



## DOE's Offshore Wind Strategy

UWIG Fall Technical Workshop

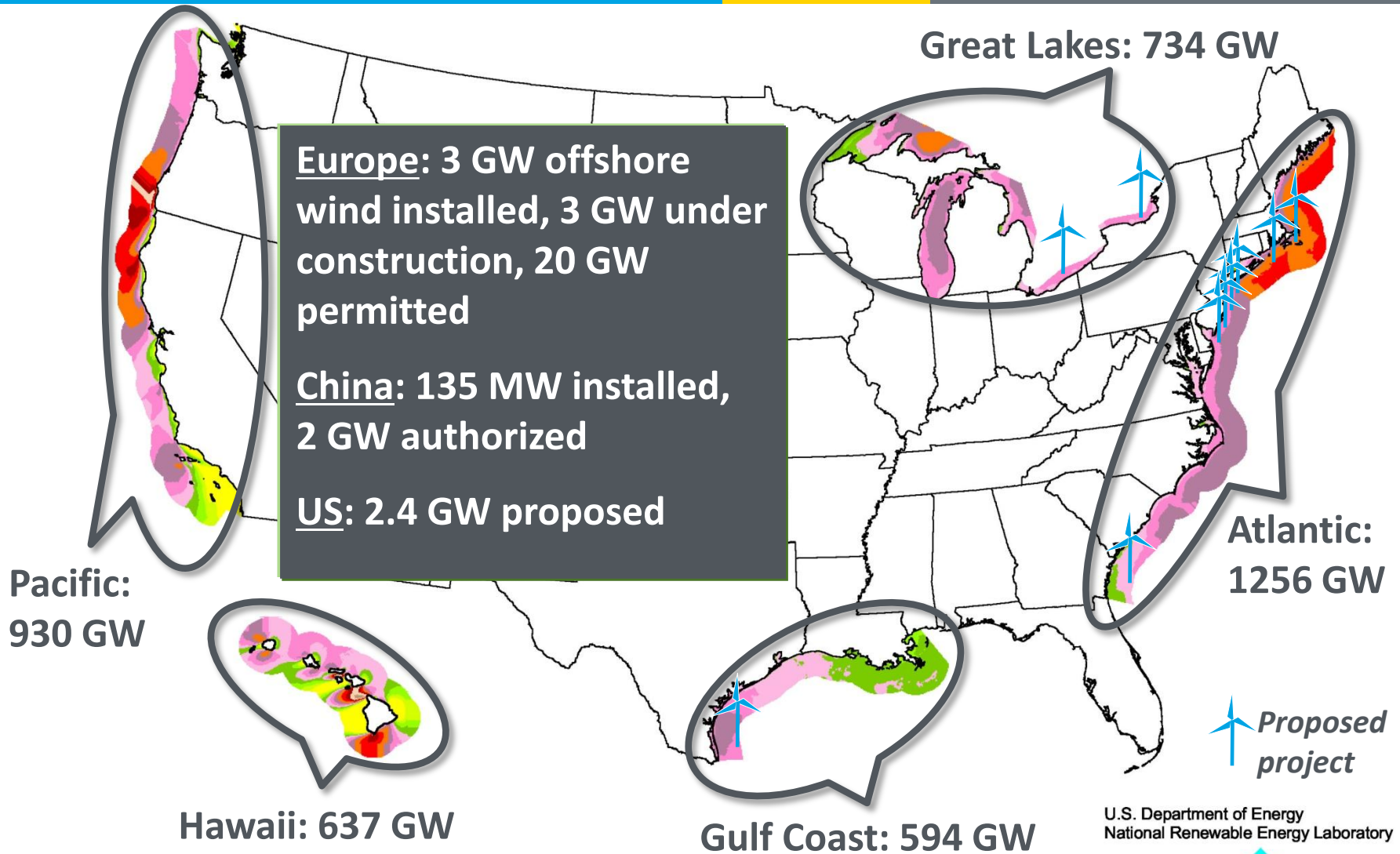
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DOE Wind and Water Power Program

# Offshore Wind: Huge Potential



*Total gross resource potential does not consider exclusion zones or siting concerns*

## *A commitment by the federal government to facilitate responsible deployment of offshore wind energy*

- Provides long range strategy for
  - Lowering cost of energy
  - Prioritizing federal R&D investments for maximum economic impact
  - Addressing the full range of stakeholder issues limiting industry growth
  - Reducing timeline for permitting and deployment
- Announced by Secretary Chu and Secretary Salazar on February 7, 2011
- Backed by an initial \$50.5 M in funding for offshore wind research and development

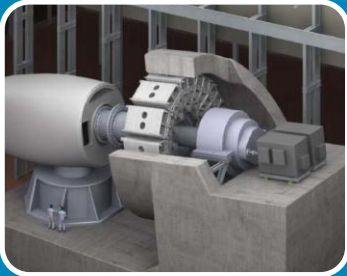


[http://www1.eere.energy.gov/windandhydro/pdfs/national\\_offshore\\_wind\\_strategy.pdf](http://www1.eere.energy.gov/windandhydro/pdfs/national_offshore_wind_strategy.pdf)



## Large Blade Test Facility (Boston, MA)

- Provides a globally unique service for testing blades up to 90m in length
- Facilitates the development of the next generation of wind turbines (up to 15MW)
- Total Project Value: \$31.6M (\$25M ARRA Grant)
- Facility commissioned on May 18<sup>th</sup>, already booked for 18 months of testing with various blade manufacturers



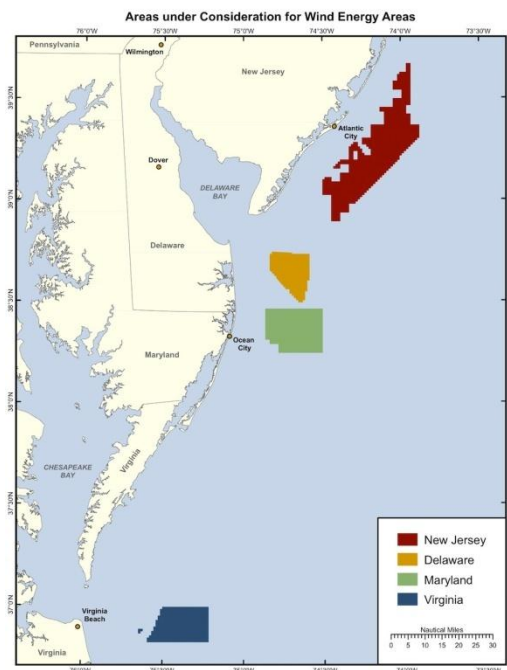
## Drivetrain Test Facility (Charleston, SC)

- Capable of highly accelerated life testing (HALT) of drive trains for wind turbines up to 15MW
- Total Project Value: \$93.6M (\$45m ARRA Grant)
- Finalizing building design plans, equipment manufacturing well underway



## U-Maine Deepwater Wind (Bangor, ME)

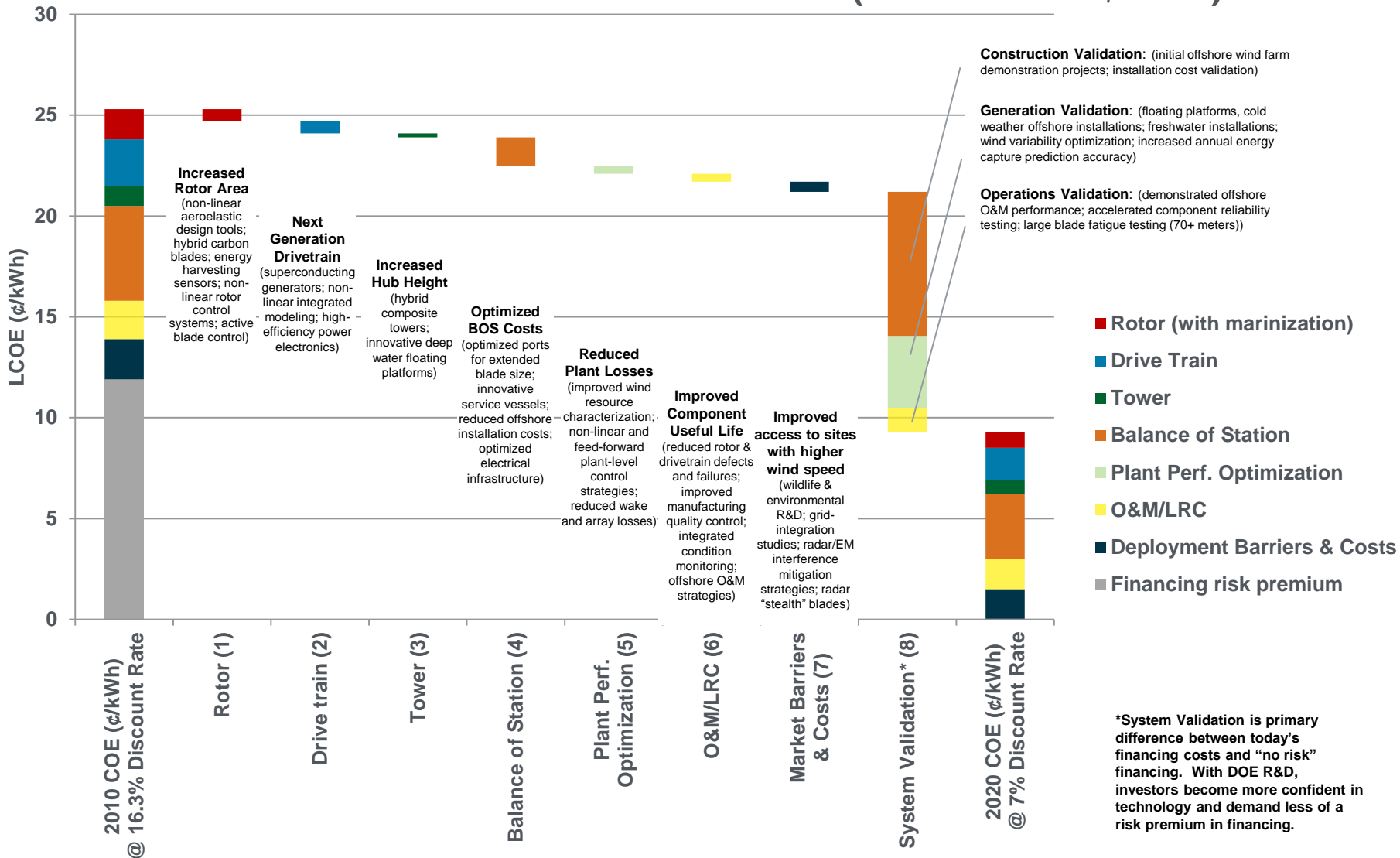
- Developing the next generation of offshore wind turbine platforms
- Facilitates commercial offshore wind deployment in deep-water environments
- Total Project Value: \$8.5M (\$7.1M ARRA Grant)
- Just completed 1:50 scale testing of selected platform designs. Selected Vestas v27 (225kW) as turbine for 1:3 scale demonstration in the Gulf of Maine

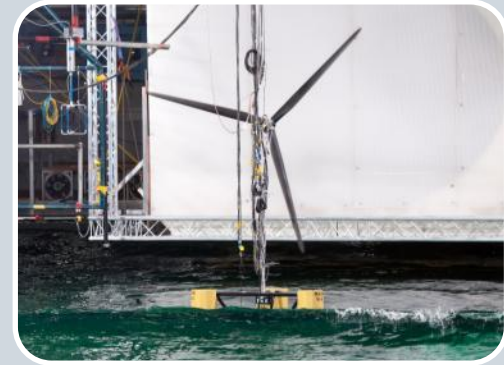
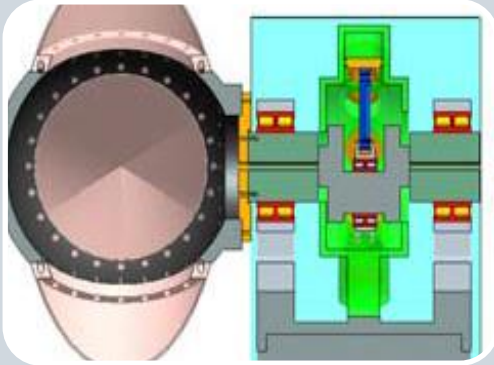


Activity	Partners
MOU for Coordinated Deployment of Offshore Wind and Marine Hydrokinetic Energy	DOI
Intergovernmental State Task Forces	DOI, state, local, & tribal govts, federal agencies
Collaborative development of environmental protocols and monitoring	DOI, NOAA
Smart from the Start Initiative	DOI
MOU on Weather-dependent and Oceanic Renewable Energy Resources	NOAA
Coordination to facilitate offshore wind deployment in Great Lakes	CEQ
Coastal and marine spatial planning efforts	National Ocean Council
Ocean observation, mapping, and infrastructure	NOC
Federal Renewable Ocean Energy Working Group	DOI, NOAA, FWS, DoD

<b>Program</b>	Interagency collaboration on range of development and deployment issues to leverage capabilities and magnify impact
<b>DOE involvement</b>	Technical input & assistance to agencies, applied research on key issues, policy and economic analysis
<b>Solutions</b>	Data collection and analysis; development of monitoring tools; stakeholder engagement
<b>Key partners</b>	DOI-BOEMRE, NOAA, NMFS, USCG, DoD, USFWS
<b>Success metrics</b>	Development of efficient permitting processes and informed decision-making

## Offshore Wind Cost Reduction Cascade (2030 Goal = 6¢/kWh)





## Developing Innovative Technologies

Computational Tools

Turbine Design

Marine Systems Engineering

## Removing Market Barriers

Siting and Permitting

Infrastructure

Resource Planning

## Demonstrating Next-Generation Designs

Demonstration Project Partnerships

Develop modeling tools, optimized system designs, and components necessary for long-term R&D to reduce cost of offshore wind energy

Modeling and Analysis Design Tools

Innovative System Design Studies

Innovative Component Development

**\$26.5M**  
**19 Awards**  
**5 Years**



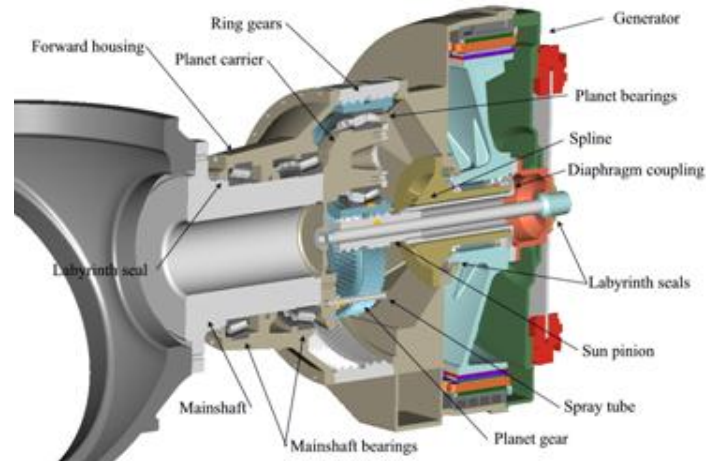
Develop core technologies for next-generation turbines, ensuring competitiveness of domestic OEMs

## Superconducting Generator

## Hybrid/Permanent Magnet Drive

## Chain and Hydrostatic Drive

**\$12M**  
**6 Awards**  
**2 Years**



Close data gaps needed for efficient permitting; develop cost-competitive O&M strategies; transmission and interconnection planning

Market and Economic Analysis

Environmental Risk Reduction

Manufacturing and Supply Chain Development

Transmission Planning and Interconnection Studies

Optimized Infrastructure and Operations

Resource Characterization and Design Conditions

Impact on Electronic Equipment

**\$16.5M**

**22**

**Awards**

**3 Years**

**ABB**

**Duke Energy**

**AWS Truepower**

**NREL**

**U of Pittsburgh**

## **National Offshore Wind Energy Grid Interconnection Study**



- Develop offshore wind development staging projections for east coast, west coast, gulf coast and great lakes
- Determine general offshore production profiles for the 4 regions
- Assess applicability of common integration study methods and provide guidance for changing techniques
- Assess regulatory trends and their impact as impediments or incentives to offshore wind power

## Case Western University

FirstEnergy

General Electric

NREL

PJM Interconnection



## Great Lakes Offshore Wind: Utility and Regional Integration Study

- Case study of Lake Erie - uses an appropriate system model, offshore wind profiles, transmission and generating system conditions to identify utility integration needs relative to Lake Erie and recommend appropriate system upgrades including capacity and storage
- General Recommendations for Interconnecting Large Great Lakes and potentially National Wind Plants to the Grid - includes interconnection points, control requirements, application of system reinforcements

## University of Delaware

Princeton U

PJM Interconnection

Atlantic Grid Development



### Mid-Atlantic Offshore Wind Interconnection and Transmission (MAOWIT)

- Comparison of radial connections to PJM vs. connections via backbone system
- High-resolution examination of power fluctuations at each node due to wind variability
- Analysis of wind power production profiles to assess North-South transmission for leveling offshore wind energy output
- Analysis how the above affect the need for PJM grid updating, congestion management, and demand
- Analysis of historic 36 and 24 hr forecasts to support the unit commitment problem and determine the optimal mix of generators given the need to respond to both wind variability and wind forecasting uncertainties

**Duke Energy**

**NREL**

**ABB**

**AWS Truepower**

**U of North Carolina**

## **Carolinas Offshore Wind Integration Case Study**



- Examine the effects of offshore wind development on the Duke Energy Carolinas system by
- Determine the cost of upgrading the transmission system
- Assess system impacts and changes in the generation dispatch needed for integration.

# Any Questions?



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