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Offshore Wind Overview

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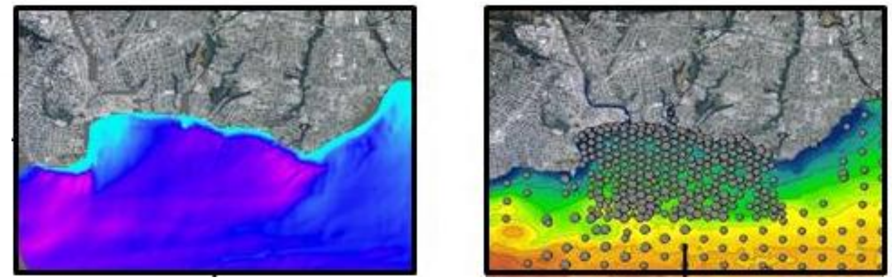
Offshore Wind @ Sandia

Addressing the challenge through research: *Identifying and mitigating technology barriers and leveraging past experiences*

Waves and Currents

Sediment Characteristics



Offshore Siting Analysis

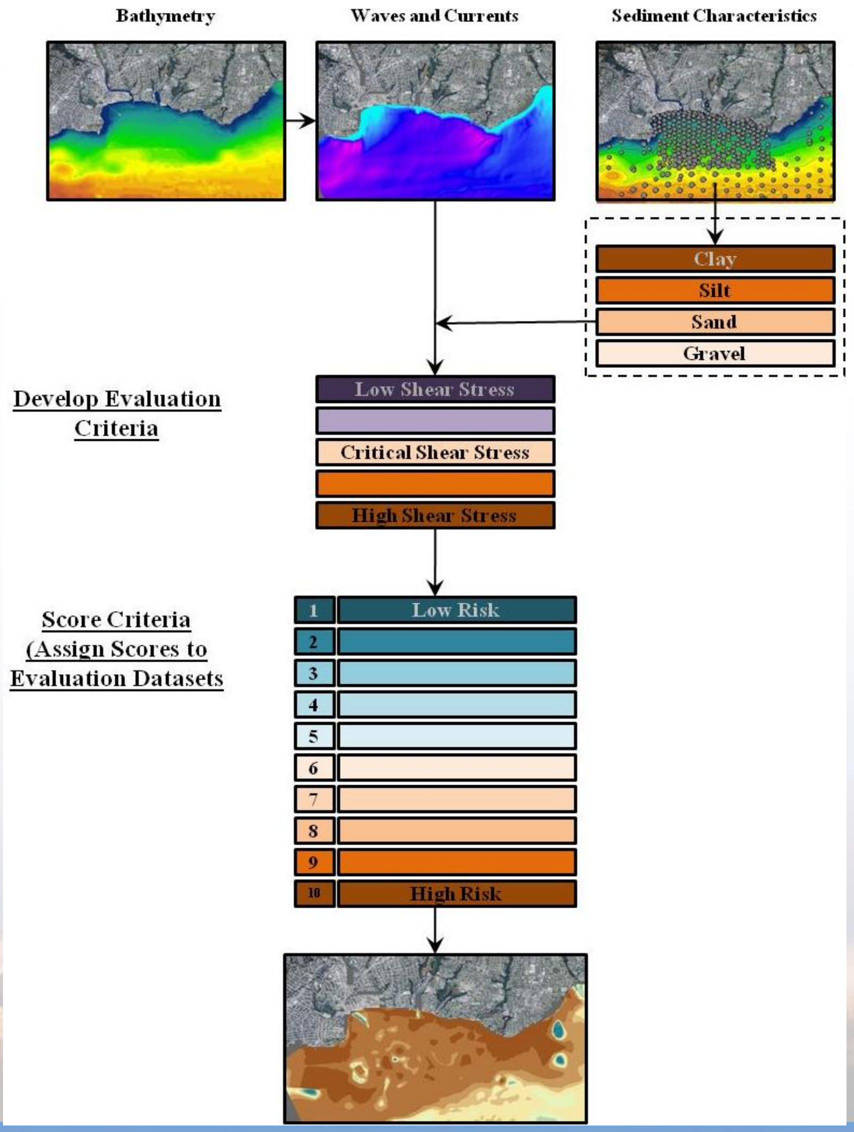
VAWT rotor development

Large Offshore HAWT Rotors (100-meter blade)

Sediment Transport, Scour and Foundation Impact Analysis

Objectives:

- Develop public domain methods/tools for assessing wind farm and ecosystem risk from sediment mobilization due to seafloor-structure interactions.
- Transfer the tools and techniques to industry for site-specific evaluations required for permitting and design.
- Develop industry guidance on coastal processes and assessment techniques for seabed dynamics to streamline OWF design and permitting

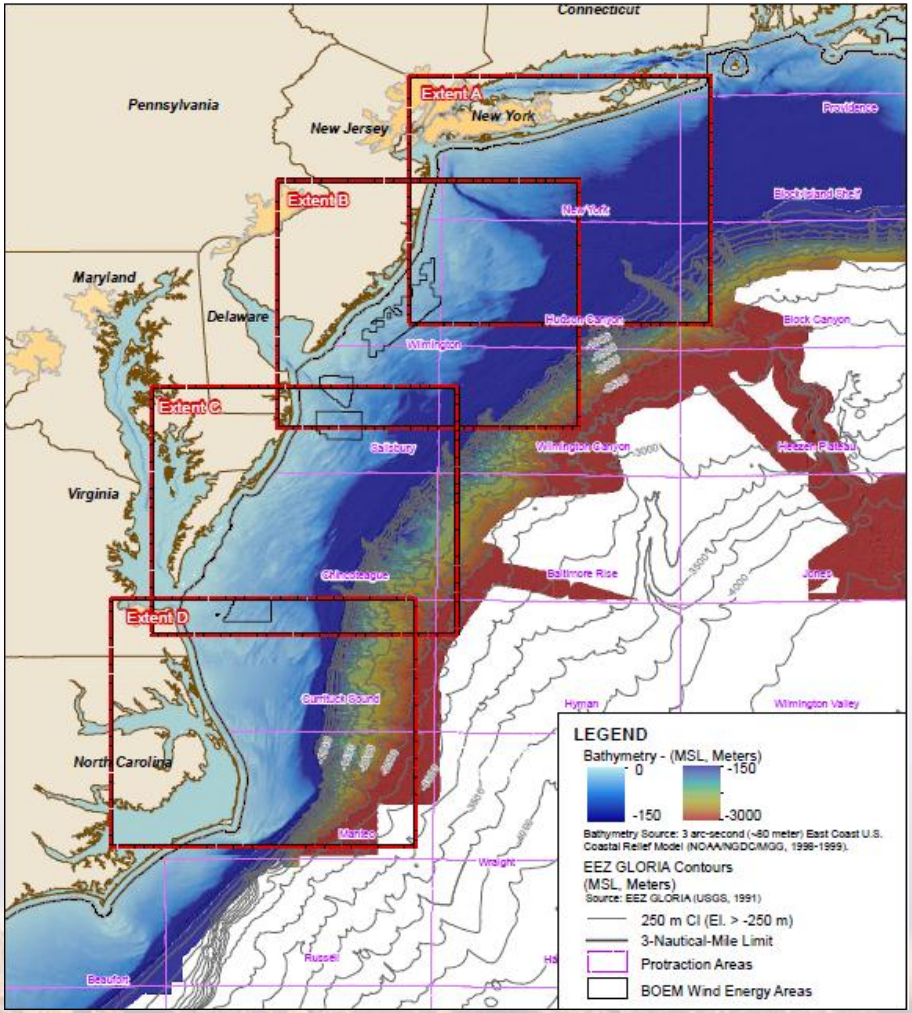


Critical to Offshore Siting

(cont'd) Sediment Transport, Scour and Foundation Impact Analysis

- **Completed draft report describing a methodology to estimate the probability of sediment mobilization and scour due to the presence of offshore wind structures using Monterey Bay, CA as a test bed.**

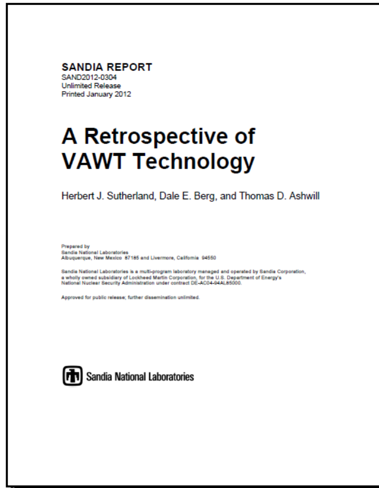
- **Studies of Atlantic coast between Long Island and Cape Hatteras (Mid-Atlantic).**



Another important siting consideration……

Project objectives:

- Identify key players in offshore turbine/radar interaction
- Identify and document key offshore radar issues/concerns
- Developing an initial plan to mitigate the identified offshore radar issues



SANDIA REPORT
SAND2012-0304
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A Retrospective of
VAWT Technology

Herbert J. Sutherland, Dale E. Berg, and Thomas D. Ashwill

Prepared by
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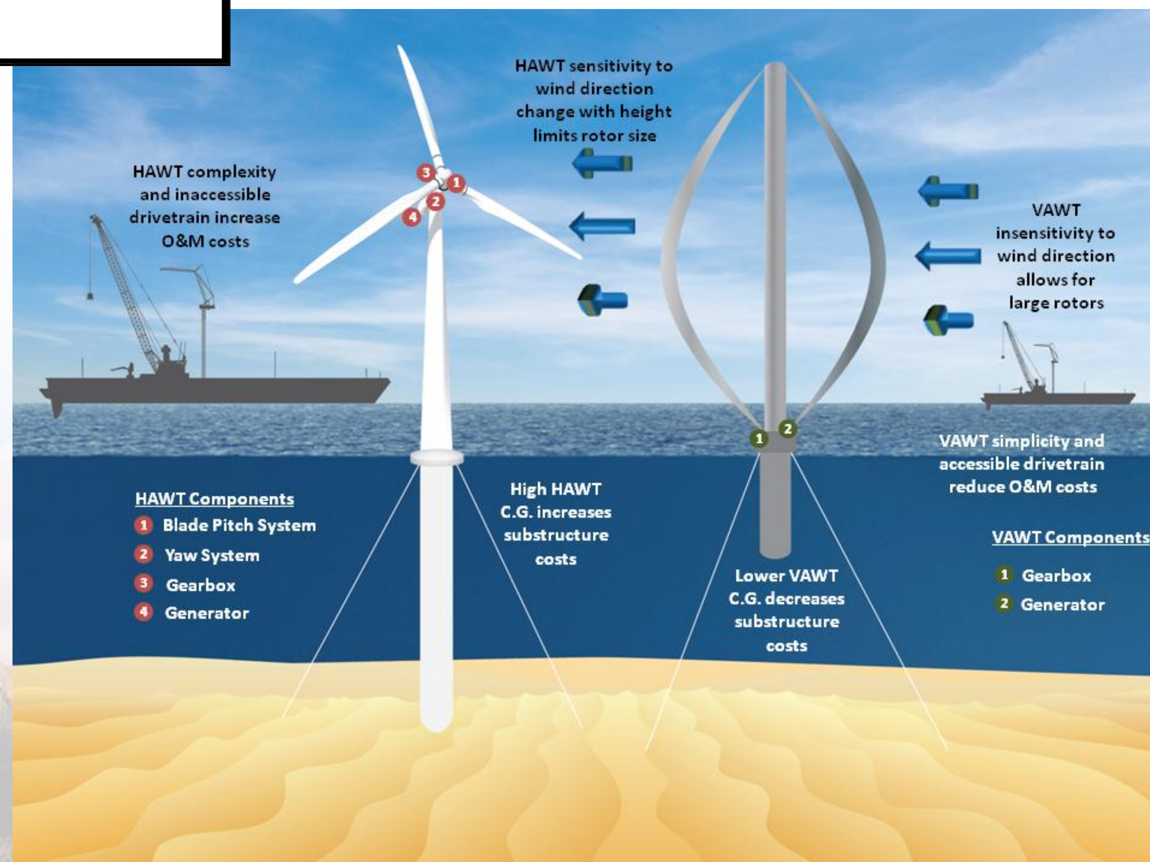
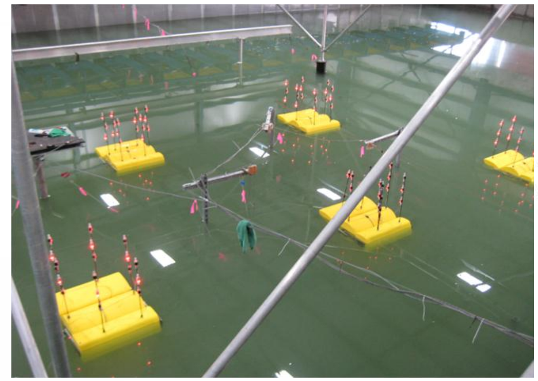
Innovative Offshore Vertical-Axis Wind Turbine Rotors

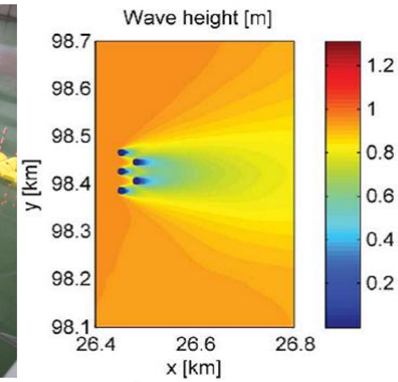
Overview:

- **This project focuses on improving the VAWT rotor sub-system through improvements in aerodynamics, materials, blade manufacturing, and test methods.**
- **Innovative rotor designs will be developed that reduce system COE.**
- **Designs will then be tested at sub-scale to prove their feasibility and increase the TRL of VAWT technology for offshore deployment.**



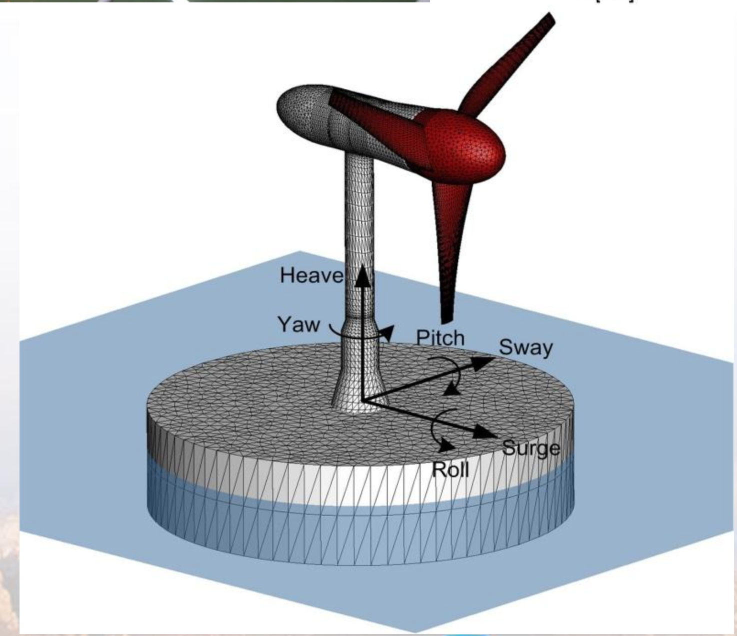
High-resolution modeling of offshore wind turbines and farms





Overview:

- The University of Minnesota and Sandia were awarded a collaborative project to investigate high-resolution modeling of floating offshore wind turbines and farms.



Small Wind Prototypes

Support of local New Mexico developers

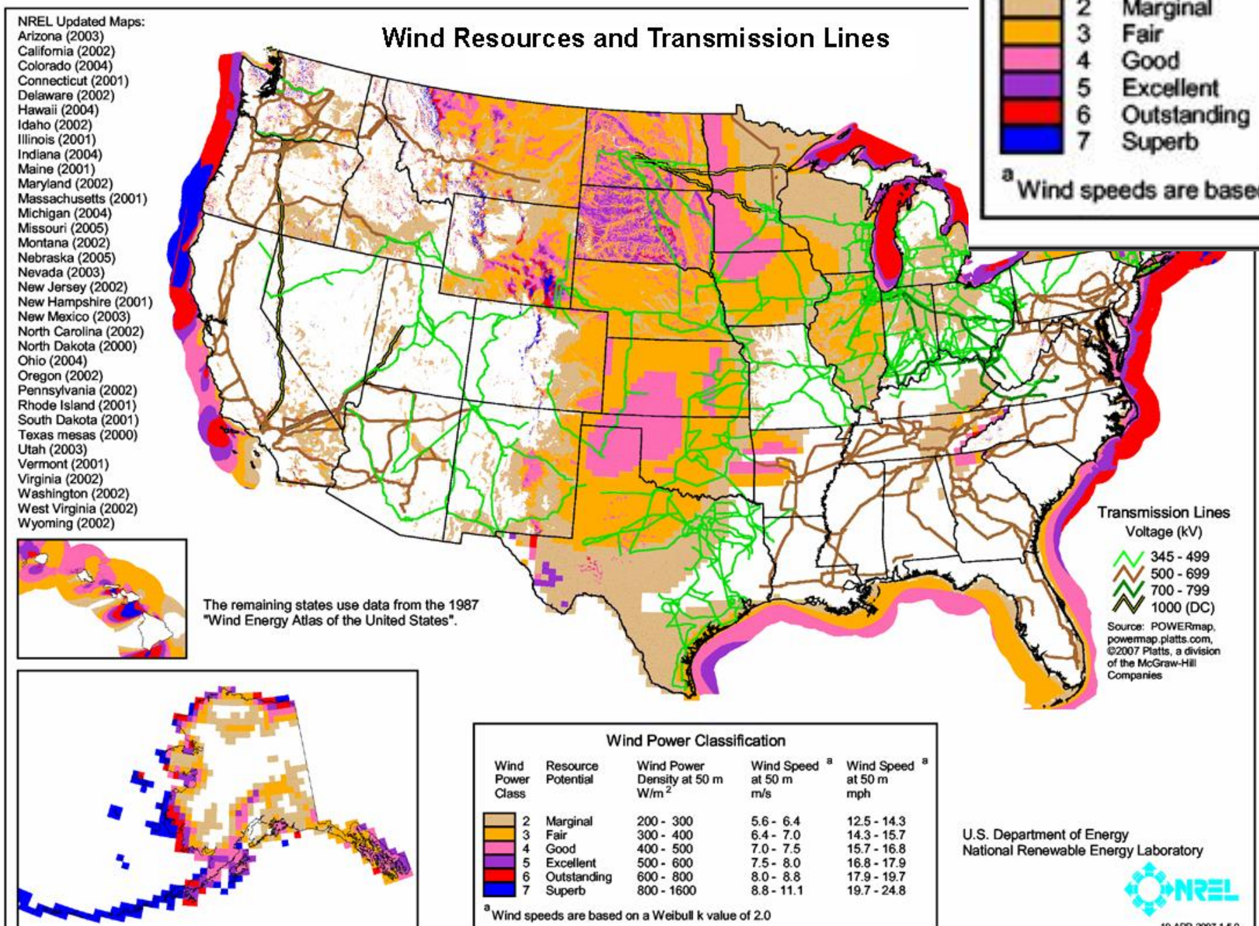
United States Wind Speed Data

- **What does 10.9 m/s mean?**

Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m^2	Wind Speed [a] at 50 m m/s	Wind Speed [a] at 50 m mph
2	Marginal	200 - 300	5.6 - 6.4	12.5 - 14.3
3	Fair	300 - 400	6.4 - 7.0	14.3 - 15.7
4	Good	400 - 500	7.0 - 7.5	15.7 - 16.8
5	Excellent	500 - 600	7.5 - 8.0	16.8 - 17.9
6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	800 - 1600	8.8 - 11.1	19.7 - 24.8

[a] Wind speeds are based on a Weibull k value of 2.0



Effect of elevation on wind:

$$v_2 = v_1 \left(\frac{h_2}{h_1}\right)^n$$

Solving for v2…

h_1=9m v_1=10.9 m/s

h_2=50m n = ground surface friction coefficient choose 0.2

N=0.1, water or smooth ground

N=0.2, tall crops

N=0.3 city downtown

v_2= 15.3 m/s

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