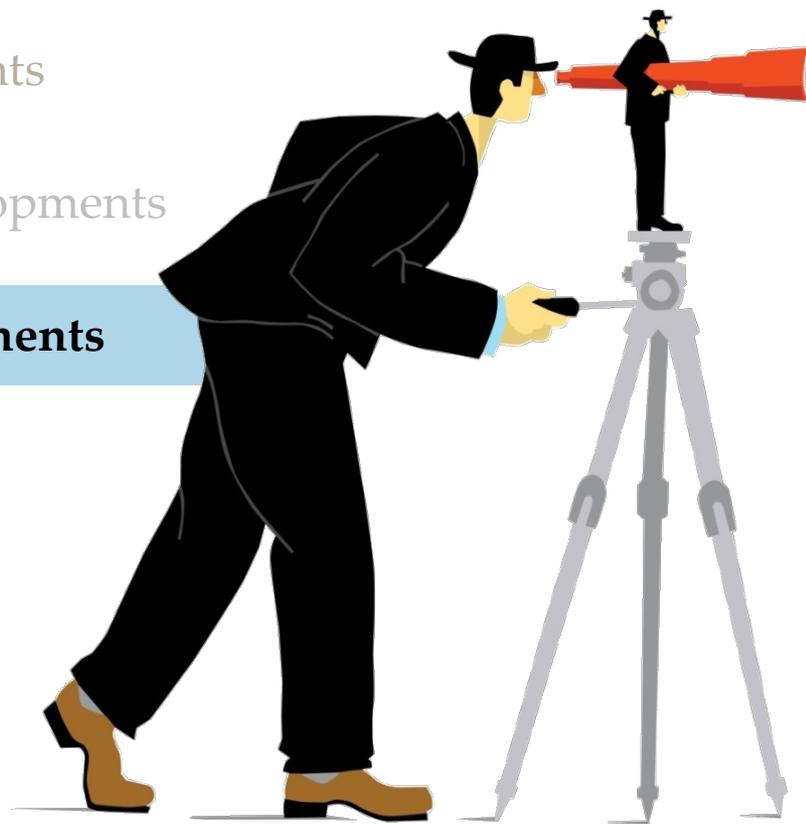


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China & Japan Developing Offshore Wind

» China

- Installed 390 MW offshore.
- Official Chinese Goals:
 - 5,000 MW by 2015
 - 30,000 MW by 2020



Hitachi 2 MW semi-submersible near Fukushima

» Japan

- Bottom-mounted and floating foundations to be tested: spar buoy and semi-submersible
- First 2.0 MW Hitachi floating turbine on spar buoy installed off Habashima Island near Nagasaki in 2013
- Second 2.0 MW Hitachi floating turbine on semi-submersible installed near Fukushima in late 2013
- Mitsubishi has announced plans for a new 7 MW turbine with a hydraulic drive, designed to operate on semi-submersible floating platforms in deep water off the coast of Fukushima.
- Ministry of Economy, Trade and Industry has said the floating offshore capacity may be expanded to 1,000 MW.

Key CONTACTS



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