

Maryland Offshore Wind Development

A Presentation to the Metropolitan Washington Council of
Governments, Energy Advisory Committee
December 15, 2011

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Center for Integrative Environmental Research

- Current and Past Projects
 - Evaluation of shale gas policy environment
 - Development of genuine progress indicator (GPI) for Maryland
 - Economic analyses of climate mitigation policies
 - Greenhouse gas inventories within the University System of Maryland

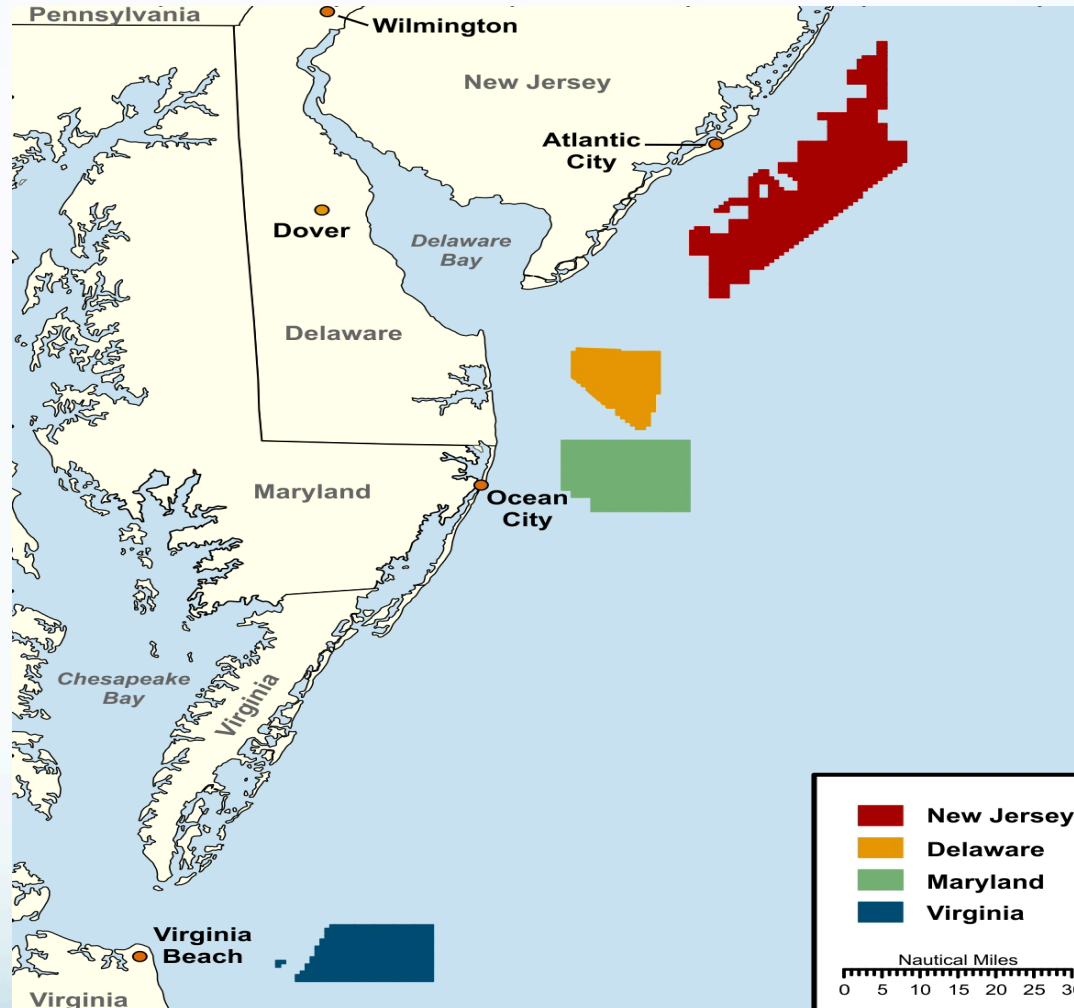


Overview

- Background Information on Offshore Wind
- Key Findings of the CIER 2010 Maryland Offshore Wind Report
- Discussion of Barriers and Research Questions



US Offshore Wind Potential



Source: 2010 Wind Technologies Market Report, US DOE



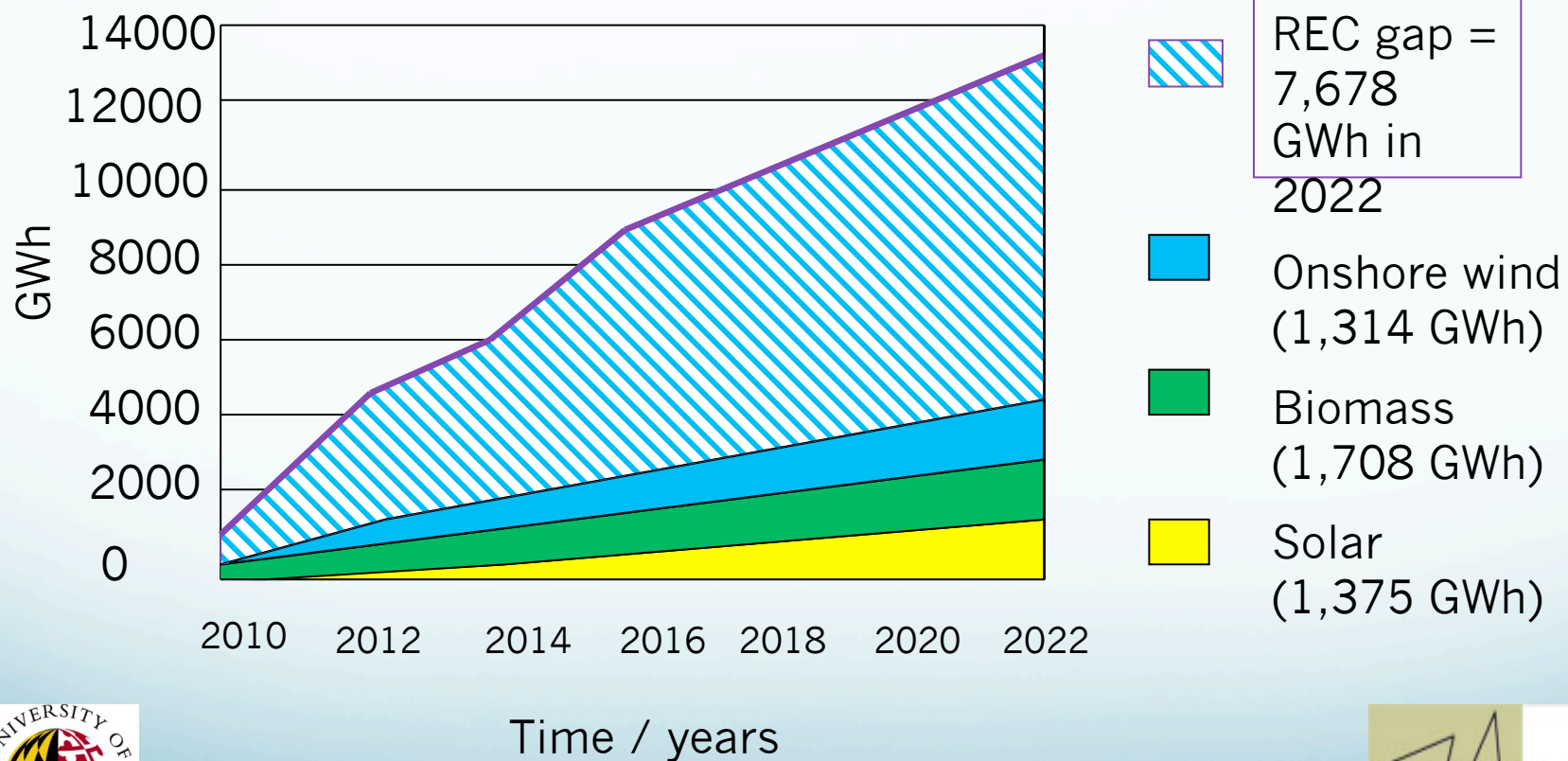
Atlantic Wind Connection



Source: Atlantic Wind Connection website



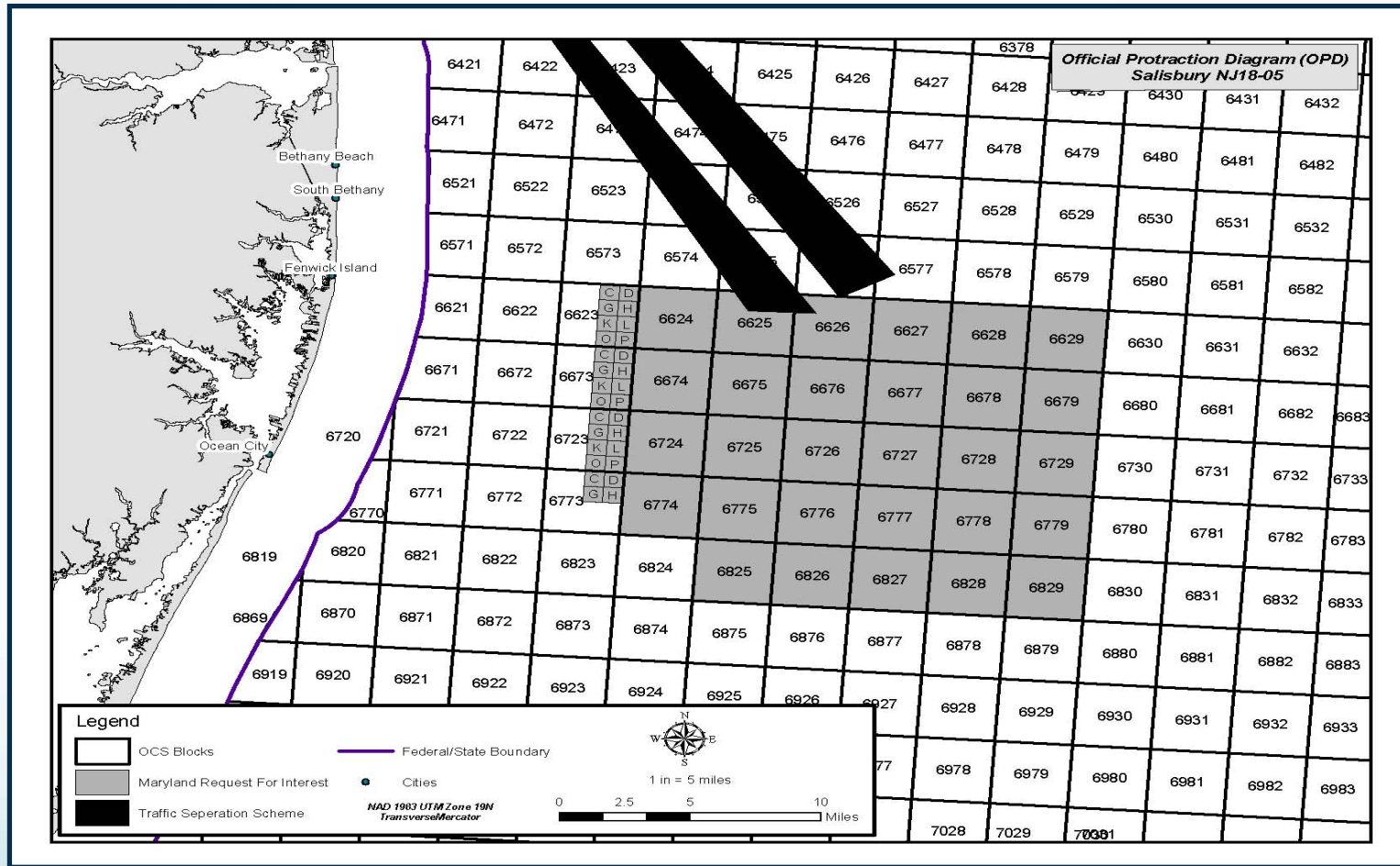
Maryland's RPS



Source: MEA, GWEC Presentation, December, 2009

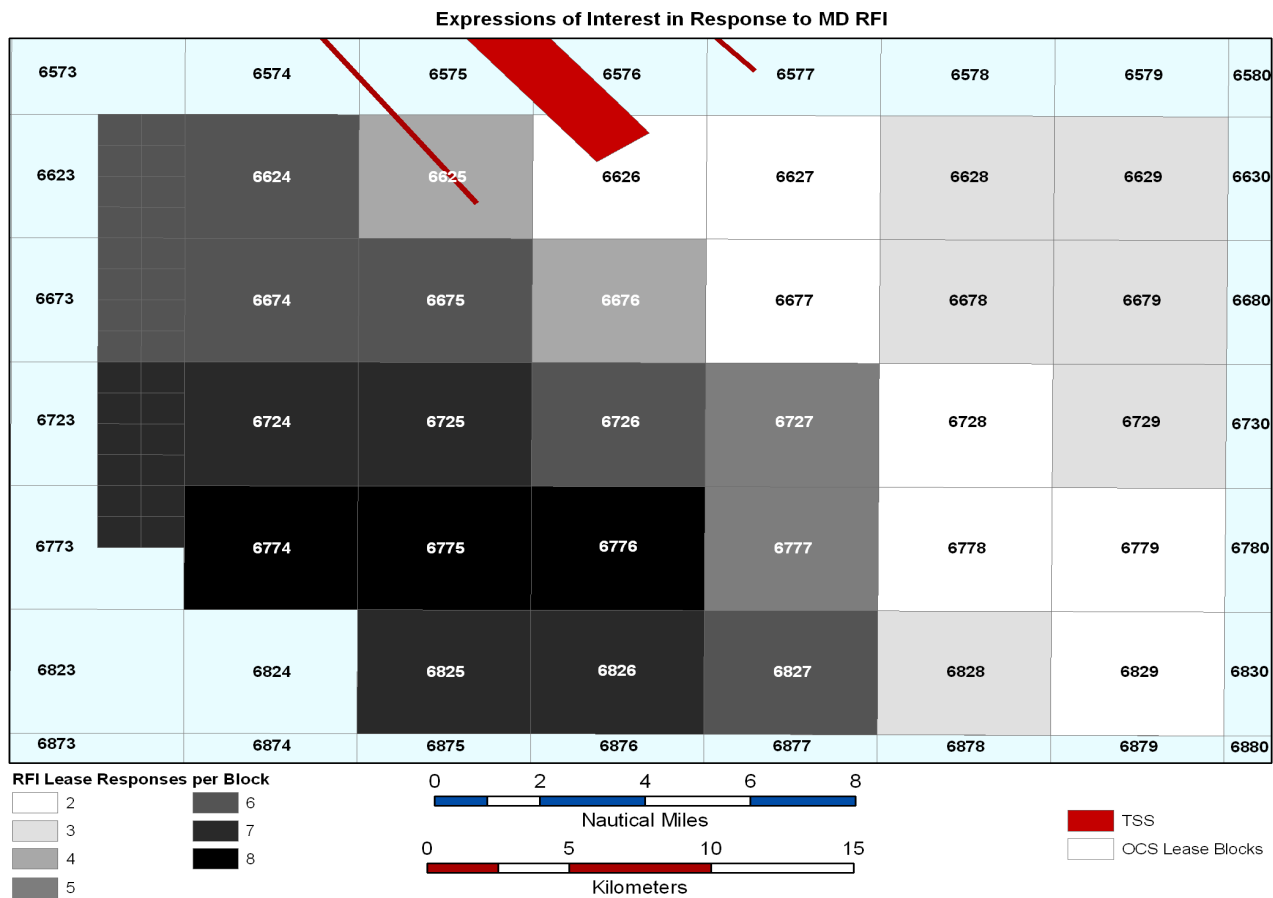


Maryland Interest Area



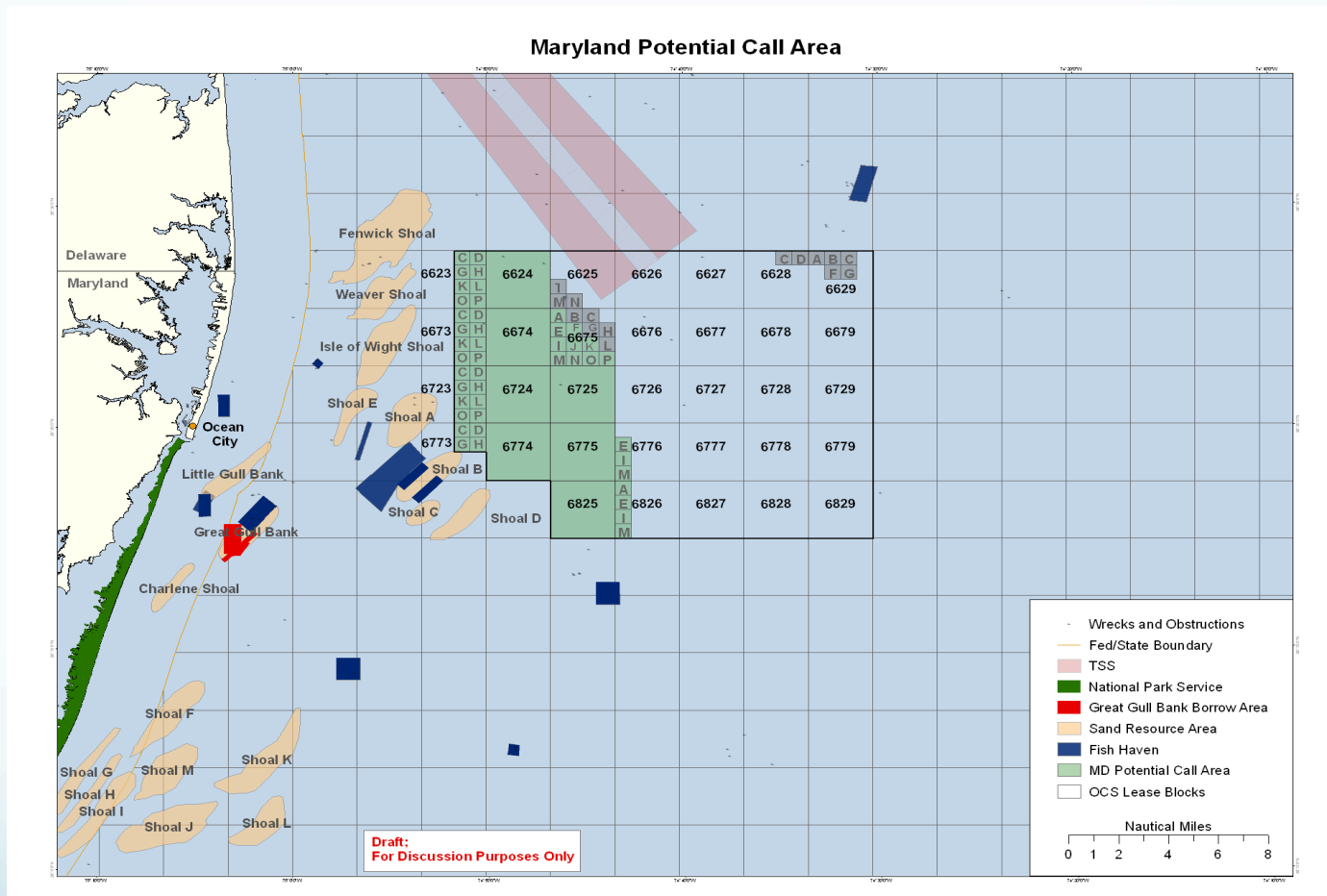
Source: BOEMRE Maryland Renewable Energy Task Force Meeting – June 24, 2011

Expressions of Interest



Source: BOEMRE Maryland Renewable Energy Task Force Meeting – June 24, 2011

Potential MD Call Area



Source: BOEMRE Maryland Renewable Energy Task Force Meeting – June 24, 2011

2010 CIER Study

- Permitting Process
- Interconnection Process
- Select Conflict Areas
- Investment Considerations



Permitting Process

- Federal Waters – BOEMRE is responsible for leasing development rights, rights-of-way, and conducting NEPA analyses for offshore wind
- State-Federal partnership via Task Forces
- Process
 - Request for Interest (RFI)
 - Call for Information and Nominations
 - Proposed Sale Notice
 - Award Lease (contingent on milestones)



Interconnection Process

- *Interconnection* – Integrating offshore wind capacity with onshore transmission network
- Process
 - Enter into PJM queue for system interconnections and upgrades; conduct feasibility and system impact studies
 - Receive state CPCN from Maryland PSC
- What matters when considering where to interconnect?
 - Conflicting uses and costs (distance, need for upgrades)
 - System reliability – current load, existing infrastructure
- Who pays?
 - The developer pays for upgrades with the prospect for future partial cost recovery



Case Study: Bluewater Wind, DE

- Initially, Bluewater Wind submitted a project to PJM that would have interconnected to Ocean City
 - However, the total cost of reinforcing all local cables and breakers connected to the substation would have exceeded \$200 million
- Instead, the current project will interconnect at Bethany Beach and then extend to Indian River, the planned Eastern terminal of the MAPP line
 - The total estimated interconnection cost of the current project is \$21 million because it requires fewer system upgrades



Optimal Interconnection for Maryland Offshore Wind

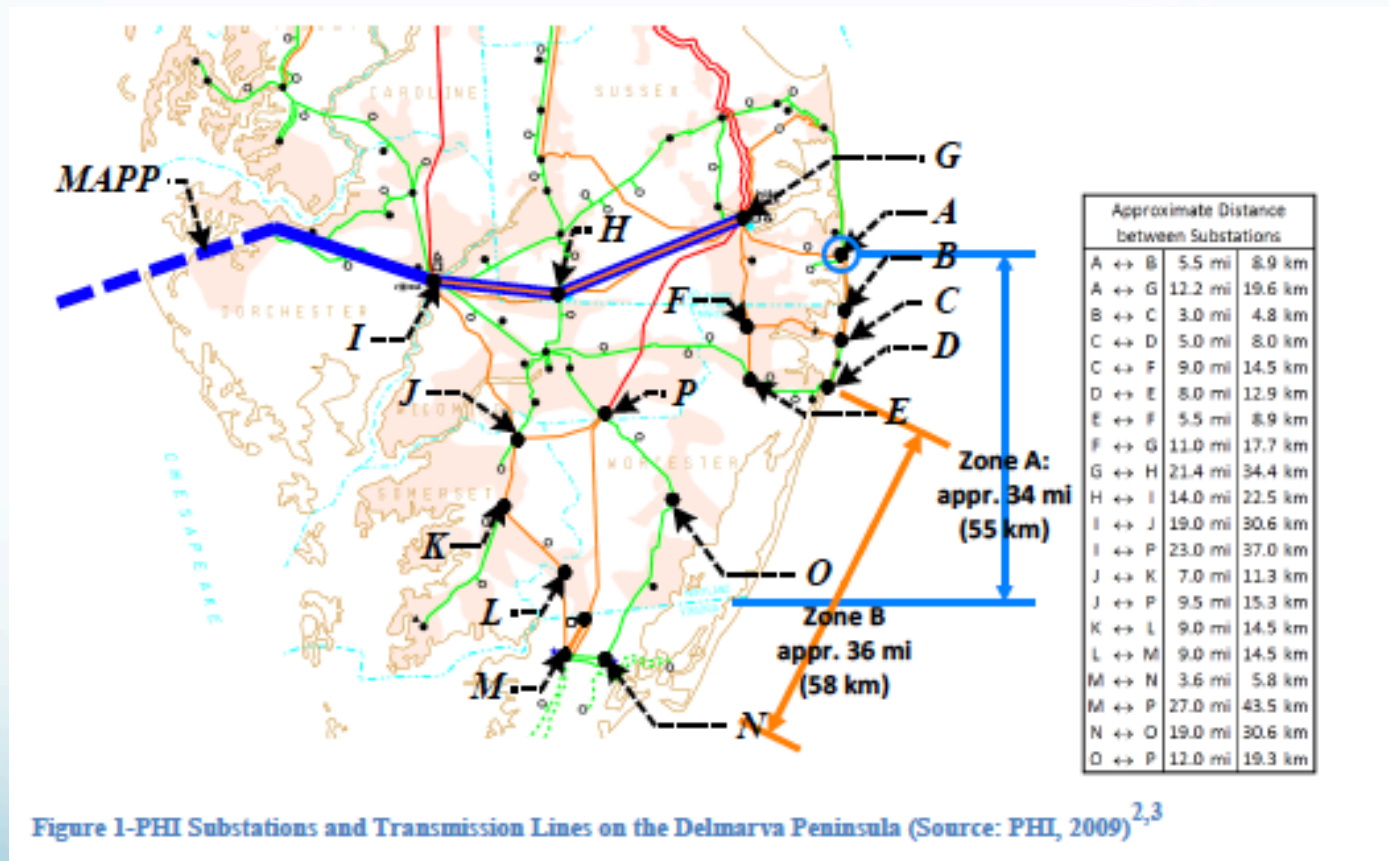


Figure 1-PHI Substations and Transmission Lines on the Delmarva Peninsula (Source: PHI, 2009)^{2,3}

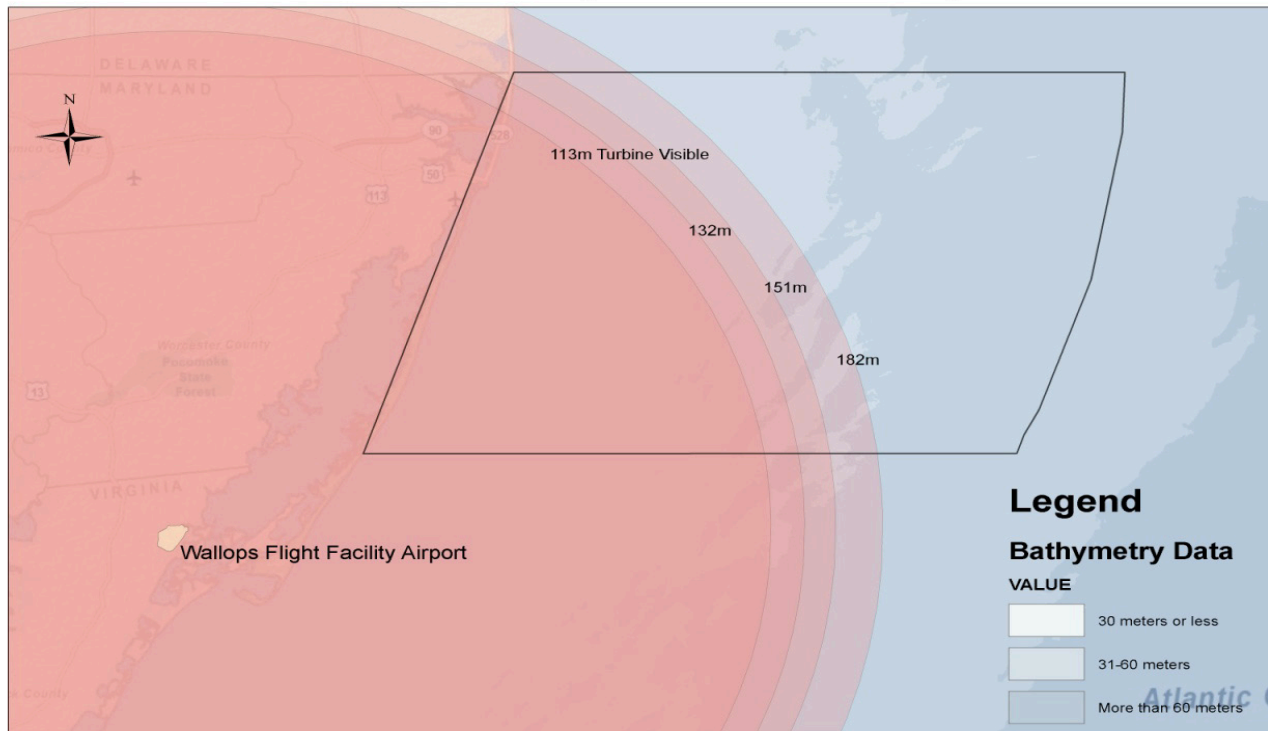
Select Conflict Areas

- Radar
- Military Operations and Aerospace Research



Radar Interference

WFF Radar Line of Sight Radii for 4 Turbine Heights



Sources
Streetmap: ESRI, Tele Atlas North America, Inc.
Radar Horizons: WFF, NASA, CIER
Bathymetry Data: The Nature Conservancy

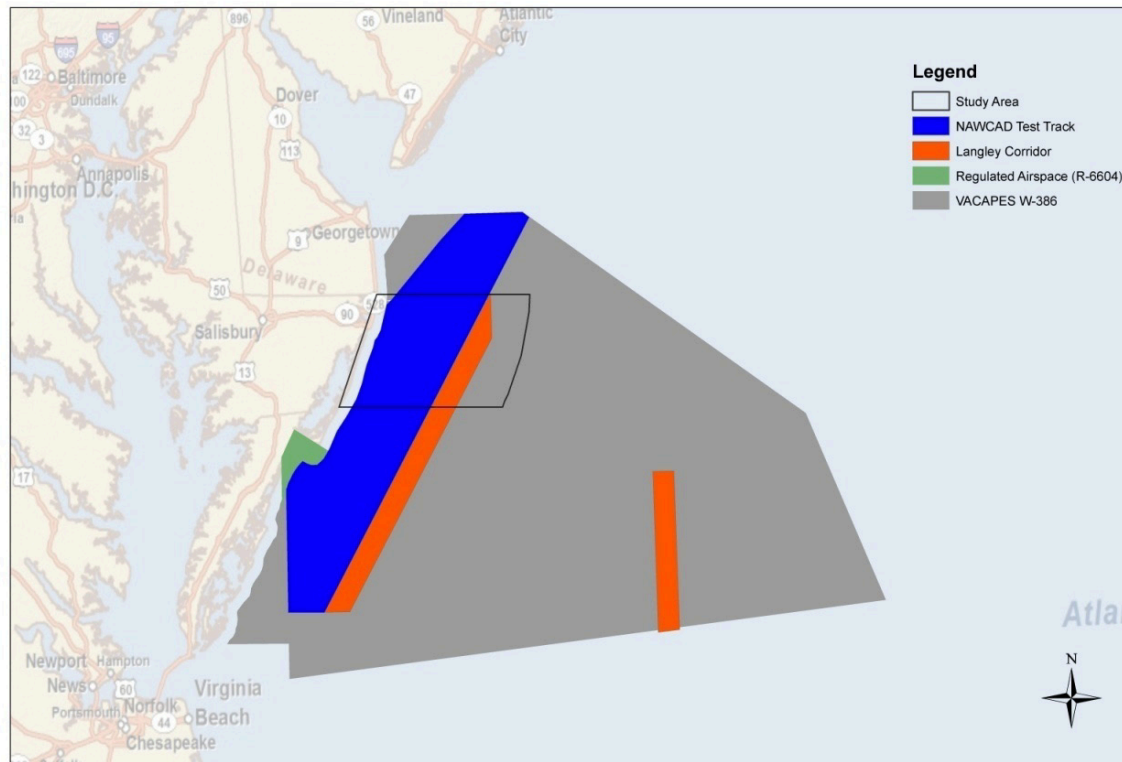
0 2 4 8 12 16 Kilometers

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Physical Conflicts

VACAPES W-386



Sources
Streetmap: ESRI, Tele Atlas North America, Inc.
Operations Area: Raymond, S., & Jarboe, C. 2009.
NAVAIR, Ranges Sustainability Office

0 12.5 25 50 75 100 Kilometers

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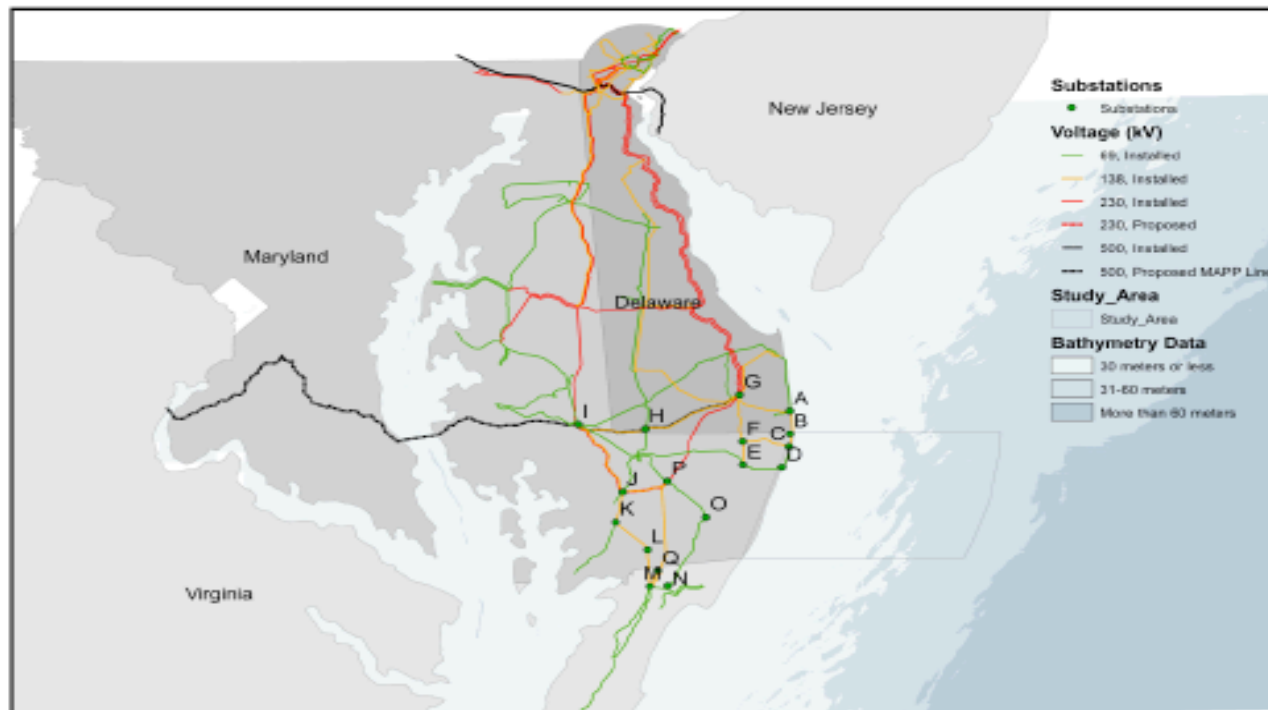
Investment Considerations

- Structural Costs
- Collection and Transmission System Costs
- Turbine Size and Layout
- Other



Bathymetry Data

Transmission Lines and Substations on the Delmarva Peninsula



Sources
State Boundary Data: US Census Bureau
Transmission layer: Pacifi Holdings, Inc.
Bathymetry: The Nature Conservancy

0 15 30 60 Kilometers

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Collection System

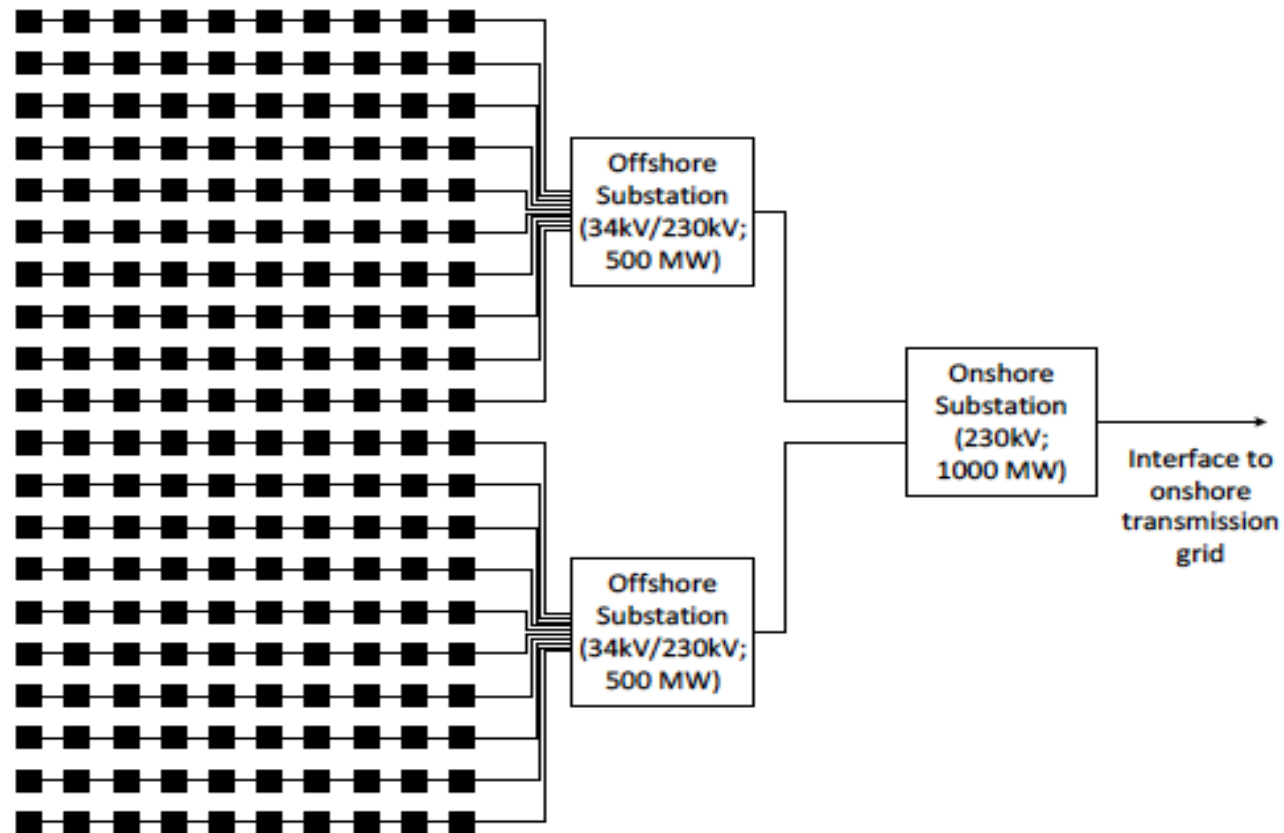


Figure 13-1,000 MW Wind Farm Layout with 5 MW Wind Turbines

Turbine Size and Layout

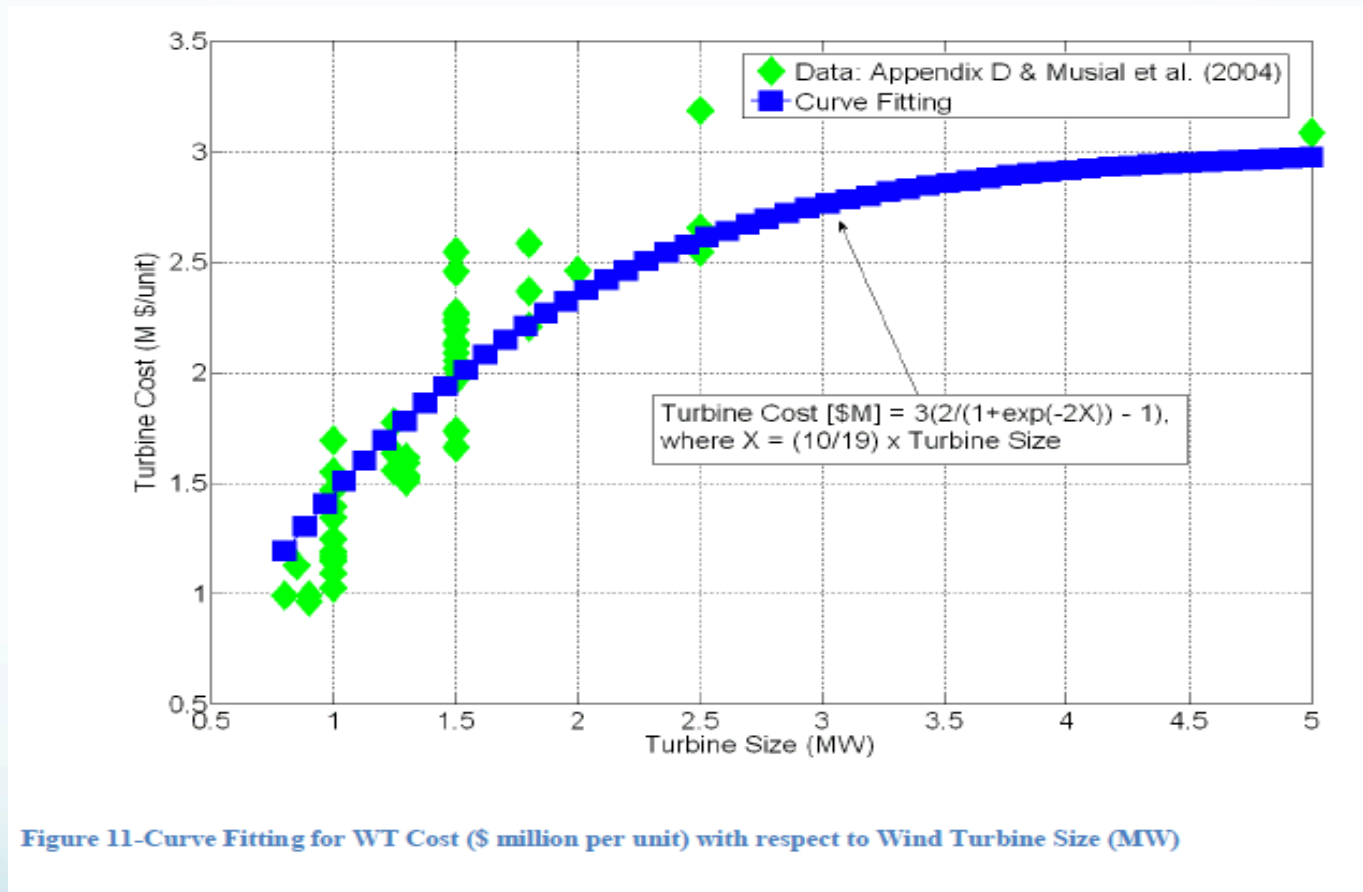


Figure 11-Curve Fitting for WT Cost (\$ million per unit) with respect to Wind Turbine Size (MW)



Other Considerations

- Federal tax credits and loan guarantees
- Operation and maintenance
- Financing mechanisms
- Grid reliability
- Greenhouse gas impacts



Barriers to Development

- Uncertain financing (e.g., Tax Production Credit)
- Uncertain generation (e.g., Intermittency)
- Uncertain performance under environmental duress (e.g., hurricane force winds)
- Uncertain technical performance over lifetime (e.g., gearboxes)



Thank You

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