U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Activity Area: Offshore Wind R&D

2019 Wind Program Peer Review

Gary Norton and Dan Beals

April 30 – May 2, 2019

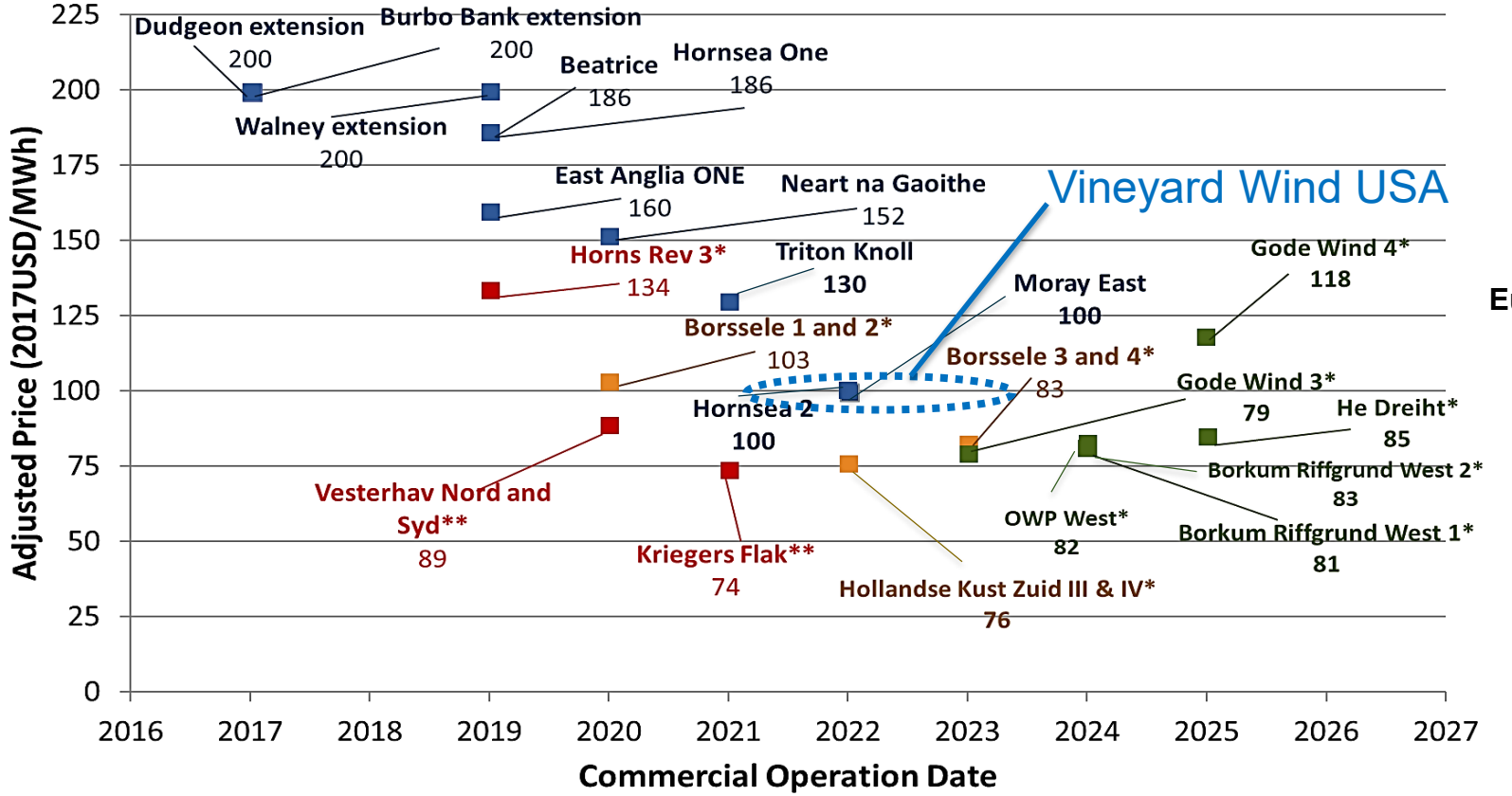
Wind Office Strategic Priorities

Clean, low-cost wind energy options nationwide

	Land-Based Wind	Offshore Wind	Distributed Wind
Technology Development & Scientific Research	Atmospheric Science & Wind Plant Systems Engineering	Atmospheric Science & Wind Plant Systems Engineering	Atmospheric Science
	Standards and Certification	Standards and Certification	Standards and Certification
	Technology Innovation	Technology Innovation	Technology Innovation
	World Class Testing Facilities	World Class Testing Facilities	
	Tech to Market Commercialization	Tech to Market Commercialization	
	Integrated Systems Design	Integrated Systems Design	
		Offshore Specific R&D	
		Advanced Technology Demo Projects	
Market Acceleration & Deployment	Advanced Grid Integration	Advanced Grid Integration	Advanced Grid Integration
	Workforce and Education Development	Workforce and Education Development	Workforce and Education Development
	Stakeholder Engagement	Stakeholder Engagement	Stakeholder Engagement
	Environmental Research	Environmental Research	
	Siting & Wind Radar Mitigation	Siting & Wind Radar Mitigation	
Analysis & Modeling	Evaluate and Prioritize R&D	Evaluate and Prioritize R&D	Evaluate and Prioritize R&D
	Model Development and Maintenance	Model Development and Maintenance	Model Development and Maintenance
	Techno-economic Analysis	Techno-economic Analysis	Techno-economic Analysis
	Electricity Sector Modeling	Electricity Sector Modeling	Electricity Sector Modeling

Context: Falling Global Offshore Bid Prices

Industrialization, volume, and optimism about technology are driving falling EU (and now U.S.) procurement prices – but continued R&D is crucial to actual project economics



Context: U.S. - Specific Offshore Challenges

Steep learning curve required –
European solutions may not be optimal or appropriate to:

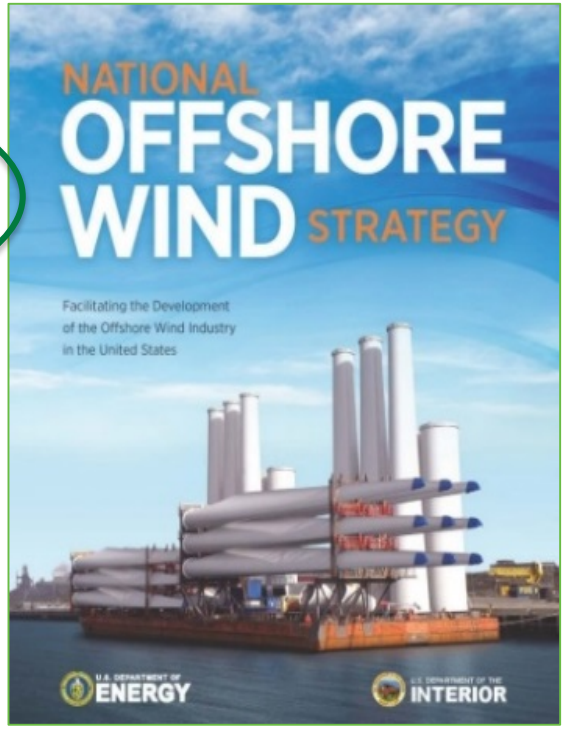
- Challenging physical conditions – e.g. hurricanes, ice, geophysical characteristics
- Available vessels and Jones Act restrictions
- Supply chain, port infrastructure and workforce training needs
- Permitting processes and state or federal regulations
- Wildlife considerations, visual impacts and potential marine use conflicts
- Deep water – nearly 60% of the offshore wind resource in the U.S. is in deep water, nearly 100% on Pacific Coast




National Offshore Wind Strategy (DOE & DOI)

- Issued jointly with BOEM in 2016 as an update of 2011 strategy; input from industry, states and other stakeholders
- Roadmap of actions supporting responsible development of a robust and sustainable offshore wind industry in the U.S
- Over 30 DOE and DOI initiatives to address 7 action areas; three strategic themes

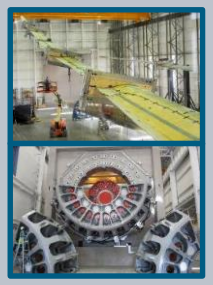
Strategic Themes	Action Areas
Reducing Technology Costs & Risks	1. Offshore Wind Power Resource & **Site Characterization** 2. Offshore Wind **Plant Technology Advancement** 3. Installation, Operation & Maintenance, & **Supply Chain** Solutions
Supporting Effective Stewardship	4. Ensuring Efficiency, Consistency & Clarity in the **Regulatory Process** 5. Managing Key **Environmental & Human Use** Concerns
Improving Understanding of the Benefits of Offshore Wind	6. Offshore Wind **Electricity Delivery & Grid Integration** 7. **Quantifying / Communicating** the Costs and Benefits of Offshore Wind



Key Offshore Projects Over Time

Major WETO Offshore Technology Development Investments and Actions

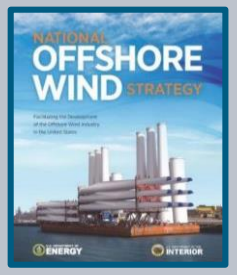
World-Class Test Facilities FY09



Initial Offshore R&D Funding
FOA 415 (FY11-12)
19 awards

Deployment of 1:8 Scale VolturnUS (FY13)

National Offshore Wind Strategy (FY16)



FY 17 – FY 18

Final FOA 415 Projects Completed

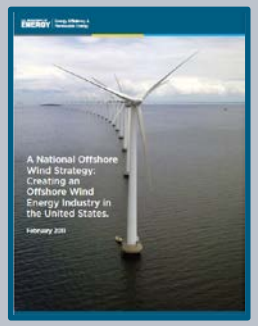
Launch of Buoy Loan Program

Demo Projects Continued

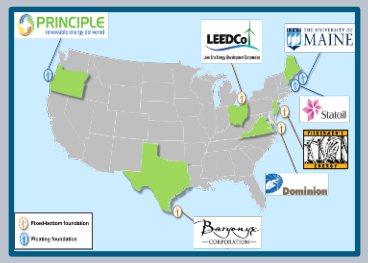
Multi-Year Program Plan (FY19)

Buoy Upgrades, Acceptance Testing, Deployment (FY19)

Funding Opportunity Announcement (FY19+)



National Offshore Wind Strategy (FY11)



Advanced Technology Demonstration Projects
FOA 410 (FY12—FY21)

DOE Procures and Deploys Metocean Buoys (FY14)

Offshore Wind Consortium Established

Offshore Wind Test Facilities RFI

Deployment and Operation of the Demo Projects (FY21+)

Offshore Wind Advanced Technology Demonstration Projects –Brief History

Objective: Reduce Cost and Risks of Offshore Wind Development

2013 - Seven Projects

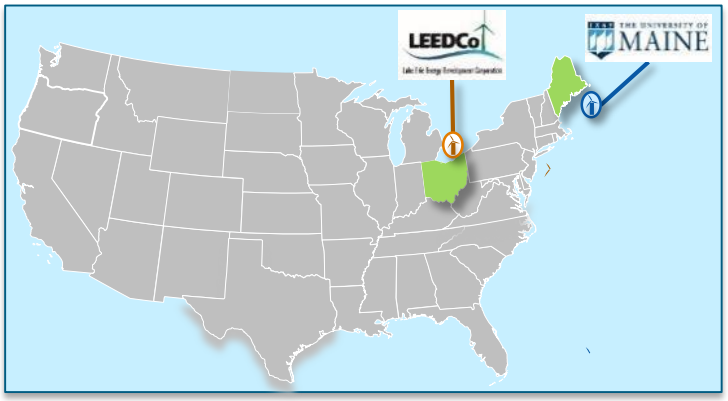
- Regionally and technologically diverse
- Down-Select based on progress and technical viability

2014 – Five Projects (three projects, two alternates)

- Goal: 100% FEED, vendor quotes, installation and O&M, completion of NEPA, regulatory and interconnection requirements
- Go/No-Go based on progress to accomplishing goals, including power purchase agreement

2017 – Two Projects

- Goal: Fabrication, installation and commissioning of the project by 2022; environmental and performance data collection 5-years beyond project completion
- Regular Go/No-Go decision points



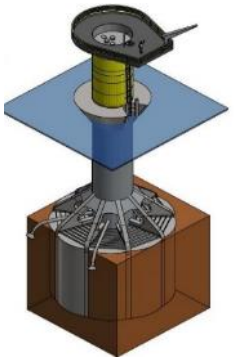
Current Portfolio

University of Maine

- Monhegan, ME
- 12 MW project, 2 turbines
- Floating concrete semi-submersible to handle deepwater offshore wind resources

LEEDCo

- Cleveland, OH
- 20.7 MW project, 6 turbines
- Monobucket (monopile large suction pile) to resist weak soils surface ice conditions of the Great Lakes



Future Priorities (FY19 and beyond)

Technology R&D

- National Wind R&D Consortium
- Offshore test facilities support: 2019 FOA
- Core capabilities in floating systems engineering (Lab)
- Improve and validate design tools (Lab)

Resource Characterization

- Buoy upgrades and deployment (Lab)
- Offshore wind resource sciences (Lab)

Demonstration

- Complete two demonstration projects
- Technology demonstration support: 2019 FOA

National Offshore Wind R&D Consortium

Goal A nationally-focused, not-for-profit organization collaborating with industry on prioritized R&D activities to reduce LCOE of offshore wind in the U.S. and maximize other economic and social benefits

Administrator (competitively awarded in 2018): New York State Energy Research and Development Administration (NYSERDA)

Project Value $41 M ($20.5 DOE funds, matched by NYSERDA)

Duration 4 years under current funding; goal is to become self sustaining through research partner funding

Desired Impacts

- Innovations directly responsive to the technical and supply chain barriers offshore wind developers face in the U.S.
- Build strong networks connecting technology innovators, investors, and industry

Near Term Milestones

11/2018 – Initial roadmap of R&D priorities
03/2019 – 1st solicitation published
05/2019 – Planned: Initial project award(s)

Consortium Members

Administration Team Partners Include:

Carbon Trust (UK)

RCG Renewables Consulting (UK and US)

National Renewable Energy Laboratory

Founding Board Members Include:

Avangrid	Deepwater Wind
EDF Renewables	EDP-R
Equinor	Innogy
National Grid	Northland Power
Orsted	Shell

New Board Members 2019:

States: Virginia, Massachusetts, Maryland

Developers: Vineyard Wind, EnBW North America

Transmission Developer: Anbaric

2019 RFI Summary and FOA: Offshore R&D Test Facilities

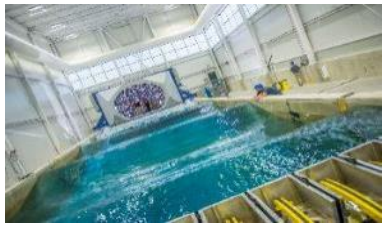
Intent Assess, utilize and upgrade national-level U.S. test facilities to support innovative research and development related to offshore wind energy

Timeframe RFI Issued 7/30/2018; closed 9/14/2018
FOA issued 3/28/2019; closes 6/17/2019

RFI Responses 21 total, from a range of industry and engineering firms, university research centers, national laboratories, and state and national business development organizations

RFI responses and Congressional language helped inform FOA

FOA $7M for up to 14 projects to conduct testing in support of innovative offshore wind R&D utilizing existing national-level testing facilities. A subtopic is included for projects that upgrade the capabilities of existing facilities to enable them to perform specific research activities.




2019 FOA:
Support for Demonstrating Innovative Technologies

Title **Project Development for Offshore Wind Technology Demonstrations**

Timeframe **RFI Issued 7/30/2018; closed 9/14/2018**
FOA issued 3/28/2019; closes 6/17/2019

Funding Up to $10M; up to 2 awards

Scope (Based on Congressional Direction)

- Enable full-scale testing of innovative technology/methodology at an offshore wind plant that will be operational no later than 2025
- Project development process must be already underway at the time of application
- Funding will be for supplemental project development activities to enabling demonstration
- Demonstration could be stand-alone or portion of a larger commercial scale offshore wind plant
- Must substantiate potential to reduce LCOE and/or future commercial-scale project risk

U.S. DEPARTMENT OF ENERGY

Thank you.

https://www.energy.gov/eere/wind/

WETO News Subscription: https://www.energy.gov/eere/wind/subscribe-wind-energy-technologies-office-news-updates

Offshore Wind Market Update: https://www.energy.gov/eere/wind/downloads/2017-offshore-wind-market-update

National OSW Strategy: https://energy.gov/sites/prod/files/2016/09/f33/National-Offshore-Wind-Strategy-report-09082016.pdf

Environmental Knowledge Base for Marine and Wind Energy (Tethys): tethys.pnnl.gov