

Offshore Wind Overview

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Bluewater Wind is a developer of offshore wind energy committed to bringing clean, reliable and affordable electricity to New York, Delaware, Maryland, New Jersey, New England and the Great Lakes.

Offshore Wind Works

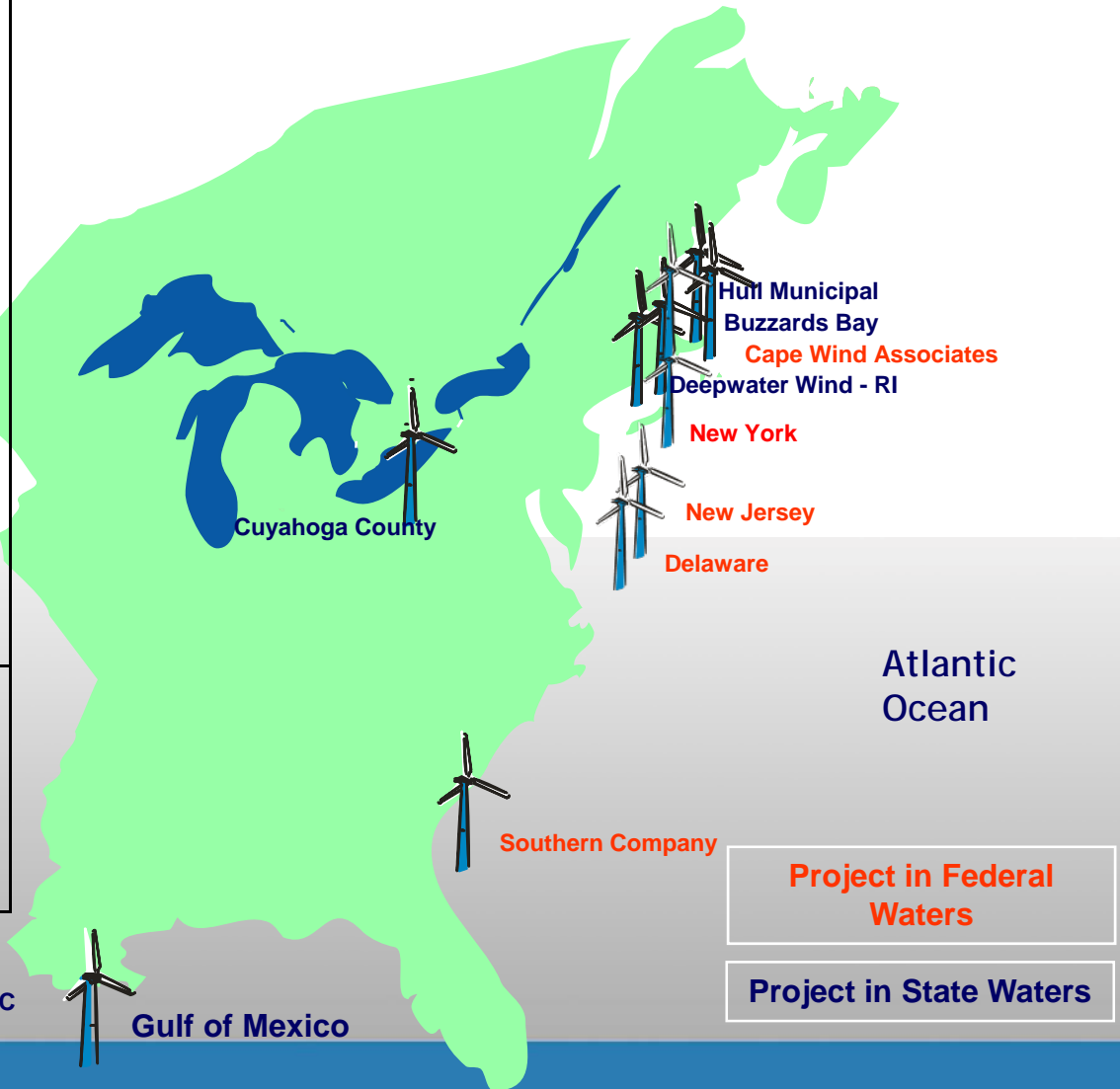
- Offshore wind parks: 30 in 10 countries
- Operational since 1991
- Current installed capacity: 1,493 MW
- Global wind total: 120,000 MW+, equals over 35 million homes; US total today over 7 million homes powered by wind
- 2,479 MW of offshore under construction
- Over 20,000 MW in permitting offshore Europe



US Offshore Wind Estimates

Project	State	MW
Cape Wind	MA	420
Hull Municipal	MA	15
Buzzards Bay	MA	300
New England	RI,	400-
	MA	850
NYPA, LIPA, Con Ed, EDC, MTA	NY	700+
New Jersey (BPU)	NJ	1000
Bluewater Wind	DE	+/-360
Southern Company	GA	10
W.E.S.T.	TX	150-300
Cuyahoga County	OH	+/-20
Total MW		3375
		to
		3975

Proposed Projects



Great Lakes Opportunities

Ohio Michigan Wisconsin New York

- These 4 Great Lake states are actively pursuing offshore wind opportunities. Their governors and state legislatures are working with developers such as Bluewater and consultants to study the development potential. The Great Lakes Wind Collaborative has already estimated thousands of MW of offshore potential.
- Sites adjacent to significant load centers
- Suitable water depth - potential visibility issues
- Ice floe/increased cost of foundations but ice blocking design in marketplace

The Bluewater Wind Team

One or more members have participated in the development of 23 of the world's 30 offshore wind parks

Category

Wind turbine

EPC Contractor

Owner's Engineer

Permitting

Offshore Electrical Engineering

Interconnection/Onshore Electrical Engineering

Electrical Equipment Supply and Installation

Wind Resource Assessment

Wind Resource Assessment

Wind Resource Assessment

Marine Field Studies

Marine Field Studies

Federal Regulatory Affairs

Insurance

Company

Repower/Siemens/Multibrud/Vestas

Fluor

Ramboll

Tetra Tech

SEAS

Energy Initiatives Group

ABB

AWS Truewind

Garrad Hassan

EMD

Aqua Survey

Ocean Surveys

Hill & Kehne

Marsh

Bluewater Wind's Five Pillars of a Wind Project

- Wind Resource
- Site Control / Access
- Permits
- Interconnection to Grid
- Buyer of Energy / Economics

Desired Qualities of an Offshore Wind Energy Site



- Avg. winds stronger than 18 mph
- Constructible water depths
- No significant water use conflicts
- Environmentally compatible areas
- Accessible transmission & ports
- Large available project area footprint

Important Drivers for Offshore Wind

- **Policy**

- RGGI: 10 participating states, successful auctions
- Increasing number of states with RPS requirements
- Potential national RPS in 2009
- Increasing costs of carbon-based technologies

- **Offshore Resources**

- Stronger, more consistent winds near load centers
- Decreased access to high wind land-based sites
- Fewer wildlife barriers far offshore (avian and bat)

- **Market Signals**

- Volatile fossil fuel prices
- Climate change considerations; emissions reduction requirements
- Economies of scale

Policy

Bluewater's project portfolio includes the following RPS states:

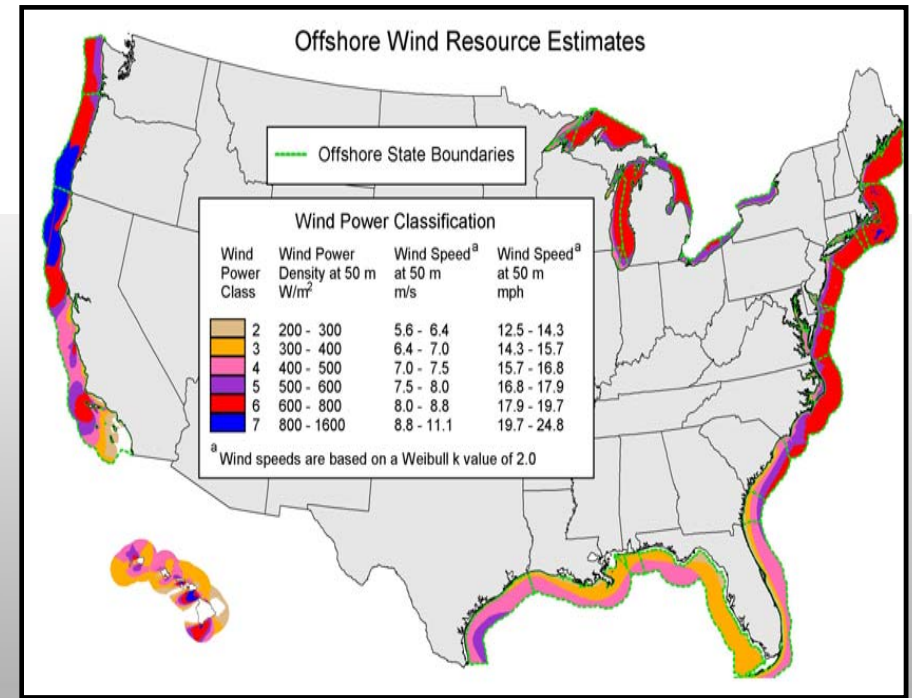
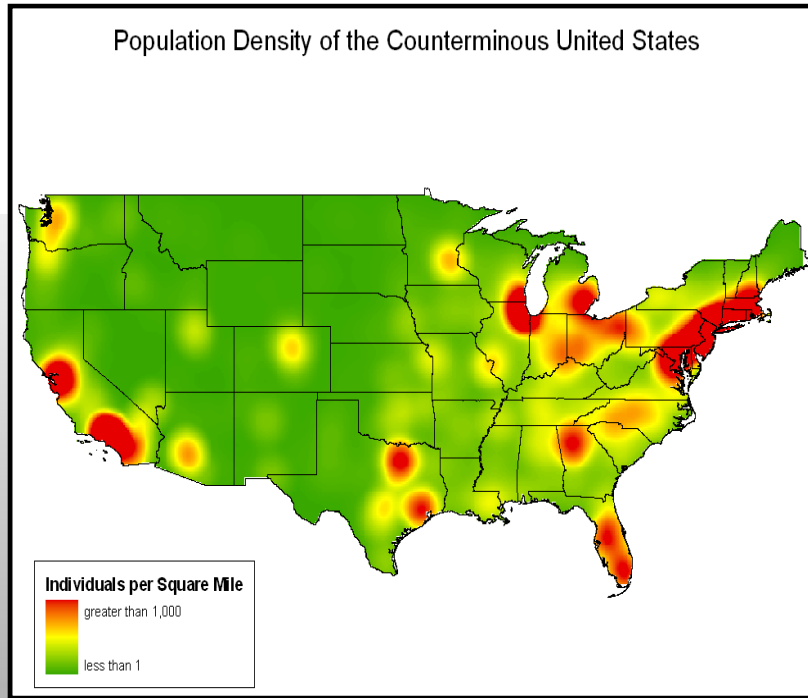
- Delaware: 20% by 2019
- New Jersey: 22.5% by 2021
- New York: 25% by 2013
- Rhode Island: 16% by 2020
- Massachusetts: 15% by 2020

These states have little land-based wind potential or have considerable roadblocks to large land-based wind

Offshore Resources

Supply Aligned With Demand

28 of coastal states use 78% of the electricity in the US



Market Signals

The Future of Fossil Fuels?

- National stimulus legislation supports renewable energy development
- Volatility of fossil fuel prices = risk and unpredictability
- Emerging issue of national energy security: lessen imports by supporting domestic energy sources
- Global warming on political agenda
- Coal plants already being reconsidered/avoided

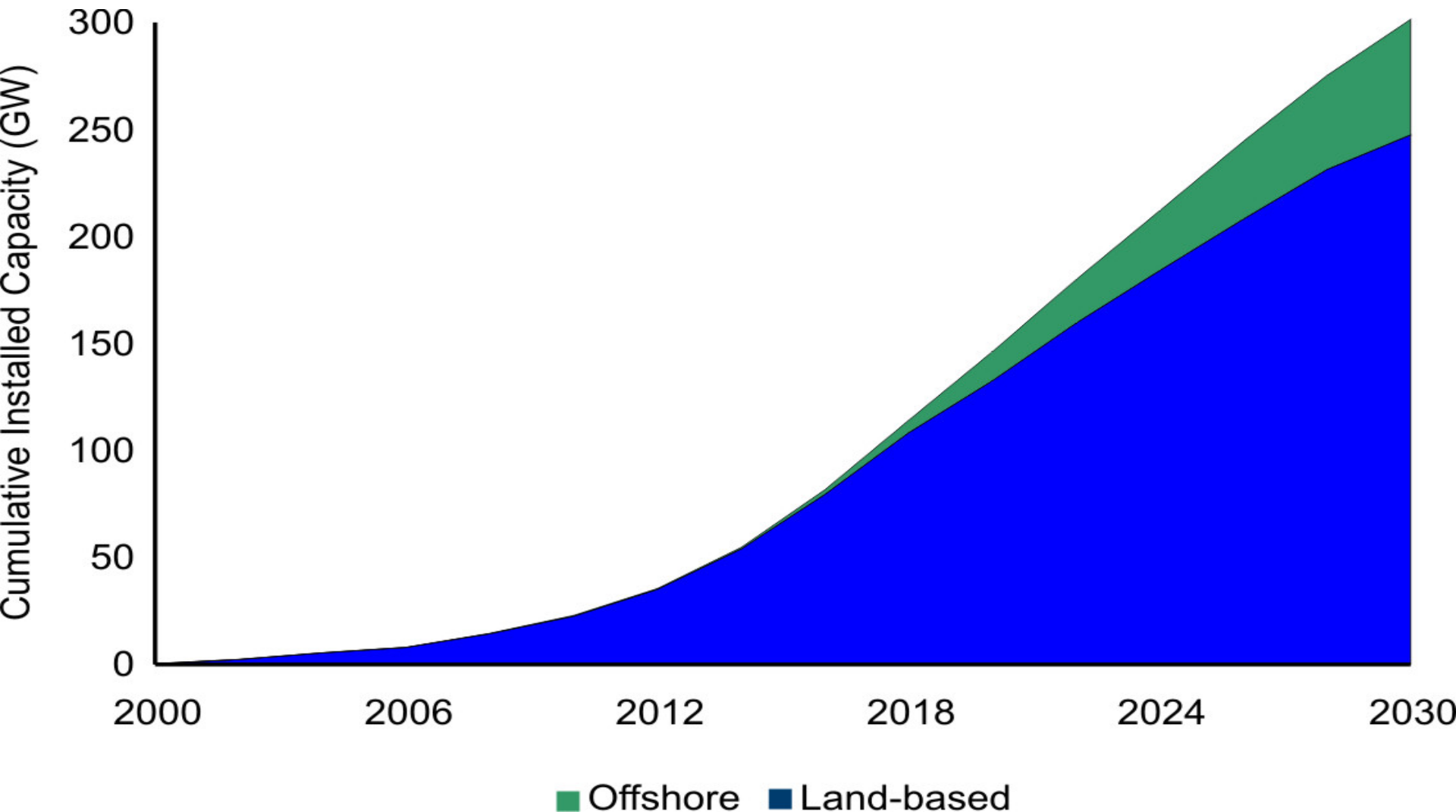
National Stimulus Legislation and the Hundred Days

- Congress passed Stimulus allowing on land wind industry to continue for next two years while traditional tax investors return to market
- Offshore Wind benefits if project has financial close by end 2010 and commissioned by end 2012
- Working on Energy Bill in Congress to extend 30% Treasury Grant for offshore wind beyond 2012
- Expanding the 85,000+ wind jobs in 2008
- Additional US component manufacturing due to stimulus and interest credit
- National RPS/RES likely in late 2009
- Electric grid: More lines, smarter system

National Economic Policies

- New industry of well-paying green collar, clean tech jobs (focus today)
- State and local economic stimulus:
Cannot outsource wind development
- National energy security, reduce imports and improve balance of payments
- Stabilize electricity prices (was focus in 2006-2008)

20% of US Electricity from Offshore = 54,000 MW by 2030



Meeting the Goal

- Land-based wind annual growth rate, past five years: **30%**
- Achieving offshore 54,000 MW by 2030: **23%** annual growth rate
- **23%** growth equals an average of 3,375 MW/year, assuming 2,000 MWs are installed by 2014
- Need to build approximately 16 US built and flagged installation vessels for 54,000 MW

Wind as Major Wedge in Carbon Reduction

- No single cure: Wind, solar, energy efficiency, transportation shift to hybrids and plug-in bi-directional electric vehicles
- Wind is only planet-wide, commercially viable, utility scale, non-proliferating electricity technology
- Project carbon footprint eliminated after operating 9 months
- Deep Green: wind and hydrogen replaces hydrocarbons or electric vehicle storage

Environmental Benefits

- No carbon contribution to global warming, ocean acidification
- No air pollution (SO₂, NO_x, mercury)
- No water pollution or sea level rise
- No CO₂
- No waste
- No fuel deliveries
- No mining or drilling
- No intake/discharge of water for cooling
- No land use for generation equipment offshore
- No noise pollution
- Promotes recreational/commercial fishing with artificial reefs created by foundations

Health Benefits

Pollution avoided per year from a
450 MW offshore wind park

CO ₂ (lbs)	1.35 billion
SO _x (lbs)	14.4 million
NO _x (lbs)	5.17 million

- Health care costs of pollution: Real but hard to quantify

Source: Analysis based on data provided in 'Assessment of Delaware Offshore Wind Power', University of Delaware. Dhanju, Whitaker, Burton, Tolman, and Jarvis. September 2005.

First US Offshore PPA

- 200MW signed 25-year PPA between Bluewater Wind & Delmarva Power
- Total Investor Revenue: \$3.6 Billion
- Energy - \$103.93/MWh (2009\$)
- RECs - \$15.23/MWh plus REC multiplier
- Capacity - \$70.23/kW year
- 2.5% annual inflation adjustor on energy, RECs, and capacity
- 70 cents - average monthly customer cost impact (PSC analysis, real levelized 2007\$)

Supporters of the Bluewater Delaware Wind Park

- Vice President Joe Biden
- US Senator Tom Carper
- Lt. Governor John Carney
- Delaware Treasurer Jack Markell
- Delaware Insurance Commissioner Matthew Denn
- Delaware Municipal Electric Corporation
- Citizens for A Better Sussex
- Citizens for Clean Power
- Coalition for Climate Change Study and Action
- Delaware Audubon Society
- Delaware Building & Construction Trades Council
- Delaware Nature Society
- Endecon, Inc.
- Epworth United Methodist Church
- Green Delaware
- League of Women Voters
- Natures Path of Integrated Health
- News Journal Editorial Board
- Delaware Chapter of Sierra Club
- Society of Natural History
- St. Andrews School
- Unitarian Universalists of Southern Delaware
- City of Dover
- City of Lewes
- City of Milford
- City of New Castle
- City of Newark
- City of Seaford
- Town of Clayton
- Town of Middletown

Approval Process

Federal, State & Local Reviews

Federal Regulations and Reviews

Energy Policy Act 2005
Coastal Zone Management Act of 1972
Rivers and Harbors Acts of 1890 and 1899
Clean Water Act of 1977
Navigation and Navigable Waters
Federal Aviation Administration
National Environmental Policy Act
Archaeological and Historic Preservation Act of 1974
Fish and Wildlife Coordination Act of 1958
Endangered Species Act of 1973
Estuary Protection Act
Marine Protection, Research, and Sanctuaries Act
US Coast Guard
Marine Mammal Protection Act
Magneson-Stevens Conservation and Management Act
Migratory Bird Treaty Act
Abandoned Shipwreck Act
Approval for Private Aids to Navigation

State Regulations, Permits & Approvals

DNREC- State Environmental Review (associated with EPA)
Coastal Federal Consistency Certification
Subaqueous lands permits and leases
Wetlands permit
Section 401 Water Certification
NPDES Storm Water Permit
Air Quality Permits
DNREC- Div. of Fish and Wildlife
DNREC- Div of Parks and Recreation
Beach Preservation Act of 1972
Delaware PSC
DE River Basin Commission
DE Heritage Commission
DE Economic Development Office
DE Energy Office
DeIDOT

Local Authorities

To be participant in NEPA/State review
Municipalities with potential visible impacts
Local communities transited by onshore cable route
Building permits as required

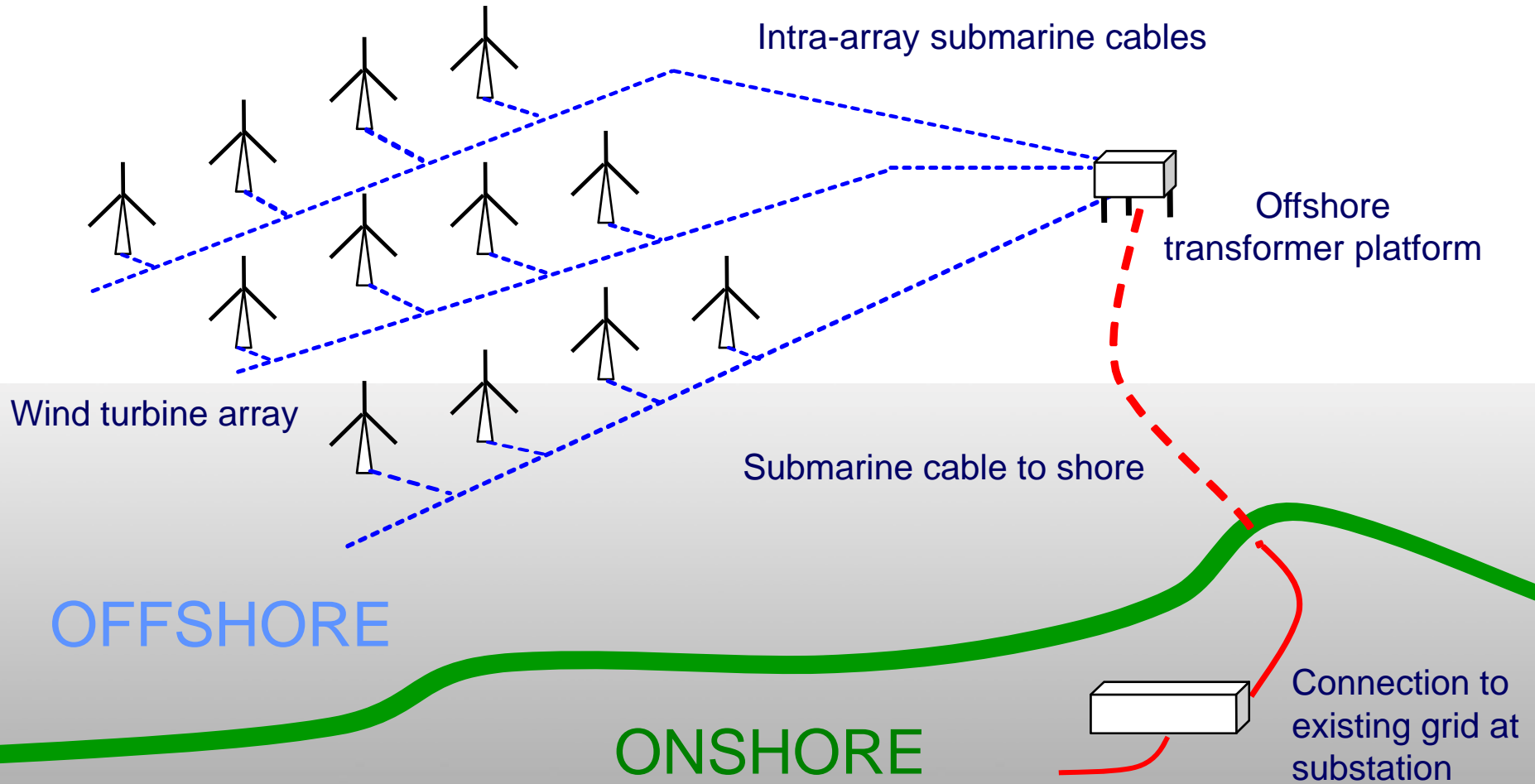
Wind as an Economic Driver: The Delaware Example

- \$1.6 Billion investment (450 MW park)
- \$200+ million direct economic impact for Delaware
- State-wide economic development: Delaware as offshore staging hub
- Brings up to 500 construction and up to 80-100 O&M jobs to Delaware
- Brings large contracts to Delaware ports
 - Construction
 - Operations and Maintenance
- Wind technician training at DelTech
- Delaware union jobs
- New businesses locate in places where electricity is affordable and stable-priced
- Increased tourism by 2.5% (University of Delaware)

Lessons From Delaware Success

- Engage the public early and often:
 - Identify all stakeholders
 - Educate, educate, educate
 - Honest and transparent communication
 - Visualizations play a critical role in acceptance

Offshore Wind Park Layout



Met Tower Installation

Met Tower Designs



Cape Wind



Horns Rev

Permitting Studies

- Avian studies ongoing
- Marine biological studies (mammals, finfish, turtles, shellfish)
- Benthic and fisheries habitat assessment
- Water quality studies
- Cultural surveys
- Navigation and FAA studies
- Wetlands and other terrestrial systems

Offshore Wind Turbine Suppliers

Turbine Manufacturer	Turbine model & rated power	Date of availability	Offshore Operating Experience
Vestas	V90 - 3 MW	2004	Commercial
Siemens	SWT-3.6 - 3.6 MW	2005	Commercial
Siemens	SWT-2,3 - 2.3 MW	2003	Commercial
Vestas	V80 - 2 MW	2000	Commercial
RePower Systems	5M - 5 MW	2005	Offshore Demo 2006 Borkum West pilot
Multibrid	M5000 - 5 MW	2005	Onshore 2005 Borkum West Pilot
General Electric	GE - 3.6-MW	2003	Commercial inactive
Bard Engineering	VM - 5 MW	2008-09	Onshore prototype 2008
Nordex	N90 - 2.5 MW	2006	Offshore Demo 2003
Clipper Windpower	Liberty 2.5 MW	NA	Not yet offshore ready
Clipper Windpower	Britannia 7.5 MW	NA	Drawing board

Installation Vessel Construction

- **Background**

Turbine installation vessels are integral to offshore wind park construction as only they can lift components weighing hundreds of tons at a height of 100 meters above the water and place it accurately in each of four lifts over the course of two days.

- **Existing fleet**

European regulatory regimes, particularly in UK & Germany, have spurred significant growth with over 1000 MW expected to be commissioned in the next five years. There are currently 24 vessels under development. The market for installation vessels will be a constraining factor on growth.

Special installation vessel

Provides stable work platform



Foundation Installation

Handling a Monopile



Source: RPS Energy Presentation



Sub-sea Electrical Cable Installation

Cable-laying Vessel at Work



Source: www.hornsrev.dk

Offshore Substation Installation

Lifting a Transformer Platform



Turbine Installation

Assembling a Tower and Lifting a Bunny Ear



Source: www.mammoetvanoord.com

Thank You

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