U.S. DEPARTMENT OF ENERGY

Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Overview of Offshore Wind Research supported by the DOE Wind Energy Technologies Office

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BOEM Gulf of Maine Task Force Meeting

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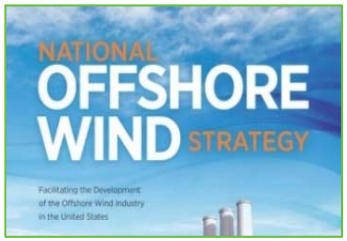
DOE's Wind Energy Technology Office (WETO)

WETO's Offshore Wind Objective: Advance the research and development of offshore wind technologies, environmental and siting research, and disseminate unbiased data to stakeholders.

DOE does not have regulatory authority for offshore wind



- Issued jointly with BOEM in 2016 as an update of 2011 strategy; input from industry, states and other stakeholders
- 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 OSW	6. Offshore Wind **Electricity Delivery & Grid Integration** 7. **Quantifying / Communicating** the Costs and Benefits of Offshore Wind

How? Directed national lab research; competitive awards; collaboration with Federal partners; communication and partnerships with stakeholders

U.S. Offshore Wind Industry Challenges and Opportunities Inform DOE Investments

U.S. Specific Challenges	Opportunities

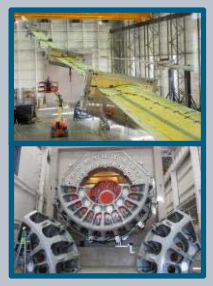
• Steep learning curve – European solutions may not be optimal or appropriate
  • Vessels and Jones Act
  • Supply Chain and Port Infrastructure
  • Permitting
  • Wildlife
• Challenging physical conditions – which are different than in Europe, i.e. hurricanes, ice, geophysical
• Floating: Deep water! nearly 60% of the offshore wind resource in the U.S. is in deep water, nearly 100% on Pacific Coast/ Gulf of Maine
• Floating: Wave Dynamics add complexity
• Floating: Advanced control strategies required
	• Generate low cost electricity near areas of high demand with limited new transmission
	• Targeted R&D and supply chain investments can result in steep cost reduction
	• Transformative technology allows offshore wind to be deployed in deep water increasing addressable energy resource
	• Foundation and installation technology that mitigates sound impacts on marine species
	• U.S. can become the world leader in floating platform technology using expertise from oil and gas industry




Key Offshore Projects Over Time

Major WETO Offshore Technology Development Investments and Actions

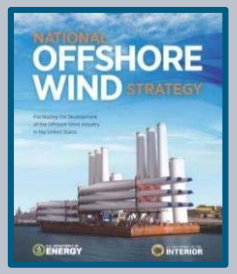
World-Class Test Facilities FY09



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

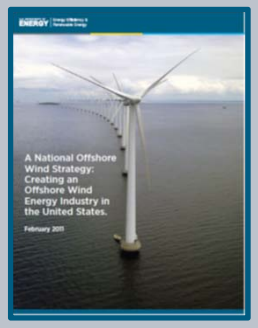
Launch of Buoy Loan Program

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+)

University of Maine's New England Aqua Ventus 1 Technology Demonstration Project

- On track to be first floating commercial-scale turbine deployed in the United States
- Will demonstrate floating concrete hulls by 2022
- Received Classification by the American Bureau of Shipping for 100% engineering design
- Industrialized concrete hull production using conventional concrete bridge construction methods. Allows domestic content and increased local job creation
- Project located in Northeast - high electricity costs & active market
- **5-year monitoring will provide invaluable data for industry and research communities on floating wind**

Floating Concrete Hull

Research and Tools Relevant for the Gulf of Maine: Technology Development

- Offshore wind energy resource assessments
  - https://www.energy.gov/eere/wind/wind-resource-assessment-and-characterization
- Techno-economic modeling and cost reduction analyses
  - Offshore Wind Resource, Cost, and Economic Potential in the State of Maine: https://www.nrel.gov/docs/fy18osti/70907.pdf
  - Annual Technology Baseline : https://atb.nrel.gov/electricity/2019/
  - Cost of Wind Energy Review: https://www.nrel.gov/docs/fy18osti/72167.pdf
- Annual offshore wind market reports
  - https://www.energy.gov/eere/wind/downloads/2018-offshore-wind-market-report
- The Advanced Technology Demonstration Program
  - https://www.energy.gov/eere/wind/offshore-wind-advanced-technology-demonstration-projects
- Deployment of the 1:8 Scale VolturnUS Offshore Wind Turbine
  - https://www.osti.gov/servlets/purl/1375022
- Offshore wind metocean buoy program
  - https://www.pnnl.gov/sites/default/files/media/file/LidarBuoy_Final.pdf
- National Offshore Wind Research and Development Consortium
  - https://www.energy.gov/eere/wind/national-offshore-wind-rd-consortium
- National Offshore Wind Test Facilities and Demonstration FOA in 2019
  - https://www.energy.gov/articles/doe-awards-28-million-wind-energy-research-development-and-demonstration-projects

Research and Tools Relevant for the Gulf of Maine: Environmental Research

Objective: Develop informed technical solutions to wildlife impacts

Data Collection & Experimentation

Conduct research to better understand species' exposure and the factors that drive risk in order to inform siting and mitigation solutions

- Multi-Year Study of Bat Activity in the Gulf of Maine, Mid-Atlantic and Great Lakes

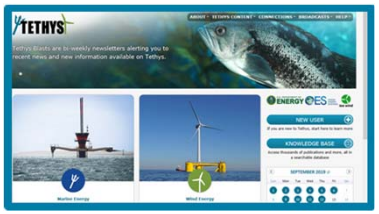
Monitoring & Mitigation

Advance technologies or measures to reduce fatalities at wind energy facilities in an affordable manner

- Development of automated bird collision detection systems
- Development of low cost, easily-deployable buoys for monitoring marine mammals around construction

Information Synthesis & Sharing

Coordinate information synthesis and dissemination through collaboratives and information sharing.



- **Tethys:** A comprehensive searchable library designed to facilitate the exchange of information & data on the environmental effects of wind

https://tethys.pnnl.gov

New Offshore Wind Initiative: Summary of Environmental Effects Research

- Summarize what we understand regarding environmental impacts based on global research to date
- Examine which of the high level findings are anticipated to be similar in U.S. waters with a focus on Mid-Atlantic, New England and West Coast.
- ID key areas where there may be knowledge gaps based on
  1. US unique complement of species,
  2. US legal/regulatory structure
- Summarize what is known regarding methodological effectiveness

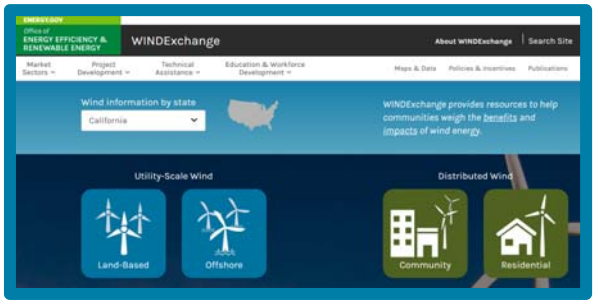


- Note: Currently in planning stage - Seeking input from external stakeholders and welcome input on structuring the initiative so that is well-aligned with Gulf of Maine needs and priorities

Research and Tools Relevant for the Gulf of Maine: Development Info. for Communities & Decision Makers

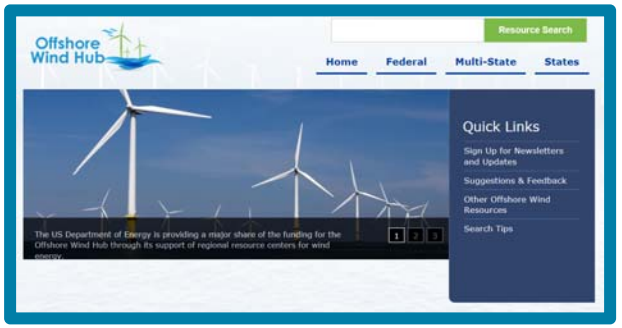
Wind Exchange: Platform for stakeholder information on wind energy market sectors, state specific profiles and publications; newsletter; siting and project development information

https://windexchange.energy.gov



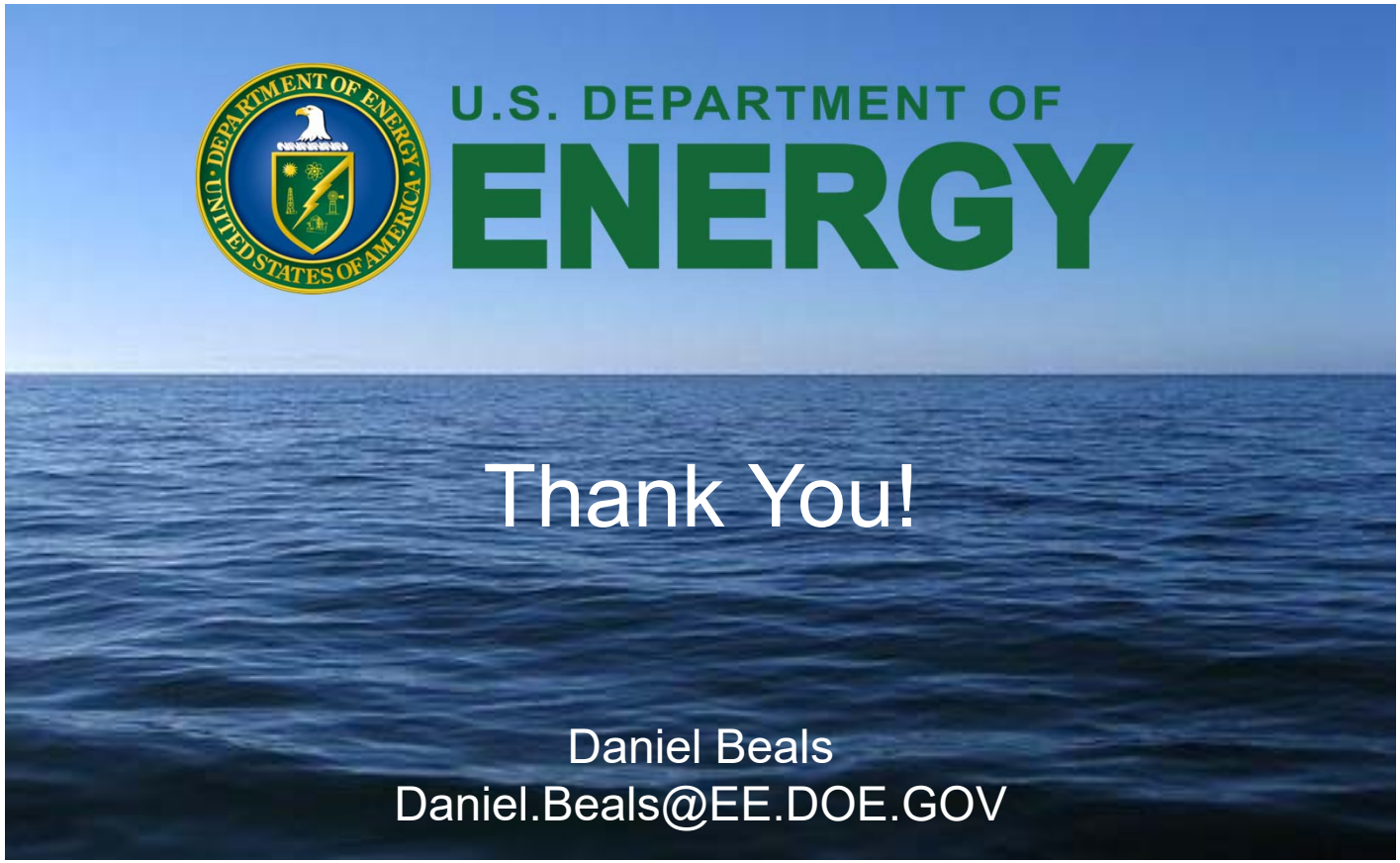
Offshore Wind Hub: Platform for published offshore wind resources with a focus on the East Coast of the US

https://offshorewindhub.org/



Offshore Wind Technologies Market Report: Industry information through June, 2019; global market; all planned U.S. projects; lease areas; state policies; technology trends

https://www.energy.gov/eere/wind/downloads/2018-offshore-wind-market-report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Thank You!
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