Offshore Wind at DOE:
Investing in R&D to enable offshore wind energy development in all U.S. coastal regions

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Wind Energy Technologies Office
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Offshore Wind at DOE –
A Technology Progression from ARPA-E to Loan Guarantee

- Valley of Death #1: Public Funds DOE ARPA-E
- Valley of Death #2: Follow-on Development Funds DOE EERE - Wind Energy Technologies Office (WETO)
- Valley of Death #3: Venture Capital/Private Equity WETO
- Valley of Death #4: Public Funds DOE Loan Program Office & SEP
Industrialization and optimism about technology driving falling EU (and now U.S.) procurement prices – continued R&D crucial

Adjusted Strike Prices from European Offshore Wind Auctions

- United Kingdom
- Denmark
- Netherlands
- Germany

Notes: *Grid and development costs added; **Grid costs added and contract length adjusted

Sources: NREL Spatial Cost Model; BNEF 2017 (German wholesale price projections); PBL Netherlands Environmental Assessment Agency (2018) (Dutch wholesale price projections)
WETO Broad Mission and Portfolio

Mission: Advance scientific knowledge and technological innovation to enable clean, low-cost wind energy options nationwide

- **Key Opportunities**
  - Reduce Cost through Technology R&D
  - Reduce Market Barriers to Deployment
  - Reduce Grid Integration Impacts

- **How?** Directed lab research, competitive awards, collaboration with Federal partners, communication with stakeholders
2016 National Offshore Wind Strategy: DOE Actions

<table>
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<tr>
<th>Strategic Themes</th>
<th>Action Areas</th>
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| 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 and Clarity in the Regulatory Process  
5. Managing Key Offshore Wind Environmental and Human Use Concerns |
| Improving Understanding of the Costs and Benefits of Offshore Wind | 6. Offshore Wind Electricity Delivery and Grid Integration  
7. Quantifying/Communicating the Costs and Benefits of Offshore Wind |
Current Research Activities: Technology R&D

Offshore Wind Advanced Technology Demonstration Projects
Demonstration and deployment of innovative commercial scale technologies with the potential to lower the cost of energy (LEEDCo, University of Maine)

Offshore Wind Plant Optimization (Atmosphere to Electrons, A2e)
Improve the performance and reliability of next-generation optimized plants by investigating systems-level efficiency losses influenced by atmospheric conditions and turbine-turbine wake interaction in large turbine arrays

Resource Characterization and Siting Research
Lidar buoy deployment and data analysis; upgrades to lidar and acceptance testing (FY19); deployment in CA with BOEM (FY19); hurricane modeling; wind forecasting improvement projects.

Floating Technology R&D and Design Tools
Integrated systems engineering toolsets, high-fidelity simulation capabilities, controls research.

Offshore Wind Specific Standards Development
**Current Research Activities: Technology R&D**

**Offshore Wind R&D Consortium**

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<th>What?</th>
<th>Why?</th>
<th>How?</th>
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| • Competitive solicitation  
• $20.5M in Federal funds with required industry matching  
• NYSERDA selected in June 2018 | • Collaboration  
• Multiple funding rounds  
• Accelerated Learning  
• Commercial Adoption | • R&D Roadmap and Solicitations  
• *First RFP to be released in February – subscribe to WETO Newsletter to stay up to speed!* |

**Offshore National Facilities Request for Information**

- Opened August 8, closed September 14
- Existing facilities, facilities upgrades, new facilities, R&D
- Catalogue and publish the results

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Current Research Activities: Analysis and Modeling

Understanding technology trends, costs, and benefits
- NREL: [2017 Offshore Wind Market Update](#)
- LBNL: "Estimating the Value of Offshore Wind Along the US Eastern Coast"

Identifying and evaluating technology improvement opportunities
- NREL: Floating offshore wind systems optimization studies
- NREL: Evaluating future cost reduction pathways

Net value of offshore wind in Northeast

Total 2016 net value ($/MWh)

Floating cost reduction pathways

2015: High LCOE

2027: Low LCOE
Current Research Activities: Market Acceleration and Deployment

**WINDEExchange**
Program designed to provide information on wind energy development to stakeholders. Includes wind resource potential data, economic impact evaluation models, information on state resources and more.

**Wind Turbine Radar Interference Mitigation Working Group**
DOE, DOD, DOI, NOAA, and FAA collaborating on R&D to:
1) Improve capacity to evaluate the impacts of wind energy on sensitive radars
2) Develop mitigation measures to increase resilience of existing radars to wind turbines
3) Encourage the development of next-generation radars resistant to wind turbine interference

**Environmental Research**
- WREN international collaborative, as well as the Bats and Wind Energy Cooperative and the National Wind Coordinating Collaborative
- Tethys database
- Monitoring technology development
Current Research Activities: Market Acceleration and Deployment

Advanced Wind R&D to Reduce Costs and Environmental Impacts FOA

$6M to support the development and validation of advanced technology to reduce environmental impacts

• Topic Area 3: Development and Validation of Offshore Wind Monitoring and Mitigation Technologies
  ➢ $2m in funding
  ➢ Proposals currently under review
  ➢ Selections anticipated in early 2019
Thank you.

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


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