Fifth Annual Offshore Wind Conference: Expansion of the U.S. Offshore Industry Off Massachusetts & Rhode Island
Welcome

John Wadsworth

Chair, EBC Energy Resources Committee

Partner, Brown Rudnick LLP
Program Introduction & Overview

Michael Ernst

Program Chair & Moderator

Executive Advisor, Power Advisory LLC
8:20 a.m.  Jim Bennett, Chief, Renewable Energy Programs, BOEM – MA OSW Lease Auction
8:40 a.m.  Bill White, MA Clean Energy Center – Ports & Infrastructure Study Preview
9:00 a.m.  OSW Plans for MA, RI, NY, NJ, DE, MD, VA & NC
  ➢ Matthew A. Morrissey, VP Deepwater Wind
  ➢ Carolyn Heeps, DONG Energy Bay State Wind
  ➢ Rachel Pachter, VP, Vineyard Wind LLC
10:30 a.m.  Networking Break
11:00 a.m.  Discussion on Fishing, Environment, Jobs & Supply Chain
  ➢ Jim Bennett, BOEM
  ➢ Bill White, Massachusetts Clean Energy Center
  ➢ Ed Anthes-Washburn, Director, New Bedford Harbor Development Commission
  ➢ Beth Casoni, Exec. Director, Mass. Lobstermen’s Association
  ➢ Catherine Bowes, National Wildlife Federation
  ➢ Paul Vigeant, Director, Wind Energy Center, New Bedford
12:30 p.m.  Adjourn
Europe
- 12.6 GW Installed off 10 Nations from 1990 to 2016
- 24.2 GW Consented for Construction & 100 GW Planned
- 2017 bids in Germany near 6 cents/kilowatt-hour
- >75,000 Jobs Today; 178,000 Jobs by 2030?

United States Dept. of Energy Wind Vision Report:
- 22 GW by 2030
- 86 GW by 2050
- Sustaining over 250,000 jobs by 2050
Cape Wind Wind Farm, Nantucket Sound 2000 - Present
RI Special Area Management Plan (SAMP) & MA Ocean Management Plan
BOEM MA & RI State Task Force Meetings 2009 - Present
BOEM MA/RI Lease Auction to Deepwater Wind
MA Legislation Requires Purchase of 1600 MW of OSW by 2027
Deepwater Wind Block Island Wind Farm & Cable – 2016
BOEM Lease Auction2 Leases Q1 2018
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Offshore Wind Lease Areas off Rhode Island & Mass.
Bureau of Ocean Energy Management
U.S. Outer Continental Shelf Renewable Energy

James Bennett
Chief, Office of Renewable Energy Programs

Environmental Business Council 5th Annual Offshore Wind Conference
Atlantic OCS Renewable Energy State Efforts

- **Maine**: 40% by 2017
- **Massachusetts**: 15% by 2020; +1% each year. Legislation requires 1.6 GW offshore wind by 2027
- **Rhode Island**: 38.5% by 2035
- **New York**: 50% by 2030. Goal of 2.4 GW offshore by 2030
- **New Jersey**: 24.5% by 2020. Carve out for 1.1 GW offshore wind; no timeline established
- **Delaware**: 25% by 2025-2026
- **Maryland**: 25% by 2022. Carve out for offshore wind, max 2.5% in 2017 and beyond
- **Virginia**: (Voluntary) 15% by 2025. Offshore wind gets additional credit (5% offshore wind = 15% regular)
- **North Carolina**: 12.5% by 2021, 10% by 2018
- **South Carolina**: (Voluntary) 2% by 2021. Only systems smaller than 10 MW eligible
Atlantic Leasing: The Path Forward
New Ports & Infrastructure Study

Bill White
Senior Director for Offshore Wind
Massachusetts Clean Energy Center
(Presentation not available)
Matthew A. Morrisey

Vice President

Deepwater Wind

Environmental Business Council of New England

Energy  Environment  Economy
Regional Energy Challenge

Over 8,000 MW of Existing Generation at Risk
The Potential
Offshore wind delivers energy when and where it’s needed most.
Growth of Offshore Wind Globally

- 12,631 megawatts in operation
- 3,589 turbines spinning
- 1,558 MW added in 2016
Deepwater Wind controls the two most strategically located sites in the US.
2011 Final revenue contract approved
2012 Permit applications submitted
2014 Final permits approved
2015 Offshore installation begins
2016 Commercial operations
Permitting
The Block Island Wind Farm required at least 27 separate state and local approvals
Tapping into the US Offshore Industry

Building Foundations in the Gulf of Mexico

GULF ISLAND FABRICATION, INC.

Montco Offshore

Keystone Engineering Inc.

OCC Offshore Marine Contractors

ABS
Rhode Island Ports
ProvPort and Quonset
U.S. Vessels and Workers Completed Installation

1. Lift and set jacket on sea bed
2. Insert and drive piles into foundation legs
3. Lift and set transition deck on jacket and weld the two pieces together
Turbine Installation Complete
Summer 2016
Deepwater Wind was awarded a 20 year contract to supply power to LIPA in East Hampton

South Fork Wind Farm will allow LIPA to defer construction of fossil-fired generation in East Hampton
Utility-scale.
Paired with energy storage.
30 miles from the mainland.
Construction beginning 2022, if approved.
Offshore Wind Developers Plans for MA, RI, NY, NJ, DE, MD, VA & NC

Carolyn Heeps
External Consultant & Consultation Manager
DONG Energy Bay State Wind
EBC Fifth Annual Offshore Wind Conference, Boston, MA
September 28th, 2017
Dr Carolyn Heeps, Consultation Manager
DONG Energy at a Glance

- Headquarters in Denmark
- 6,200 employees (including Oil & Gas)
- Revenue in 2016 DKK 61.2 bn
- EBITDA in 2016 DKK 19.1 bn
- Phase out the use of coal by 2023

80%* Wind Power
- Global market leader in Offshore Wind Power
- Develops, constructs, owns and operates offshore wind farms in Denmark, Germany, the Netherlands and the UK.
- Development projects in Taiwan and the USA
- Established US business in 2016 following acquisition of Ma and NJ leases

4%* Bioenergy & Thermal Power
- Generates and sells power and heat to customers in Denmark and Northwestern Europe

4%* Oil & Gas ** (discontinued operations)
- Produces oil and gas from fields in Denmark, Norway and the UK

12%* Distribution & Customer Solutions
- Power distribution grid on Zealand and sale of power and gas to customers in Northwestern Europe

* Share of the DONG Energy Group’s capital employed
** On 24 May 2017 DONG Energy entered into an agreement to divest its upstream oil and gas business to INEOS. This corresponds to the entire share capital of DONG Energy E&P A/S for an unconditional payment of USD 1,050 million (DKK 7 billion) on cash and debt free basis. DONG Energy will retain all cash flows until 30 June 2017.
DONG Energy Wind Power Overview

DONG Energy Wind Power geographical footprint

USA
- Bay State Wind
- Ocean Wind
- Coastal Virginia Offshore Wind

Europe
- Walney Extension
- West of Duddon Sands
- Isle of Man
- Barrow
- Burbo Bank Ext.
- Burbo Bank
- Walney 1 & 2
- Westermost Rough
- Hornsea 1
- Hornsea 2 & 3 & 4
- Race Bank
- Hornsea 3
- Hornsea 4
- Borssele 1 & 2
- London Array
- Gunfleet Sands 1 & 2
- Gunfleet Sands 3
- Lincs
- Horns Rev 1 & 2
- Borkum Riffgrund 1
- Borkum Riffgrund 2
- Gode Wind 1
- Gode Wind 2
- Gode Wind 3 & 4
- Anholt
- Middelgrunden
- Vinddeby
- Nysted

Asia Pacific
- Formosa 1.1
- Formosa 1.2
- Greater Changhua projects

Unparalleled experience and track record

- 25+ years of experience and track record in the offshore wind sector
- 22 offshore wind farms in operation
- 6 offshore wind farms under construction
- 3.8 GW Constructed capacity
- 2,000 Dedicated employees
- 3.6 GW under construction
- 7.7 million Europeans with clean electricity
- 3.5 GW World’s leading operator
- 14 Partnerships

Partnerships
- 25+ years of experience and track record in the offshore wind sector
- 2017

In operation
- Under construction
- Under development
- Decommissioned after 25 years
DONG Energy Wind Power in the U.S.

Secured project rights for ~3 GW capacity
- Entered U.S. 50/50 JV for Bay State Wind with Eversource in 2016
- Announced Coastal Virginia Offshore Wind partnership with Dominion Energy in July 2017 to provide EPC

Bay State Wind
- 2,000 MW potential capacity
- 15 miles from Martha’s Vineyard
- Connecting into Massachusetts
- Water depths of 100 – 125 feet

Ocean Wind
- 1,000 MW potential capacity
- 10 miles from shore
- Connecting into New Jersey
- Water depths of 65 – 100 feet

Coastal VA Offshore Wind
- 12 MW Stage 1 (demo) windfarm
- 22 miles from shore
- Connecting into Virginia
- Water depths of 80 – 100 feet

1. Offtake, grid connections and planning consents have not yet been secured
Bay State Wind Development

- MA legislation requires procurement of 1,600 MW of offshore wind by 2027
  - First solicitation launched June 30, 2017
  - Bids due in December, Winners selected in May 2018
  - Next RFP in June 2019
- Bay State Wind
  - 50/50 partnership between DONG Energy and Eversource announced in December 2016
  - Jointly own ~300 square mile lease 15-25 miles south of Martha’s Vineyard
  - Capacity to hold at least 2,000 MW
- Work has begun on key elements of development, drawing on the partners’ expertise and DONG Energy’s experience from Europe
  - Wind measurements and seafloor assessments
  - Permitting plan development and optimization
  - Interconnection and technical project development
Bay State Wind Project Update

- SAP area and lease area reconnaissance geophysical surveys completed 2016
- Cable route reconnaissance geophysical survey 2017
- Flidar deployment 2017
- Offshore Avian surveys 2017
- COP survey protocols for baseline characterization
- Geophysical and geotechnical survey Fall 2017
- Stakeholder outreach ongoing
Flidar Deployment July 2017 following Site Assessment Plan (SAP) approval by BOEM
Flidar Deployment July 2017
Weblink: https://portal.axys-aps.com/platforms/P2012P/
Ocean Wind Project Overview

- BOEM Lease Area OCS-A 0498 (March 2016)
- Approx. 9 nautical miles southeast of Atlantic City, NJ
- Total Area of Approximately 160,480 acres
- Water depths range from 50 to 120 feet
- Site Assessment Plan activities commenced summer 2017
- Similar site conditions to successful existing DONG Energy projects in Europe
- OWEDA provides a workable market framework in NJ
- Region faces retirements of existing plants and will require replacement generation
- A 1,000MW wind farm can power over 500,000 homes
Ocean Wind, New Jersey, Floating Lidar locations

- Geophysical surveys Summer 2017 on SAP locations and reconnaissance
- Geotechnical survey Fall 2017
- Stakeholder outreach
DONG Energy’s Next Steps in Virginia

- Entered EPC arrangement to build Mid Atlantic’s first OSW project, Coastal Virginia Offshore Wind, with commissioning expected by 2020.
- Entered strategic partnership with Dominion to explore large, commercial scale project. Project site has potential to build up to 2,000MW
- DONG Energy is considering establishing a small office in Richmond or Norfolk
- Will commence exploration of Norfolk and other port and supply chain opportunities
## Significant Cost Reductions Driven by Scale, Innovation and Industrialization

### Offshore wind cost to society (EUR/MWh)\(^1\)

<table>
<thead>
<tr>
<th>Project</th>
<th>Year</th>
<th>Cost (EUR/MWh)</th>
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<tbody>
<tr>
<td>Walney Extension</td>
<td>2014</td>
<td>156</td>
</tr>
<tr>
<td>Race Bank</td>
<td>2015</td>
<td>145</td>
</tr>
<tr>
<td>East Anglia</td>
<td>2015</td>
<td>124</td>
</tr>
<tr>
<td>Borkum Riffgrund 2</td>
<td>2015</td>
<td>122</td>
</tr>
<tr>
<td>Horns Rev 3</td>
<td>2015</td>
<td>102</td>
</tr>
<tr>
<td>Borssele 1 &amp; 2</td>
<td>2016</td>
<td>78</td>
</tr>
<tr>
<td>Kriegers Flak</td>
<td>2016</td>
<td>68</td>
</tr>
<tr>
<td>Borssele 3 &amp; 4</td>
<td>2016</td>
<td>68</td>
</tr>
<tr>
<td>Cluster 1</td>
<td>2017</td>
<td>62</td>
</tr>
</tbody>
</table>

### Scale
- Increased size of windfarms and turbines:
  - 3.6MW 2009
  - 6.0MW 2014
  - 8.0MW 2016

### Innovation
- Driving innovative solutions
- Digitalisation

### Industrialisation
- Standardisation and procurement for multiple projects
  - Fully capturing new technological opportunities

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Sources: DECC; Danish Energy Agency; Energinet.dk; NEV

1. Cost to society over the lifetime of the project used as proxy for the levelised costs to society. It consists of a subsidy income on top of market prices for the first years and a pure market income for the remaining years of the 25 years lifetime. Discount rate of 3.5% used to reflect society’s discount rate. Market income based on country specific public wholesale market price projections at the time of contracting. For comparability across projects a generic scope adjustment (incl. transmission and extra project development costs) has been applied.
Offshore Wind Can Create Economic Development Opportunities in Massachusetts for Ports and the Supply Chain

Focus on Ports – Case Study from Belfast Harbor, Northern Ireland, presents Opportunities For Investment in Virginia’s Extensive Port Infrastructure

*DONG Energy signed a long-term lease on the $60m state-of-the-art Offshore Wind Terminal at Belfast Harbor, the first custom built installation and pre-assembly harbor in the UK and the source of 300 full-time jobs.*
Offshore Wind’s Economic Impact for Sponsor States
Case Study from the Humber Region in the United Kingdom

DE is constructing 2,000 MW offshore wind in the Humber Region of the United Kingdom

DONG Energy experience in the UK provides a good proxy for opportunity for Massachusetts

- 1,600 jobs/year on average 2015 thru 2020
- 500 long-term jobs (operations and maintenance)

Siemens completed new wind turbine factory in Hull, started operation September 2016

- $470m inward investment
- 1,100 direct new jobs
- Close working relationship with DONG Energy a “significant factor in decision to build the Hull Siemens factory”

Because of its relative proximity to population centers, offshore wind creates jobs in the states that are benefitting from and paying for the resource
Case Study from the Humber Region in the UK – Cont.

Similar Investment Possible in U.S.

Supplier Development in the UK

- Array Cables in Hartlepool
- Transition pieces in Middlesbrough
- WTG blades will be manufactured in Hull
- WTG blades in Isle of Wight

DONG Energy Local Development Progress

- USD billion
  - Invested 2013-19: 9
  - Gross added value by 2030: 1.8
  - DONG Energy jobs in Humber Region: 1600

- [VAL UE]
  - Average jobs/year 2015-20
  - Long-term O&M jobs

- Above investments and jobs are created by DONG Energy in the Humber Region
- This is a result of the 2,000 MW offshore wind which will be built by DONG Energy in the region by 2020
Questions?
Offshore Wind Developers Plans for MA, RI, NY, NJ, DE, MD, VA & NC

Rachel Pachter

Vice President
Vineyard Wind LLC

Environmental Business Council of New England
Energy Environment Economy
Presentation to:
Environmental Business Council of New England
September 28, 2017
AGENDA

- Introduction
- Overview of Vineyard Wind
- Project status
- Stakeholder outreach
- Project mitigation
LEASE AREA

LEASE OCS-A-0501

• Acquired in 2015 through US Department of Interior competitive lease auction
• As good as any offshore site in the world:
  • High wind speeds
  • Solid seafloor conditions
  • Multiple grid connection options
• Project sizing/buildout will be influenced by Massachusetts procurement process
EXPERIENCED TEAM, STRONG FINANCIAL BACKING

- One of US’s largest wind owner / operators
- 6 GW of wind in 22 states
- Part of Iberdrola group:
  - World largest renewables asset base
  - 14,000 megawatts renewable energy
  - 12 countries

- Substantial offshore wind experience (Scottish Power):
  - West of Duddon Sands: UK, 389 MW, 2014 COD
  - Wikinger: Germany, 350 MW, 2017 COD
  - East Anglia One: UK, 714 MW, 2020 COD
  - St. Brieuc: France, 496 MW

- Long-term, clean energy infrastructure focus
  - Invests on behalf of 21 institutional investors
  - Some of largest Scandinavian pension funds

- Early engagement / buy and hold

- Today manages over € 5 billion

- Specialized team to deliver offshore wind (“COP”):
  - Veja Mate, 402 MW, Germany
  - Beatrice, 588 MW, UK
  - Individuals on team have had key roles on:
    - More than 15 offshore wind projects in Europe
    - 10 of the 15 largest projects to date
    - As early as world’s 2nd offshore wind farm, built in 1995
• First and only developer in the US to execute a Community Benefit Agreement with a local, non-profit partner
• Provides meaningful local participation in project
  • 1400 members: 10% of island’s utility meters
  • Seasonal, year-round, and small business members
• Closely involved in day-to-day development activities
• Provides guidance regarding important local issues
• Identifies opportunities to benefit local community
ACOE → MMS → BOEMRE → BOEM

Evolution of our site selection
- Task force
- Working groups

Environmental Assessment (EA) on Massachusetts WEA

Vineyard Power Partnership

Lease issuance April 1, 2015

Site Assessment Plan
- For metocean data collection
- Due April 1, 2016
- Extended to April 1, 2017
- Under review by BOEM

Construction and Operations Plan (COP)
- ‘Due’ April 1, 2020
• Fall 2016: Geological surveys in lease area conducted in
• Winter 2017: SAP Submitted
• August 2017: Export cable survey
ON-GOING OUTREACH TO FISHERIES

• Fisheries Representative (on-going)
• Flyers and advertisements (showing LORAN lines)
• Thumb drives for chart plotters
• Scheduled and ad hoc meetings
• Real time response during surveys
• Consultations on all aspects of project design:
  • Turbine lay-out
  • Cable routes
  • Ports and harbors
  • Safety, navigation, and communications
  • Fishing gear and practices
  • Fisheries studies
  • Etc.

Notice to Mariners & Fishermen

Please call Jim Kendall for the latest information: 508-287-2010

Geophysical Survey
Beginning on or about: July 28
Estimated duration: up to 3 weeks

Vessel: R/V Henry Hudson
LOA 45 Foot
Flag: USA
Cell Phone: +1 201 955 7185
Vessel Email: jbailey@alpineocean.com
Standing by on VHF channel 16

Geotechnical Survey
Beginning on or about: August 1
Estimated duration: up to 3 weeks

Vessel: R/V Shearwater
LOA 110 foot
Flag: USA
Bridge VHF Phone: +1 201 297 6015
Vessel Email: jbailey@alpineocean.com
Standing by on VHF channel 16

In July and August, geophysical & geotechnical surveys will take place between the Vineyard Wind lease area and Cape Cod including Muskeget Channel and Nantucket Sound. The survey will cover a much larger area than needed for the cables, so as to identify local cable routes. Please see reverse side for chart of expected survey area. Survey may vary in the field. Please check with the contact below for latest information.

Both vessels may be towing geophysical equipment up to 300 feet, and generally following long survey track lines on the same baseline. The R/V Hudson may be operating an RDI. The R/V Shearwater may be conducting shallow towing or other operations.

Collecting data and working with the local fisheries
Vineyard Wind is committed to communicating and working with the local fishermen in the region across all fishery sectors and during all stages of development of the proposed offshore wind farm. Information gathered will be used to design the wind farm and select the location for the cable route from the project area to shore.

In advance of and during survey operations, we seek contact with fishermen who are or may be working in the survey area (see reverse side). Please contact:

<table>
<thead>
<tr>
<th>Vineyard Wind Contact</th>
<th>Company</th>
<th>Role</th>
<th>Phone</th>
<th>Email</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jim Kendall</td>
<td>New Bedford</td>
<td>Fishery</td>
<td>508-287-2010</td>
<td><a href="mailto:njbcr@comcast.net">njbcr@comcast.net</a></td>
</tr>
<tr>
<td>Seabird Consulting</td>
<td>Representative</td>
<td></td>
<td>508-997-5013</td>
<td></td>
</tr>
</tbody>
</table>

For general inquiries please contact Vineyard Wind
Phone: 508-777-9814
Email: info@vineyardwind.com
www.vineyardwind.com

As of July 21, 2017
OTHER STAKEHOLDER OUTREACH

• Environmental NGOs
  • Ongoing updates and consultations
  • Compliance with NGO proposed approach to surveys
  • Active engagement at industry level
• Tribal consultation underway
• Municipal outreach underway
PROJECT MITIGATION TO DATE (AMONG OTHERS)

Marine Mammals & Sea Turtles
  • Protected species observers
  • Exclusion zones / equipment shut-downs
    • 500m for North Atlantic Right Whale
    • 200m for all species
  • Passive acoustic monitoring
  • Night vision binoculars
  • Vessel speed restrictions

Historic Concerns
  • Oversight from a Qualified Marine Archaeologist
  • Review of geophysical data prior to bottom disturbing activity
  • Ongoing and planned consultations
NEXT STEPS

• Massachusetts RFP for projects
• Finalize Project Envelope
• Permitting
• On-going: Input from stakeholders
CONTACT INFO:

RACHEL PACHTER
VP PERMITTING AFFAIRS
700 PLEASANT STREET, SUITE 510
NEW BEDFORD, MA 02740
(O) 508-640-5136
(C) 508-680-6455
rpachter@vineyardwind.com
Perspectives on Fishing, Environmental, Workforce & Supply Chain Issues

Bill White

Senior Director for Offshore Wind
Massachusetts Clean Energy Center
(Presentation not available)
Perspectives on Fishing, Environmental, Workforce & Supply Chain Issues

Ed Anthes-Washburn

Port Director & Executive Director
Port of New Bedford

Environmental Business Council of New England
Energy Environment Economy
EBC Offshore Wind Conference

September 28, 2017

Port of New Bedford
Harbor Development Commission
Port of New Bedford
## 2016 Economic Impact Report

<table>
<thead>
<tr>
<th>Economic Value</th>
<th>Details</th>
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| **$9.8 billion** of total economic value | • $3.3 billion of direct business revenue  
• $6.1 billion of related output  
• $429.4 million of re-spending of direct income and local consumption purchases |
| **36,578 jobs** generated by Port activity | • Direct Jobs: 6,225 (91% from seafood industry)  
• Induced Jobs: 4,101 (92% from seafood industry)  
• Indirect Jobs: 2,512 (88% from seafood industry) |
| **$1.2 billion** of federal, state and local taxes | • $150.5 million direct, induced and indirect  
• $358.1 million direct, induced, and indirect federal  
• $200.7 million related taxes/local taxes  
• $534.7 million related federal taxes |
Multiple Uses
Scallop Fishery
Southern New England Locations
What can we learn from Port Fourchon, LA?
Thank you!

Edward C. Anthes-Washburn
Executive Director
Port of New Bedford
ewashburn@newbedford-ma.gov
Perspectives on Fishing, Environmental, Workforce & Supply Chain Issues

Beth Casoni

Executive Director
Massachusetts Lobstermen’s Association
The Crossroads of Lobster Fishing In Massachusetts

Beth Casoni, Executive Director
Massachusetts Lobstermen’s Association est. 1963

Commercial Fishing
It’s more than just a job...
It’s a way of Life...
The Massachusetts Lobstermen’s Association
Who we are & What we do

- Established in 1963
- One of the leading commercial fishing industry Associations in New England
- 1,800 members from Canada-Virginia
- MLA works to maintain both the industry and the resource while protecting the habitat
- MLA communicates with its members through a monthly newspaper, weekly email, Facebook, Twitter and Instagram
- MLA attends countless industry meetings and events and hosts an Annual Weekend & Trade Show
Fisheries Management
Lobster Management & Stock Areas

- LMA 1
- LMA 2
- LMA 3
- LMA 2/3 overlap
- LMA OCC
- LMA 1/OCC overlap

- Gulf of Maine
- Georges Bank
- Southern New England
Ocean Planning

• Bureau of Ocean and Energy Management
• Northeast Regional Ocean Council
• Massachusetts Ocean Planning Commission
Industry Outreach

Massachusetts
Meet the Fleet
Industry Concerns about Offshore Wind

- No fishing zones – Restrictions from USCG or Homeland Security
- Scientific research – before, during and after construction
- Electromagnetic Field impacts
- Silting impacts
- Transiting – Radar Scatter and travel time
- Benthic impacts
THANK YOU

Beth Casoni, Executive Director
Massachusetts Lobstermen’s Association est. 1963
Perspectives on Fishing, Environmental, Workforce & Supply Chain Issues

Catherine Bowes
Senior Manager
Climate & Energy
National Wildlife Federation
National Wildlife Federation

Uniting All Americans to Ensure Wildlife Thrive in a Rapidly Changing World

• Founded in 1936 by sportsmen leaders

• Over 1 million members & supporters

• Headquartered in DC, 9 field offices

• 50 state affiliates

• Organizational priorities:
  ➢ Protecting Wildlife & Habitat
  ➢ Connecting Kids with Nature
  ➢ Confronting Climate Change
Why Offshore Wind Power?

1. Massive scale of US offshore wind resource is game-changer for transitioning to a clean energy economy.

2. Available in close proximity to America’s largest electricity markets.

3. Energy production corresponds with peak electricity demand, offering an increasingly cost-competitive energy choice.

4. Opportunity to create hundreds of thousands of jobs & economic development in both coastal and inland communities.

5. Offshore wind can be developed responsibly with minimal impacts to coastal and marine wildlife.
NWF’s Campaign for Offshore Wind Power

- Cultivate & connect national, regional, state, & local offshore wind advocates along the coast
- Demonstrate support from diverse voices to Governors/state leaders, federal Administration, & Congress
- Rapid response & social media communications
- Advocacy to ensure wildlife protections during offshore wind siting, construction & operations

OFFSHOREWIND.NWF.ORG
Key Principles for Environmentally Responsible Offshore Wind Development

• Ensure siting & permitting decisions are informed by best available data, effective stakeholder engagement & current ocean planning efforts

• Avoid locating projects in sensitive, critical wildlife habitat areas (i.e. near shore areas, shoals, boulder reefs, etc.)

• Adjust timing & method of survey & construction activities to protect sensitive wildlife (i.e. seasonal restrictions on pile-driving, underwater noise mitigation, vessel speed limits)

• Ongoing, robust data collection to inform impact mitigation strategies moving forward
Working Collaboratively w/Offshore Wind Industry to Protect Right Whales

- **Goal**: Address potential threats to critically endangered North Atlantic Right Whale (i.e. underwater noise and increased risk of ship strikes)

- **Strategy**: Active dialogue between offshore wind leaseholders, environmental NGOs, and scientific experts to develop workable industry practices to minimize risks

- **Outcomes**: 2 major agreements reached with leading developers to employ the following practices during pre-development activities:
  - Seasonal restrictions on HRG surveys & pile-driving
  - Vessel speed restrictions
  - Noise-reduction technologies
  - Comprehensive monitoring
  - Exclusion zones

Success Story at America’s First Project: Block Island Wind Farm

- Construction schedule adjusted to avoid time of high risk for Right Whales
- Proactive step to remove a potential roadblock & secure environmental support
NWF is proud to stand with a growing, diverse coalition of environmental, business, labor, & community leaders calling for the responsible development of America’s offshore wind resources.

JOIN US!

Catherine Bowes
National Wildlife Federation
bowes@nwf.org
802.552.4311

OFFSHOREWIND.NWF.ORG
Perspectives on Fishing, Environmental, Workforce & Supply Chain Issues

Paul Vigeant

Executive Director
New Bedford Wind Energy Center

Environmental Business Council of New England
Energy  Environment  Economy
### Fastest Growing Occupations

**Fastest growing occupations:** 20 occupations with the highest percent change of employment between 2014-24.

*Click on an occupation name to see the full occupational profile.*

<table>
<thead>
<tr>
<th>OCCUPATION</th>
<th>GROWTH RATE, 2014-24</th>
<th>2015 MEDIAN PAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind turbine service technicians</td>
<td>108%</td>
<td>$51,050 per year</td>
</tr>
<tr>
<td>Occupational therapy assistants</td>
<td>43%</td>
<td>$57,870 per year</td>
</tr>
<tr>
<td>Physical therapist assistants</td>
<td>41%</td>
<td>$55,170 per year</td>
</tr>
<tr>
<td>Physical therapist aides</td>
<td>39%</td>
<td>$25,120 per year</td>
</tr>
<tr>
<td>Company Type</td>
<td>Field of Activity</td>
<td>Skilled</td>
</tr>
<tr>
<td>------------------------------</td>
<td>--------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>Planning &amp; Development</td>
<td>Management</td>
<td>X</td>
</tr>
<tr>
<td>Design &amp; Manufacturing</td>
<td>Wind Turbines &amp; Turbine Components</td>
<td>X</td>
</tr>
<tr>
<td>Construction &amp; Installation</td>
<td>Building the Wind Farm</td>
<td>X</td>
</tr>
<tr>
<td>Operation, Maintenance &amp; Repair</td>
<td>Regular Inspection, Operations and Repair</td>
<td>X</td>
</tr>
<tr>
<td>Technical, Financial &amp; Legal</td>
<td>Diverse Specialized Professional Activities</td>
<td>X</td>
</tr>
<tr>
<td>Ship Building &amp; Retrofitting</td>
<td>Specialized Jones-Compliant Vessels for Installation &amp; Repair</td>
<td>X</td>
</tr>
</tbody>
</table>
Occupations Span Many Skill Levels

Source: US DOE
Mapping the Workforce Needs

Data Bridge

PPC Cross-walk between UK and BLS Occupational Classifications

OSW Workforce Needs
- Data from European Experience
- Data from US Land - Based Wind Experience
- Data from Block Island Experience
- Key Informant Interviews

Current Massachusetts workforce skill sets
- Occupational Profiles from O*Net
- Data from BLS Survey

Workforce Gap

Workforce Bridge

Up-skilling, New Degree Programs, and Capital Investment in Facilities

Economic Opportunity
The OSW industry in the UK is increasingly depending on the National Vocational Qualifications (NVQs) system to classify the knowledge, skills, and abilities (KSAs) required for jobs in the industrial sectors.

The US lacks an integrated system like the NVQ.
Example of Crosswalking the European Data

**Occupational Crosswalk**
Operations and Maintenance

<table>
<thead>
<tr>
<th>Related Transfer Occupations (Europe)</th>
<th>European Offshore Wind Development Stage</th>
<th>Occupational Categories</th>
<th>US Offshore Wind Development Stage</th>
<th>Related Transfer Occupations (US)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Research and Development Planning</td>
<td>Site Manager</td>
<td>Research and Development Planning</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Site/Plant Manager</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Construction</td>
<td>Project Engineer</td>
<td>Construction</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Technical Engineer</td>
<td>Mechanical Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Control &amp; Instrumentation Engineer</td>
<td>Crosswalk</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Operations &amp; Maintenance Manager</td>
<td>Quality Engineer</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>O&amp;M Technician</td>
<td>Asset Manager</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Wind Technician</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Current Sources of Recruitment

* Military and Oil & Gas industry
  - Technical training in electricity, mechanics & hydraulics
  - Receptive to upskilling and retraining
  - Experience working in teams
  - Experience working in harsh conditions

* Private training companies and increasingly public K-16 system
Apprenticeships

* Apprenticeship programs in the UK are strong and more widely utilized in comparison to the United States (US) required for jobs in the industrial sectors

* Through apprenticeship experiences, OSW technicians learn to work in real world conditions
* O&M jobs are typically sourced locally and extend for the life of the wind farm

* One example is Wind Technician
  - Classified as entry-level skill by DOE; requires high school diploma; certified technical training in electrical/mechanical engineering and hydraulics
  - Receive training on servicing proprietary equipment from the OEM
  - Augmented with (GWO) safety training, working at heights, working in confined spaces, sea safety and crew transfer training
The phase of offshore wind development that is the least clear in terms of employment impacts is the design and manufacturing of components. Like with construction, it is expected that at first most of the work will involve foreign labor. However, the United States has the benefit of being an isolated market with vast wind resources.
Wind industry experts expect that eventually, most of the manufacturing of the largest components for the US market will take place locally. This is due to the sheer cost of logistics. However, it is not clear which, if any, of these components will be manufactured in Massachusetts.
Thank you for your interest. 
Happy to answer any questions you may have.
Panel Discussion

Moderator: Michael Ernst, Power Advisory LLC

Panelists:

- James F. Bennett, Bureau of Ocean Energy Management
- Ed Anthes-Washburn, Port of New Bedford
- Beth Casoni, Massachusetts Lobstermen’s Association
- Catherine Bowes, National Wildlife Federation
- Paul Vigeant, New Bedford Wind Energy Center
- Bill White, Massachusetts Clean Energy Center