OFFSHORE WIND ACCELERATOR
PROJECT WEBINAR SERIES

Understanding Regional Supply Chain Opportunities for Offshore Wind

Global Wind Network (GLWN)

March 19, 2013

OffshoreWind Accelerator Project
Managed by Clean Energy States Alliance

CleanEnergy States Alliance

Housekeeping

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You are encouraged to type in questions regarding today's presentations at any time during the webinar by entering your question in the **Question Box** on the webinar console. Questions will be answered as time allows following all of today's presentations.

This webinar is being recorded and will be made available after today's webinar at **www.cleanenergystates.org** under **Events**. Previous webinar recordings are also posted.

Today's Agenda

- Presentation by Dee Holody and Patrick Fullenkamp, GLWN
- Time for questions

Please Submit Questions

Questions submitted from webinar participants will be addressed following the presentation. Please type your questions in the webinar console's Question box at any time during the broadcast.

Clean Energy States Alliance

CESA is a non-profit organization working with states, federal agencies, and municipalities to advance the renewable energy sector through:

- Information Exchange & Analysis
- Partnership Development
- Networking and Collaboration

www.cleanenergystates.org

Offshore Wind Accelerator Project

OWAP Objective: Address key challenges facing offshore wind in five focus areas

1. Ensure cooperation and communication among stakeholders and government leaders on priority problem-solving.
2. Improve regulatory approaches to support smart siting while reducing review costs & timelines.
3. Advance investment through power procurement collaborative networks and use of new financing mechanisms.
4. Advance opportunities, strategies, and collaboration to build a domestic OSW industry **(USOWC leads the supply chain effort).**
5. Implement a communication effort to ensure public education and stakeholder access to objective information.

Stay connected to OWAP!

- Offshore Wind WORKS campaign website: **http://www.offshorewindworks.org**
- Like us on Facebook: **http://www.facebook.com/offshorewindworks**
- Follow us on Twitter: **http://www.twitter.com/OSWindWorks**
- **Email: Marissa@cleanegroup.org**

Today's Presenters

Dee Holody

Director of Operations,
GLWN

Patrick Fullenkamp

Director, Technical Services
GLWN

Thank you!

www.cleanenergystates.org

Understanding Regional Opportunities in Offshore Wind

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Dee Holody *dholody@glwn.org;*

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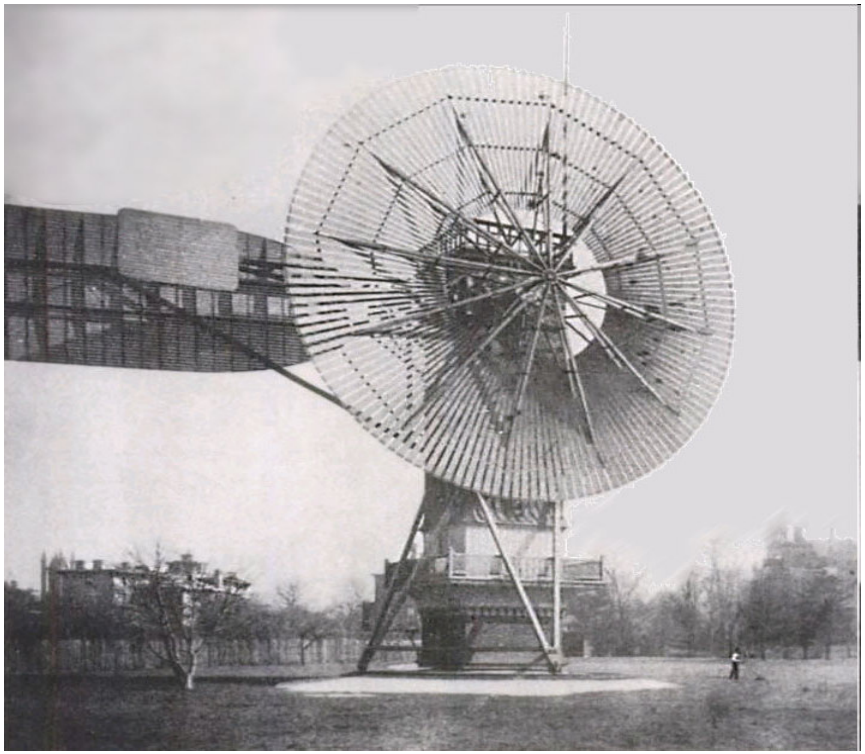
Wind Turbines: An American Invention



Charles Brush - Cleveland, OH
12 Kilowatts 1888

NASA - Oahu, HI
3.2 Megawatts 1980

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GLWN……*Call us Global*

- **Membership-based, Non-Profit**
- **2009 – started Onshore Supply Chain initiative**
- **International Supply Chain Advisory Group**
- **Supplier Headhunters for the Wind Industry**
- ***Resource* for Suppliers and Service Providers**
- **Developed the on-line GIS Wind Supply Chain Map**
- **Currently 1600 companies listed across 35 States + Canada**

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GLWN……*Call us Global*

- **Mission:**

  Increase the Domestic Content of North America's Wind Turbines

  We are Supply Chain Experts

- *Note of thanks to our original funders*
  - *Cleveland Foundation*
  - *Ken Smith Foundation*

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Topics to be covered

- Current U.S. Offshore Projects – Private/Public Investments
- German Actual Offshore Wind Data 2011
- Bremerhaven Port: WeserWind Tripod Production
- Cuxhaven Port: Cuxhaven Steel Construction, Ambau, Strabag
- Manufacturing Opportunities
- GLWN/DOE Offshore Project – A Competitiveness Analysis
- OEM Needs & Wants
- Engaging with GLWN Wind Industry Technology Experts

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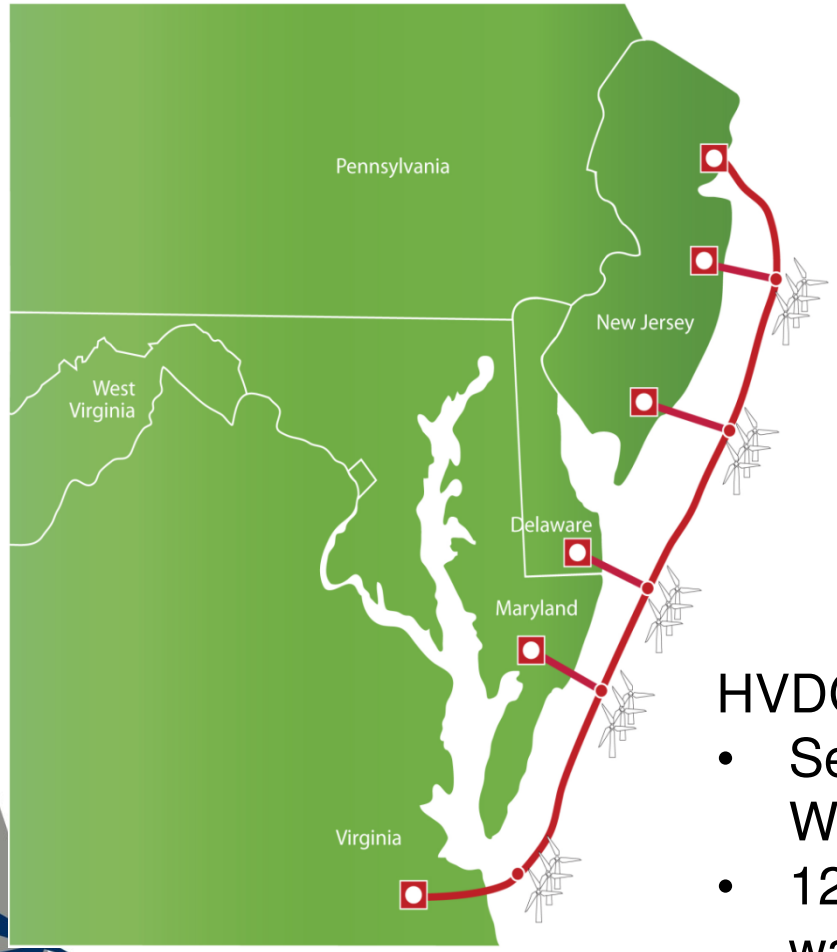
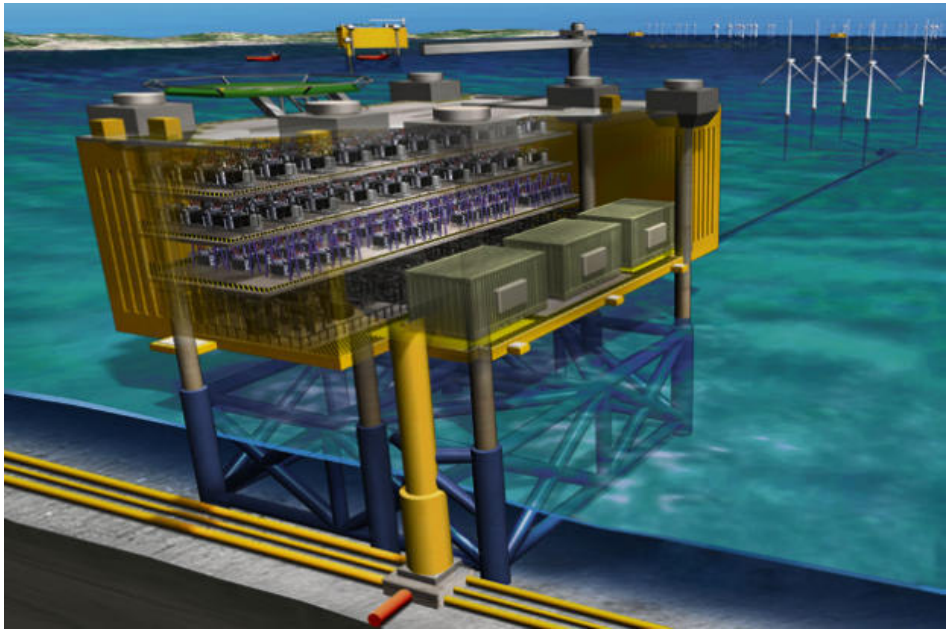
Atlantic Wind Connection - $5 B Transmission System - Fall 2012





HVDC Converter Hub

- Several Spurs feeding 7GW of Offshore Wind Power to 2 Million Homes
- 12 – 15 miles offshore, 100 – 150 ft water, cables buried 4 to 6 feet
- 10 Years ~300 miles

Source: www.atlanticwindconnection.com

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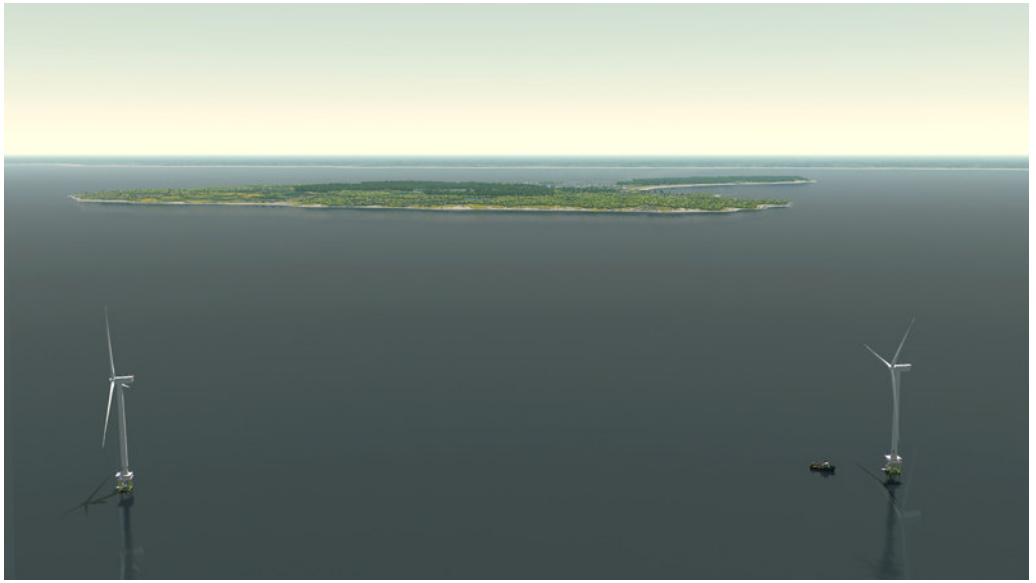
Block Island – Rhode Island



- Nations 1st Regional Offshore Wind Energy Project
- 30 MW Demonstration Project
- 5 Wind Turbines
- 125,000 MW hours/yr
- Deepwater Wind Construction to begin 2014

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Source: www.dwwind.com

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Cape Wind – Massachusetts
View 5.6 miles from beach

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Source: www.capewind.org

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Cape Wind – Massachusetts

- Cape Wind is America's **first offshore wind farm** to secure Federal and State approval and to be issued a lease to operate by the Federal Government – July 5, 2012
- Cape Wind Begins Major Offshore Operations with Commencement of Final Design & Engineering.
- Construction to begin April 2013
- Energy Management Inc (EMI) is Developer
- 130 Wind Turbines and 420 MW
- 1,000 Jobs in Assembly & Construction
- 150 Permanent Jobs

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Source: www.capewind.org

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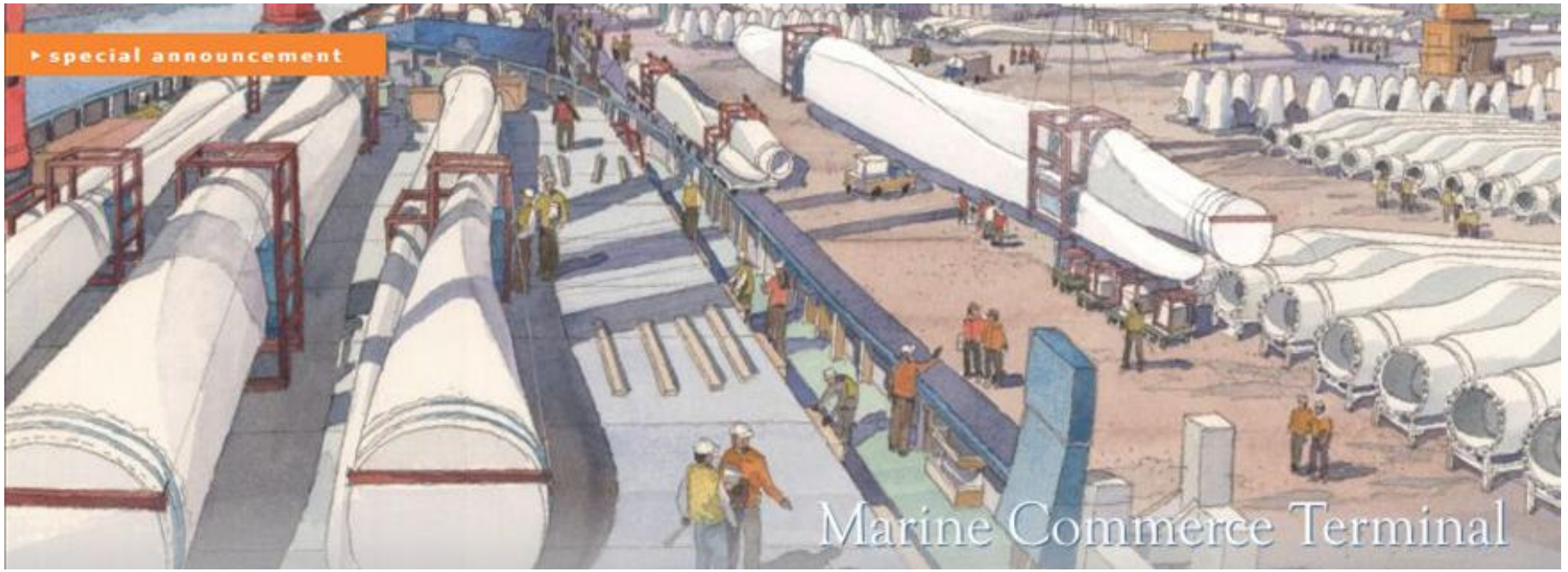
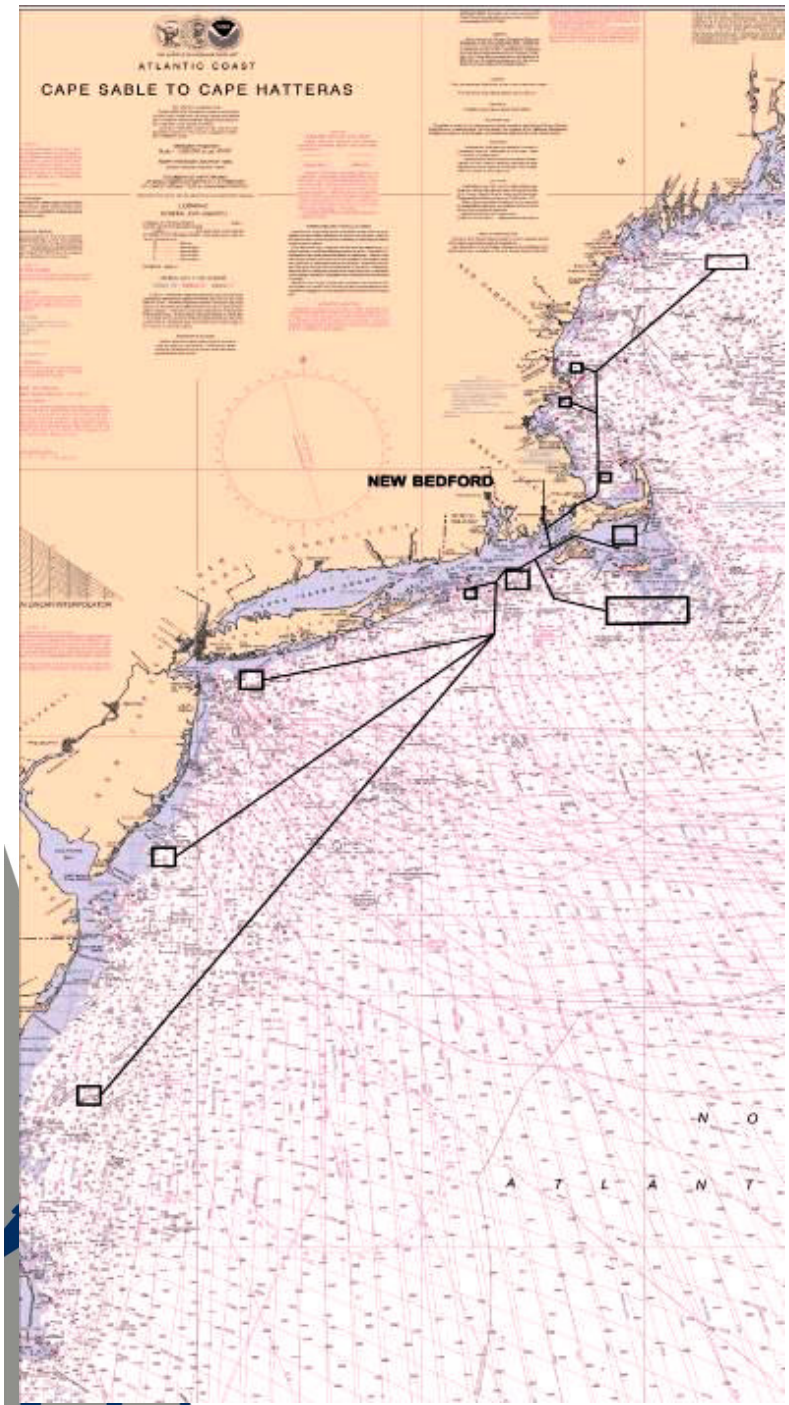
New Bedford Marine Terminal Port



- First facility in the nation designed to support the construction, assembly, and deployment of offshore wind.
- State investment of $100mil
- Construction begins April 2013



New Bedford Port

Logistics, Logistics, Logistics

- Uniquely positioned to service the NE Atlantic coast wind farms
- Proximity to high-wind areas
- Access to land-based transportation
- Protected harbor
- Deep water
- Lack of obstructions
- Skilled maritime-industrial workforce

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Public Investment – 7 DOE Awards

- Baryonyx Corporation, Port Isabella, TX
  Advanced Jacket Foundation, hurricane resistant
- Fishermen's, Atlantic City
  Advanced bottom mount foundation design
- LEEDCO, Cleveland, OH
  Use of "ice breaker" monopile
- Principle Power, Coos Bay, OR
  Semi-submersible, floating foundation

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Public Investment – DOE Awards

- Stat Oil, Booth Bay harbor, ME
  Floating spar buoys 460 feet water
- University of ME, Monhegan Island, ME
  Concrete semi-submersible foundations
- Dominion Power, Virginia Beach, VA
  Innovative Twisted Jacket

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2012 Manufacturing is Buzzing in Bremerhaven, Germany- This can be in the USA!

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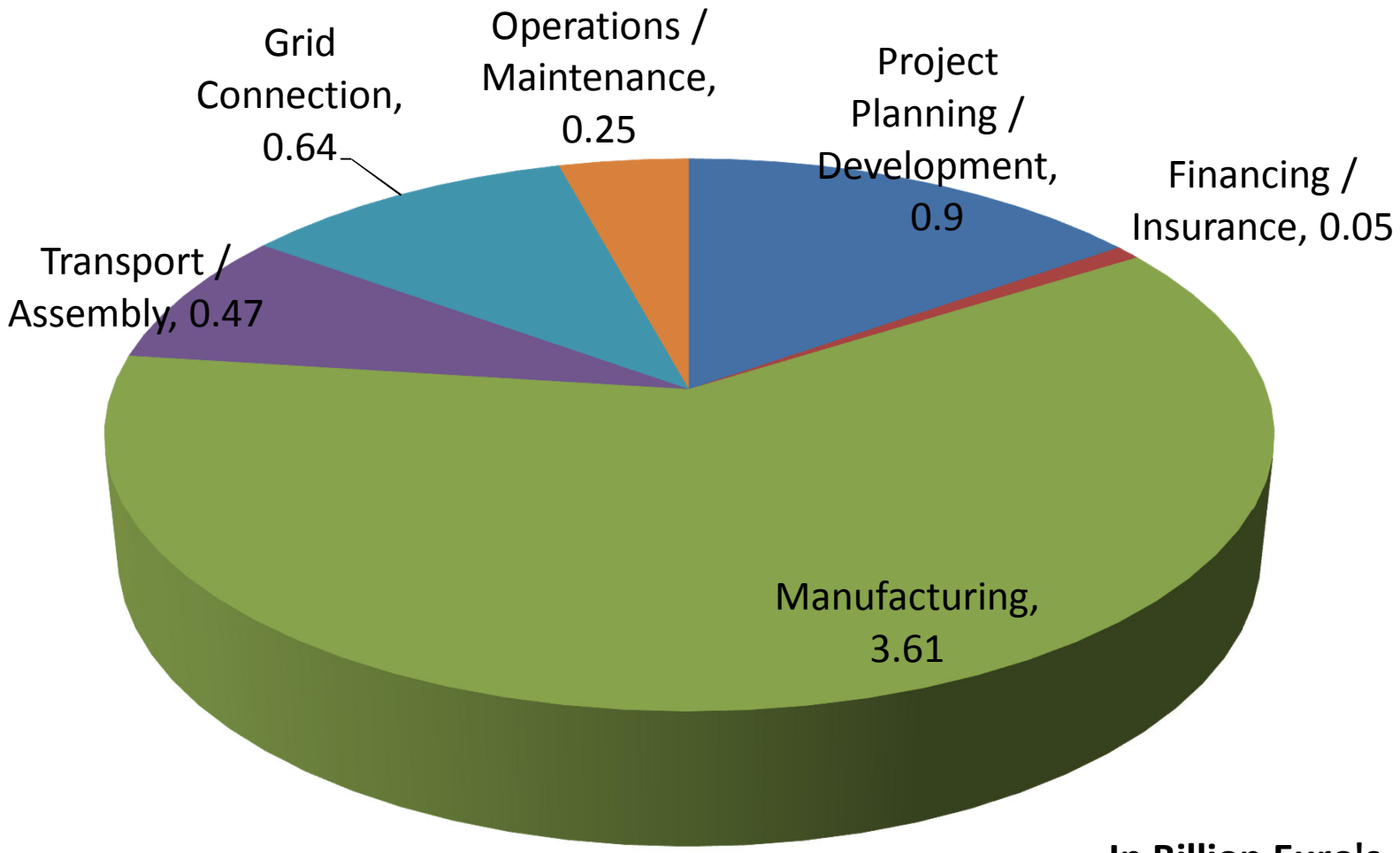
Germany 2011 Total Value Add 5.9B



In Billion Euro's

Source: wab, windenergie agentur

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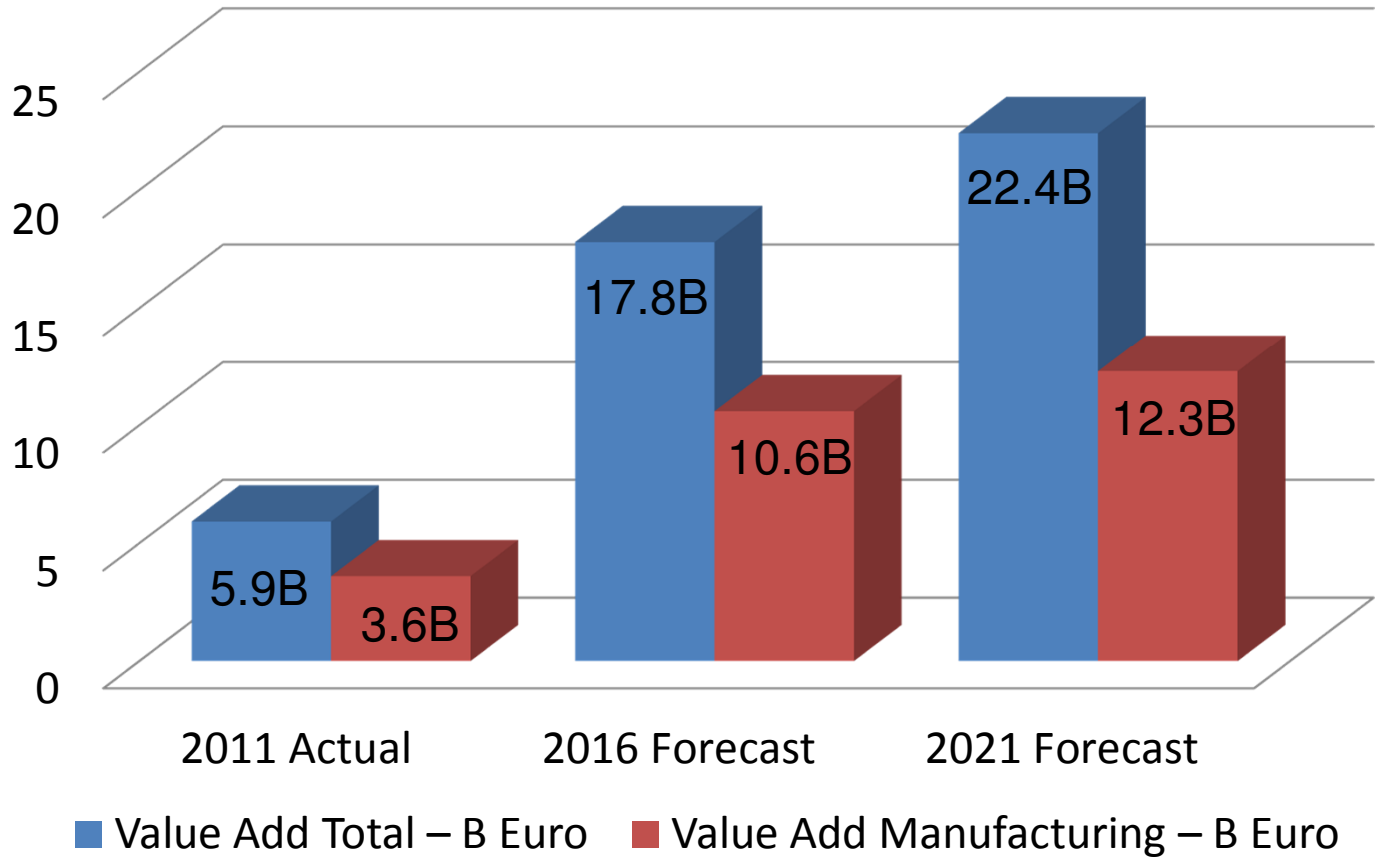
Germany Offshore Value Add



Source: wab, windenergie agentur

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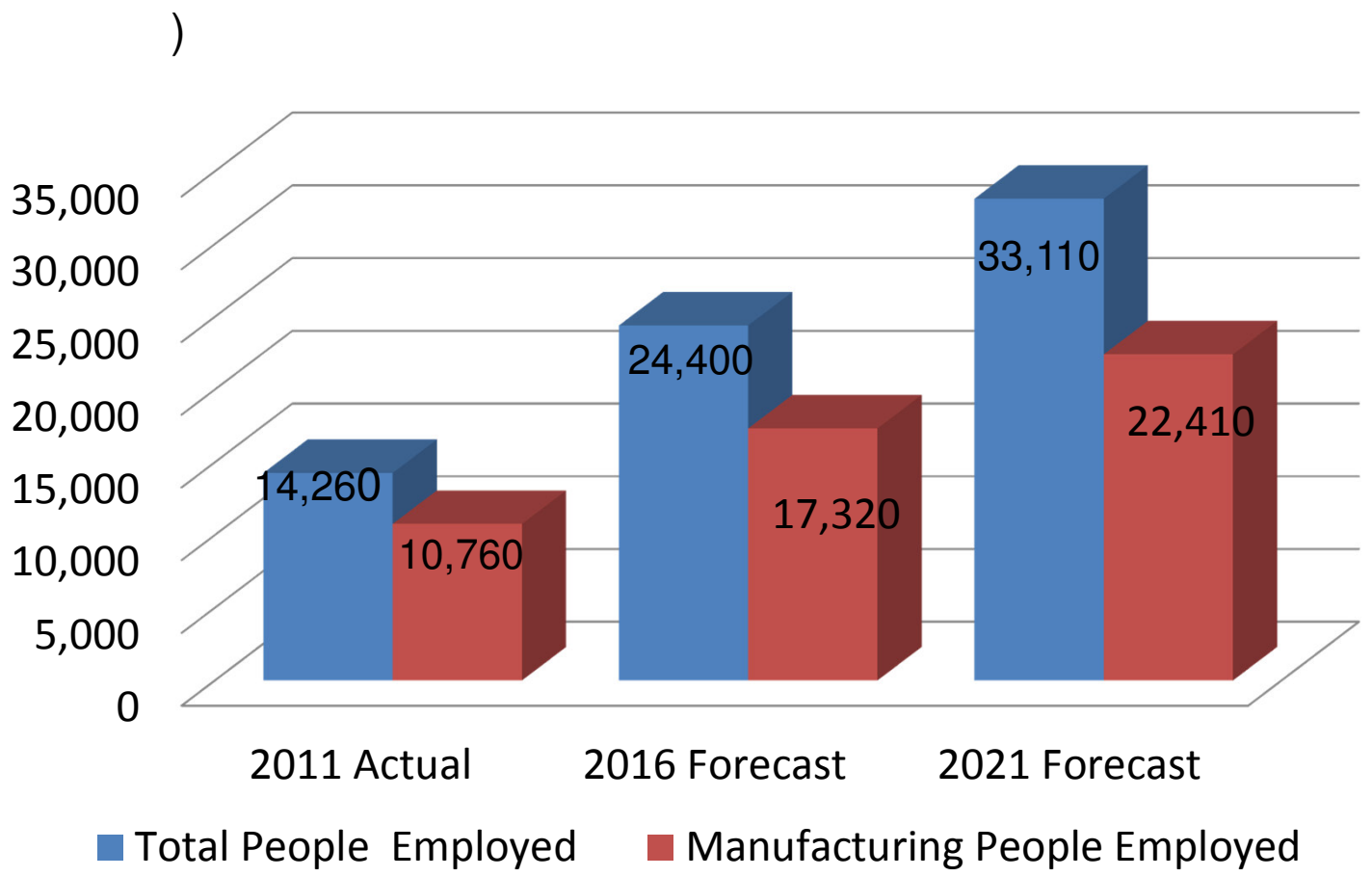
German Offshore Wind Employment



Source: wab, windenergie agentur

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WeserWind Tripods – Production Halle II Germany

- 50 Tripods / Hall / Yr
- 900 – 1200 Ton
- 13 Sub-assemblies
- 38 Process Steps

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WeserWind Tripods – Rail Transport To Quay –Weser River

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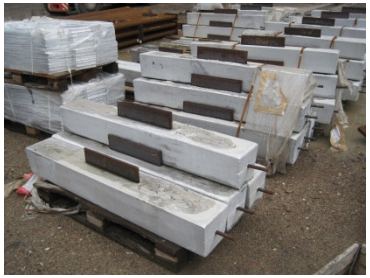
WeserWind Tripod Components



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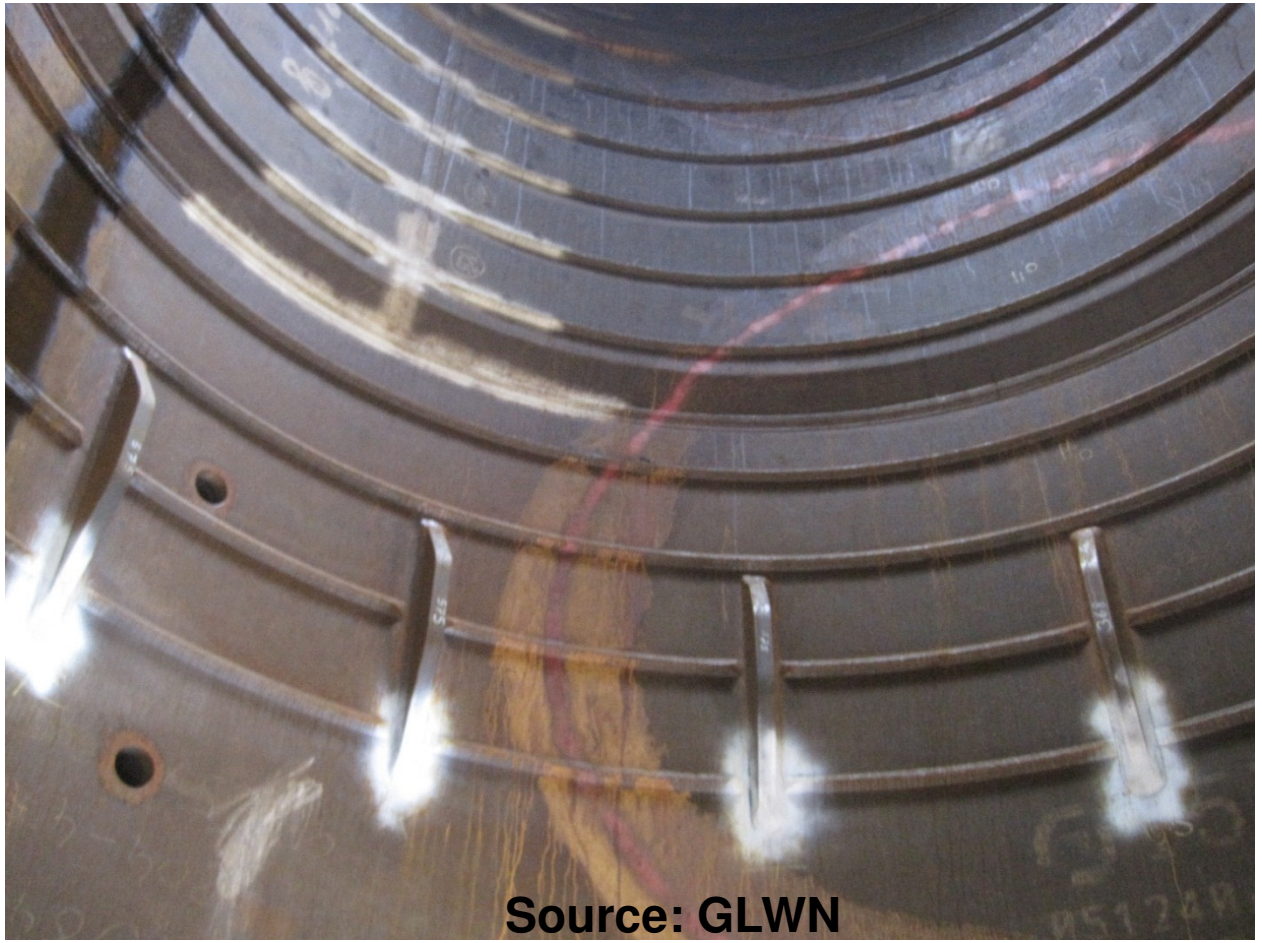
WeserWind Tripod – Foot Section for grouting to pile



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Tripod Loading on Barges

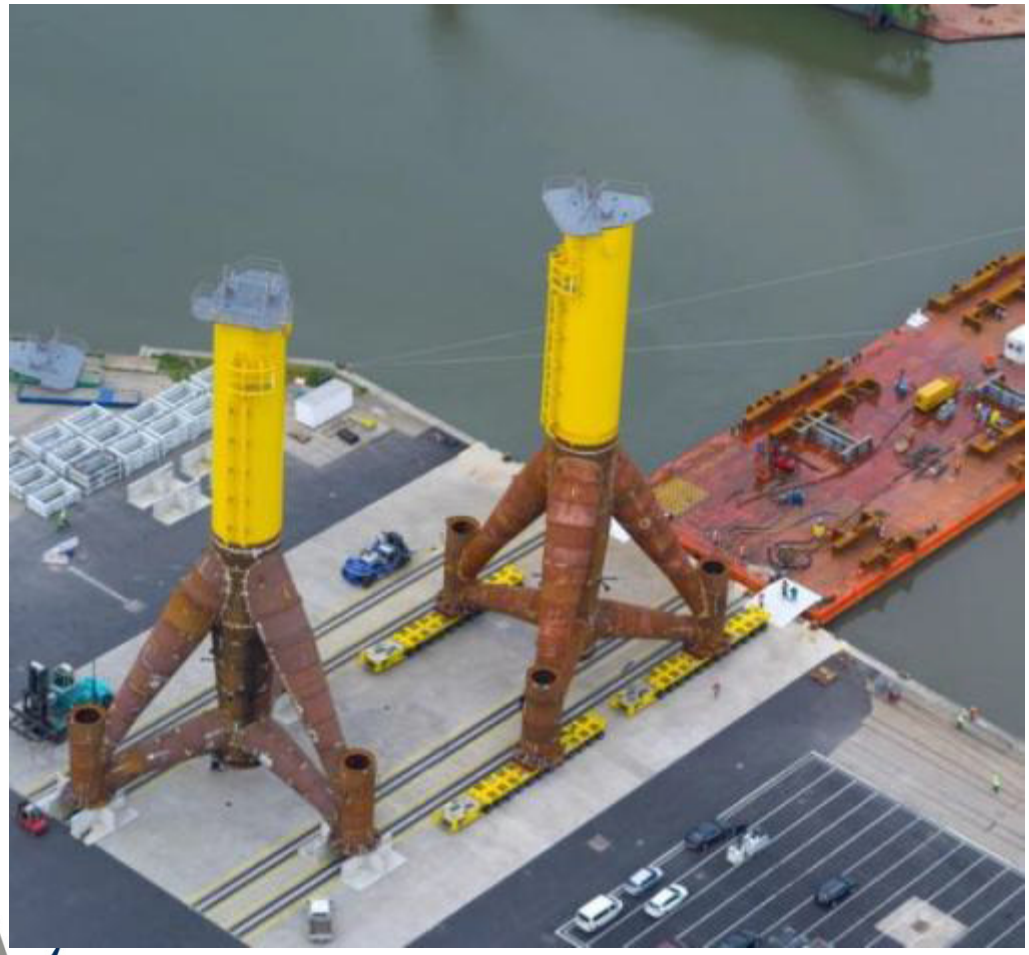

Photo Courtesy of BLG Logistics

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WeserWind 4 Leg Jackets on Barge

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5 MW Blade Production Germany

5 MW Turbine Blade

56.5 m length
16 ton

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OTB-Offshore Terminal Bremerhaven

- Primary Port for Alpha Ventus Wind Farm
- AREVA & REpower Turbine Assembly – 100 units per year
- WeserWind GmbH – Foundations
- Power Blades GmbH- Blades
- BLG Logistics – Logistics and Installation
- Falck Nutec Offshore Training Center
- Plus 200 hectares for other manufacturers and suppliers

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Vessels

- Transport Vessels
- Installation Vessels – Lifting Platform (Jack-up), Self propelled jack-up that can transport and install, Heavy duty ships with wave compensation
- Crew Transport Vessels
- Helicopters 3,000 to 18,000 lb payload

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Offshore Wind Supply Chain Opportunities

DOE Goal 54 GW by 2030 = 10,800 Units if all are 5 MW

- Logistic & Port Infrastructure Impact
- Foundations - fabrication-machining-coatings
- Towers – fabrication-forging-machining-coatings
- Blades – composites-processing-machining
- Support Bases and Hubs – casting/fabrication-machining-coatings
- Vessels – fabrication-casting-forging-machining-electrical-hydraulics-coatings
- Cable & Substation – all major manufacturing sectors

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Offshore Heavy Fabrication

- Foundations (400T to 10,000T): Steel Plate Rolled, Forged Flanges, Fasteners, Angular and Tubular Steel, Brackets, Ladders, Weld wire
- Towers (250T to 600T): similar to foundations
- Platforms: Steel Plate, Tubular
- Main Frame, Generator Frame: Cut and welded flat plate all shapes and sizes, Weld wire
- Vessels – current ship building needs

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Casting and Machining

- Support Bases / Main Frames
- Rotor Hub
- Gearbox or Direct Drive Housings
- Generator Housings
- Forward Bearing Housings
- Brake Components
- Smaller Ancillary Components

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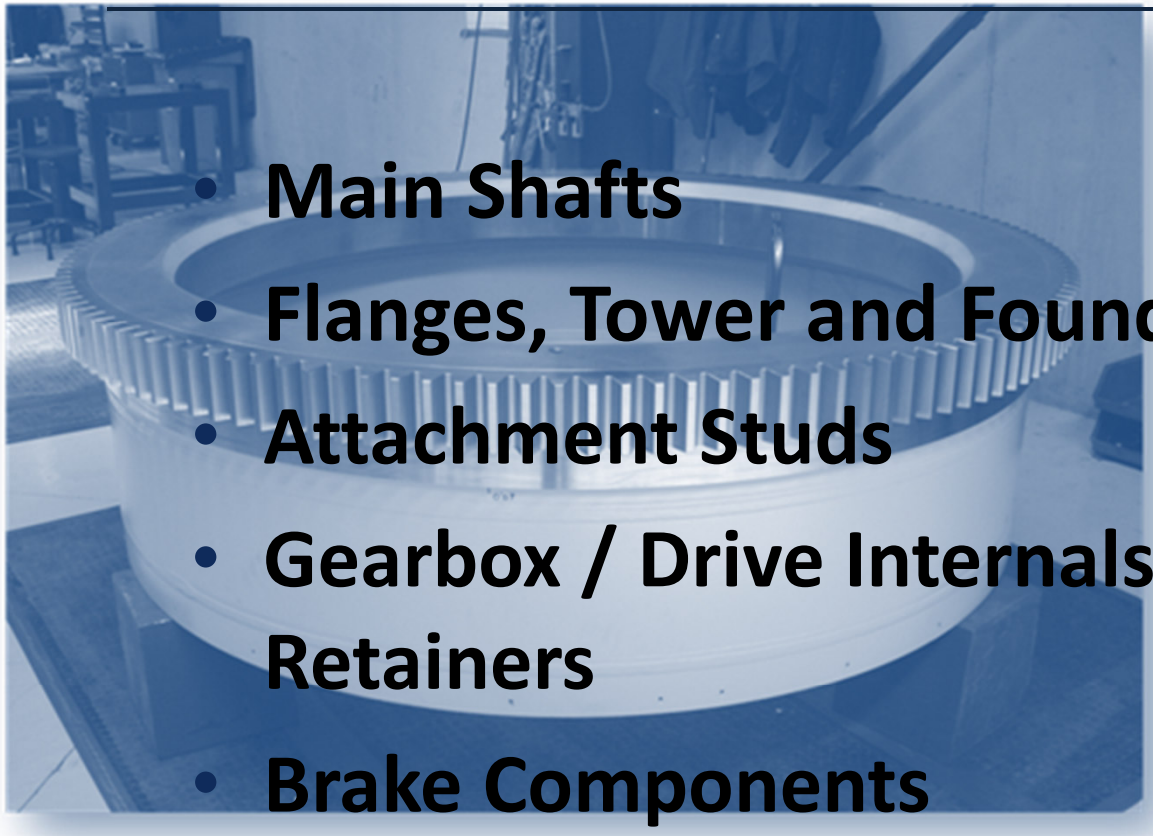
Forging and Machining



- Main Shafts
- Flanges, Tower and Foundation
- Attachment Studs
- Gearbox / Drive Internals: shafts, Gears, Retainers
- Brake Components
- Shrink Discs
- Smaller Ancillary Components

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Electrical

- Generators
- Transformers
- Invertors
- Substations
- Power Controls
- Cable
- Circuit Boards, Lighting, Harnesses, Insulators, Sensors, Motors, Universal Power Supplies

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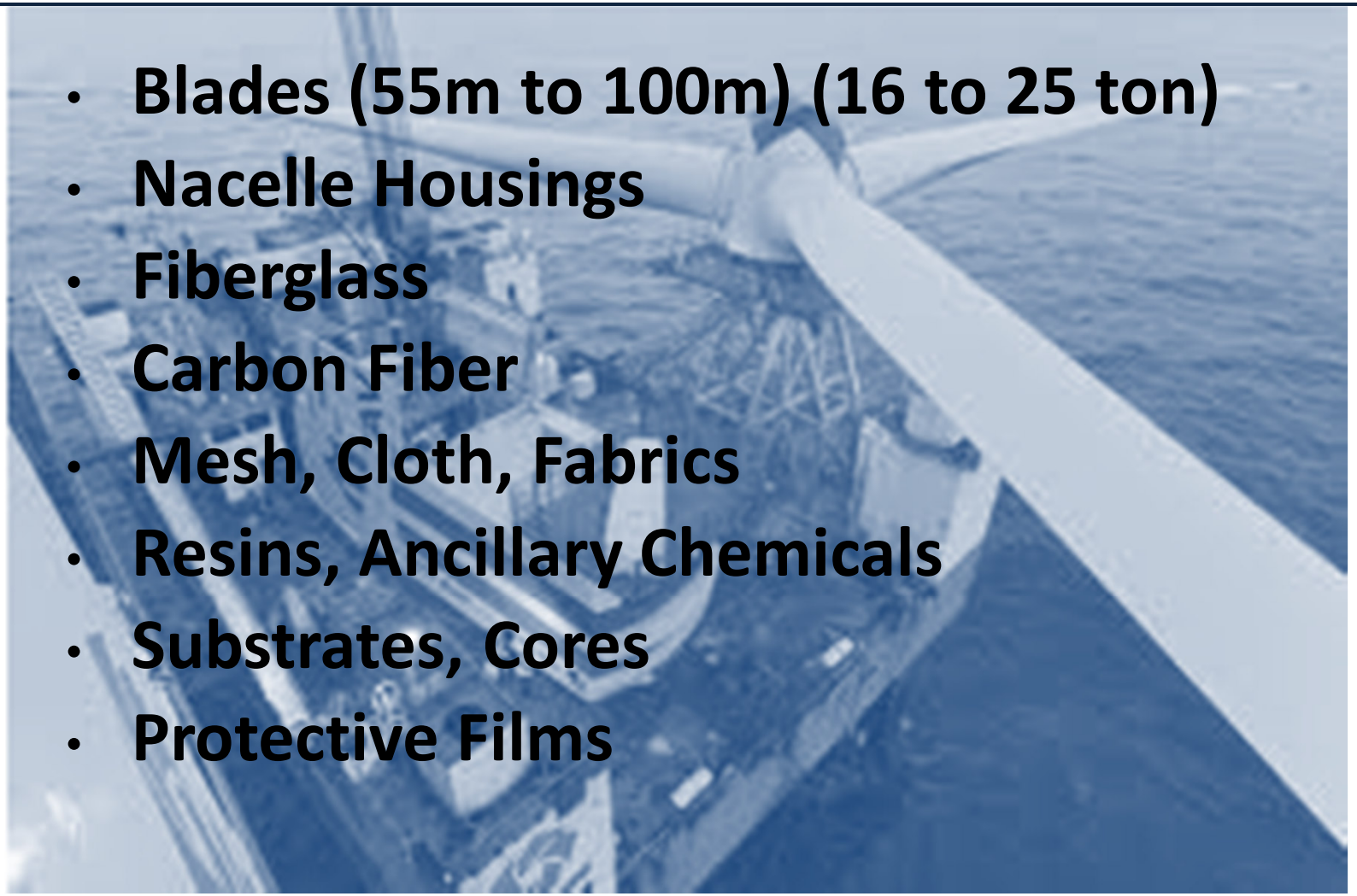
Composites



- Blades (55m to 100m) (16 to 25 ton)
- Nacelle Housings
- Fiberglass
- Carbon Fiber
- Mesh, Cloth, Fabrics
- Resins, Ancillary Chemicals
- Substrates, Cores
- Protective Films

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OEM Needs & Wants

- Logistics support:
  - Truck & Rail inbound to port
  - Ocean going barge
- Maintenance providers at the port
- O&M providers for off-shore
- Crane & heavy equipment providers
- Potential – Fabricators of large weldments

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DOE Project Award to GLWN

US Wind Energy Manufacturing and Supply Chain: A Competitiveness Analysis

1. Value Stream Mapping
2. Cost Breakdown Analysis
3. Offshore Industry Scorecard
4. Identify Capable Manufacturers in Coastal Regions
5. Expand GLWN's Supply Chain GIS Map for Offshore

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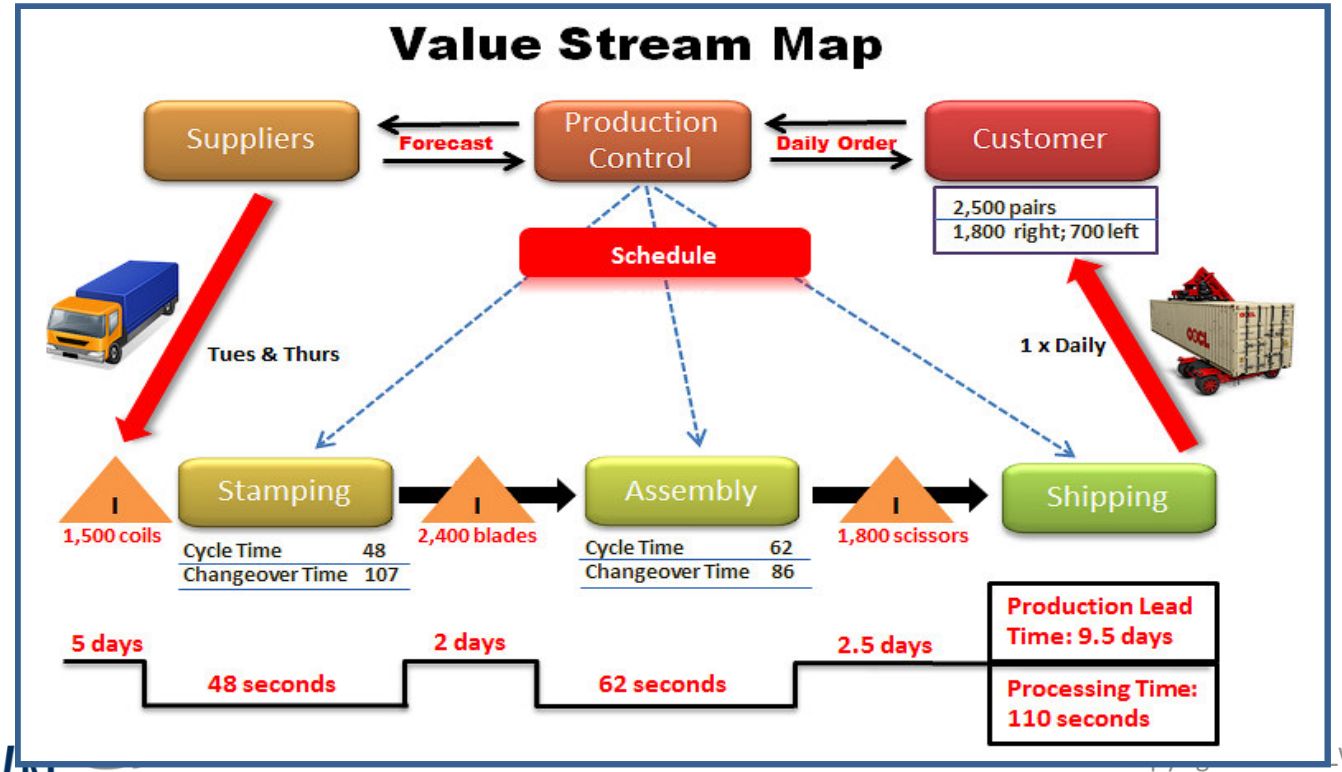
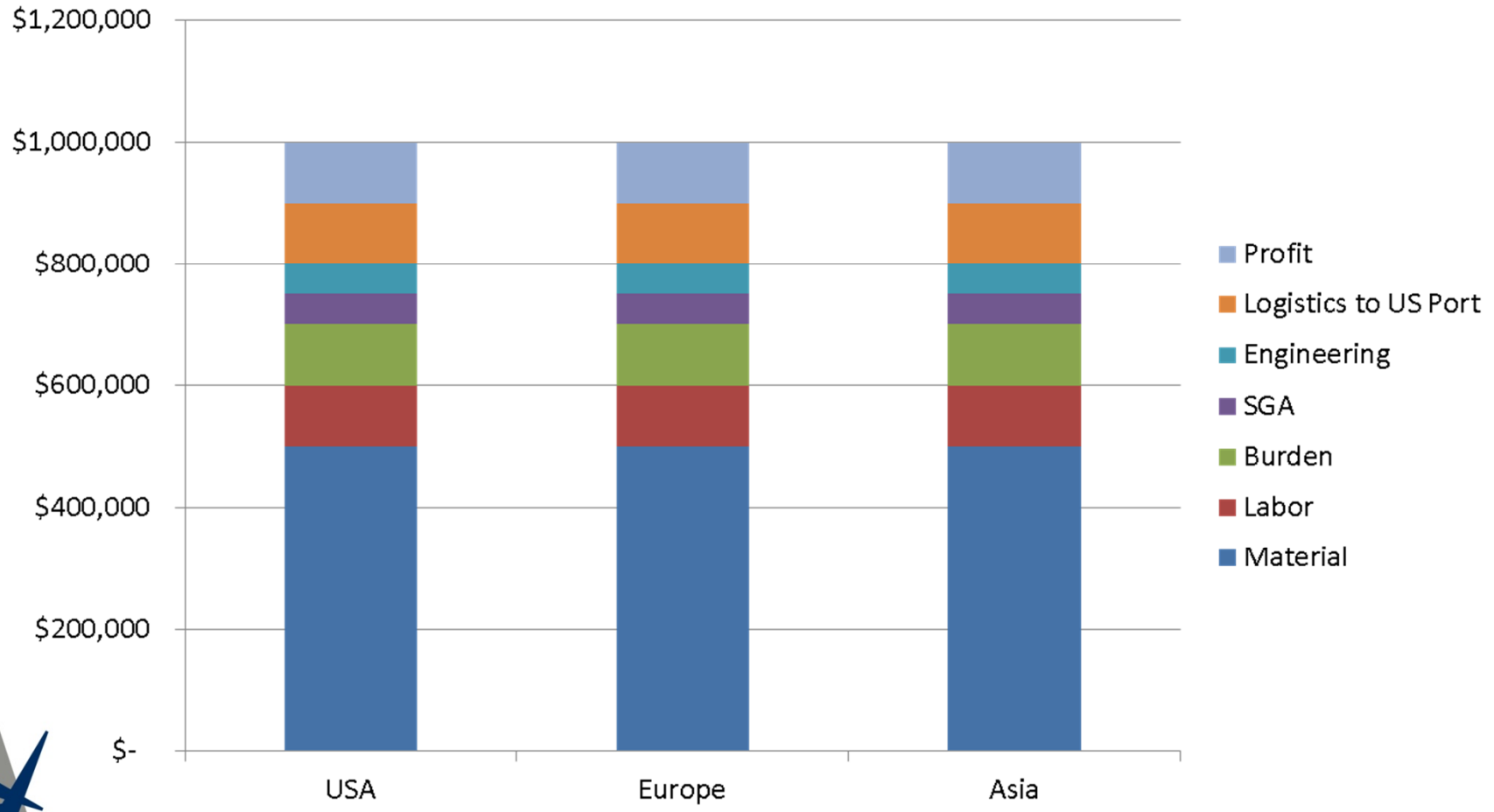
1. Value Stream Mapping

- 4 Major Components: Steel foundations, Towers, Blades, Direct Drive Permanent Magnet Generator
- 3 Regions: USA, Europe, China



2. Cost Breakdown Analysis



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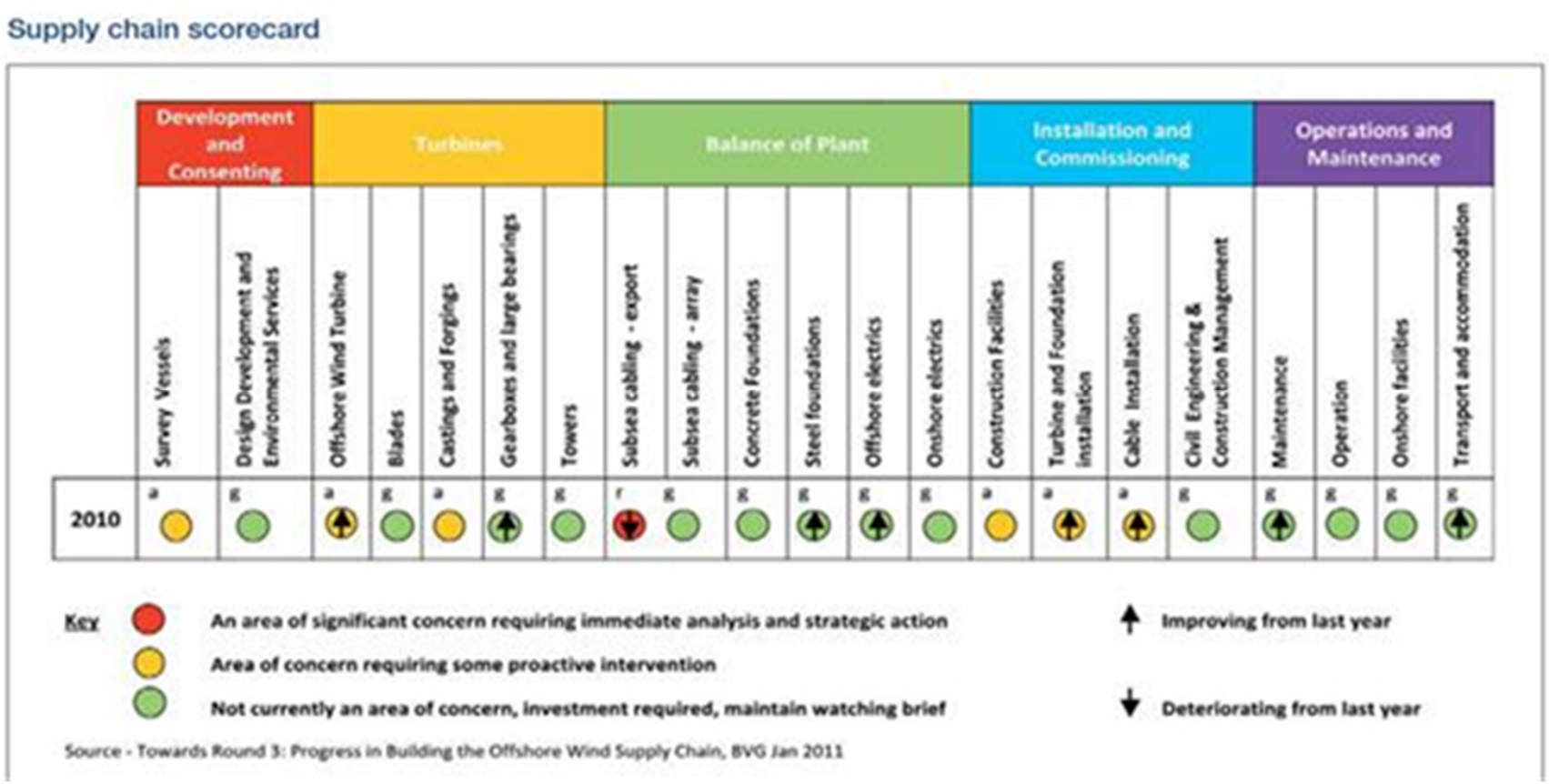
3. Offshore Industry Scorecard

Includes: Foundations, Towers, Blades, Cast Rotor Hubs, Support Bases, Generators, Ocean Cable



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4. Identify Potential Offshore Suppliers

- Collaborate with regional organizations:
  MEP's, Econ Devel orgs, and state agencies.
- Conduct a capabilities "Short Survey"
  - Specific to wind requirements part size limits, in-house equip., certifications, and quality management systems.
  - Specific wind industry sectors
  - Coastal region manufacturers emphasis
- Conduct regional Supply Chain Workshops
  - Select mfgrs by invitation + general
  - educate manufacturers and identify potential suppliers

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4. Identify Potential Offshore Suppliers

- Coastal region priorities for DOE workshops
  - Maine (Portland)
  - Mass (New Bedford)
  - Oregon (Coos Bay region)
  - Texas (Port Isabel)
  - Great Lakes (Cleveland)

- Further identify and qualify key suppliers
  - identify potential suppliers most qualified for making connections as the industry develops.
  - Conduct onsite visits to verify and further asses a manufactures abilities
  - *- GLWN Wind Capabilities Profile*

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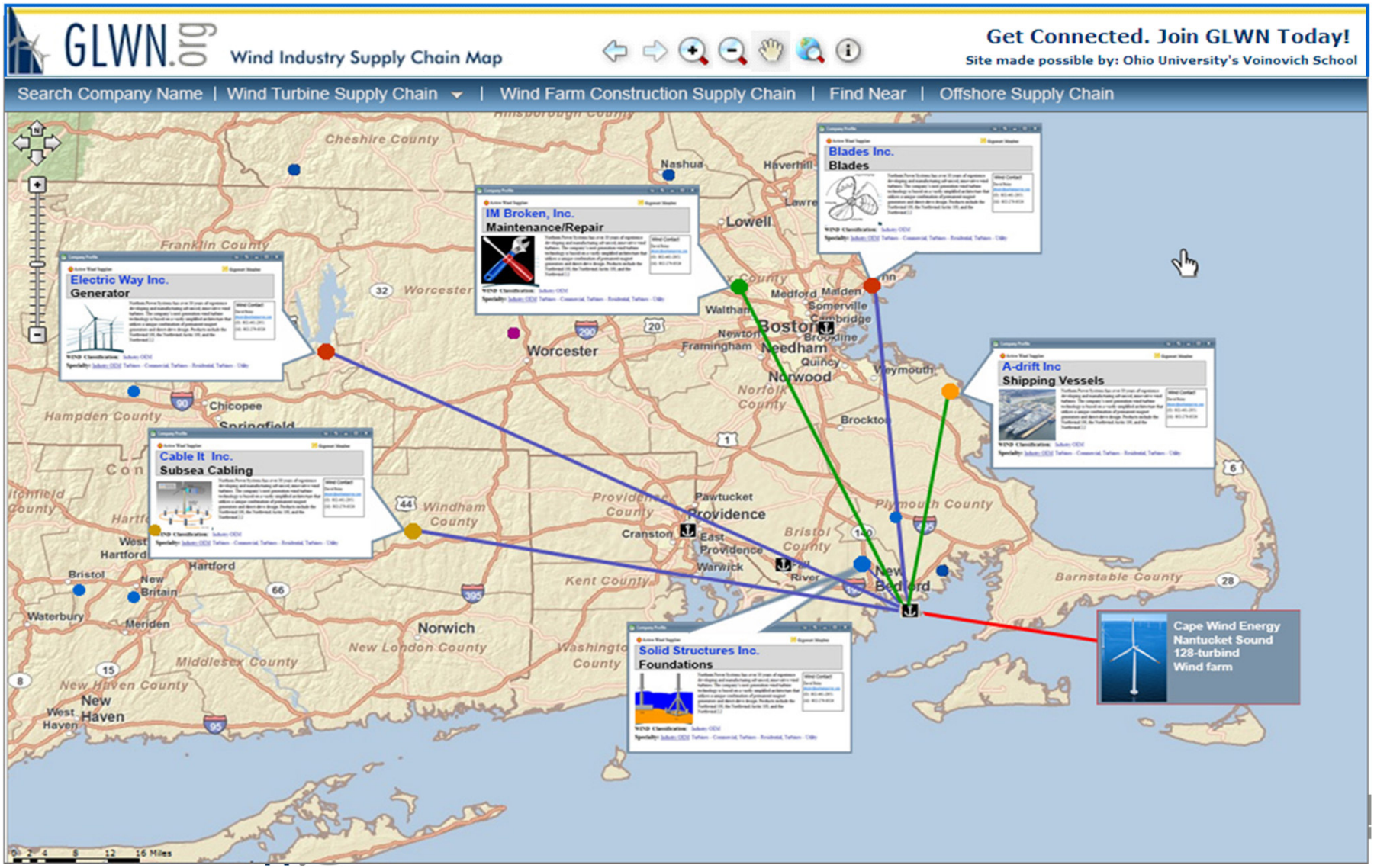
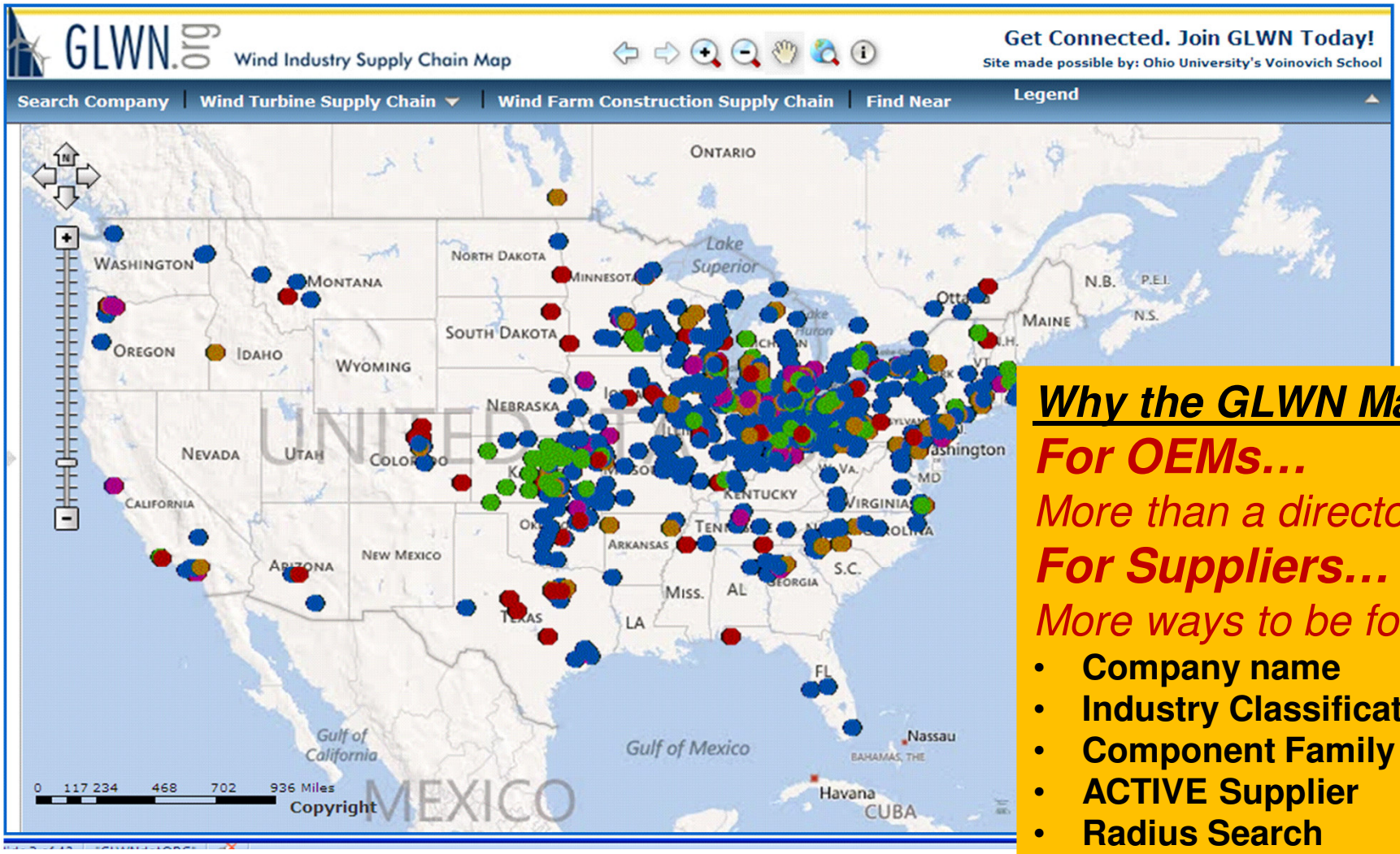
5. Expand GLWN Supply Chain Map to include Offshore specifics



Disseminate Findings
Provide Exposure for U.S. Manufacturers



Why the GLWN Map?

For OEMs…

More than a directory

For Suppliers…

More ways to be found

- **Company name**
- **Industry Classification**
- **Component Family**
- **ACTIVE Supplier**
- **Radius Search**
- **2011, WF Construction SC**
- **2014, Offshore SC**

Engaging with GLWN
Leverage the GLWN supply chain expertise

- **OEM's and Tier 1's –** identify the supply chain needs and find qualified suppliers
- **Manufacturers –** educate, qualify, and connect to opportunities
- **Regional Economies** – assist leaders in the supply chain development for the Offshore Industry
  - Better understanding their regional supply chain
  - Developing a plan for attraction/JV opportunities
  - Land Use & Workforce considerations

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Engaging with GLWN
Leverage the GLWN supply chain expertise

- ✓ **Educate** regional leadership and Econ Devel on Offshore development & supply chain opportunities
- ✓ **Identify** regional *capable & qualified* manufactures
  - ➢ Conduct the Short Survey of the mfg base
  - ➢ Conduct a focused workshop for key mfgrs
  - ➢ Identify JV opportunities for regional mfgs
  - ➢ Identify mfgs best suited for public and/or private investment
- ✓ Conduct **Onsite Visits** & assessments
  - ➢ GLWN Wind Capabilities Profile

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Engaging with GLWN Wind Industry Technology Experts

- ✓ **Connections** and introductions for supplier and JV opportunities.
- ✓ **Coach** and advise leadership/ED on regional supply chain opportunities and development
- ✓ Customized **Regional Supply Chain map**
  - ➢ Portal into the GLWN supply chain database and map search functionality
  - ➢ **International Exposure** for your regional manufacturing and service providers

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THANK YOU!

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