

Offshore Wind: Opportunities for Eastern Shore, Ocean City and Maritime Industry

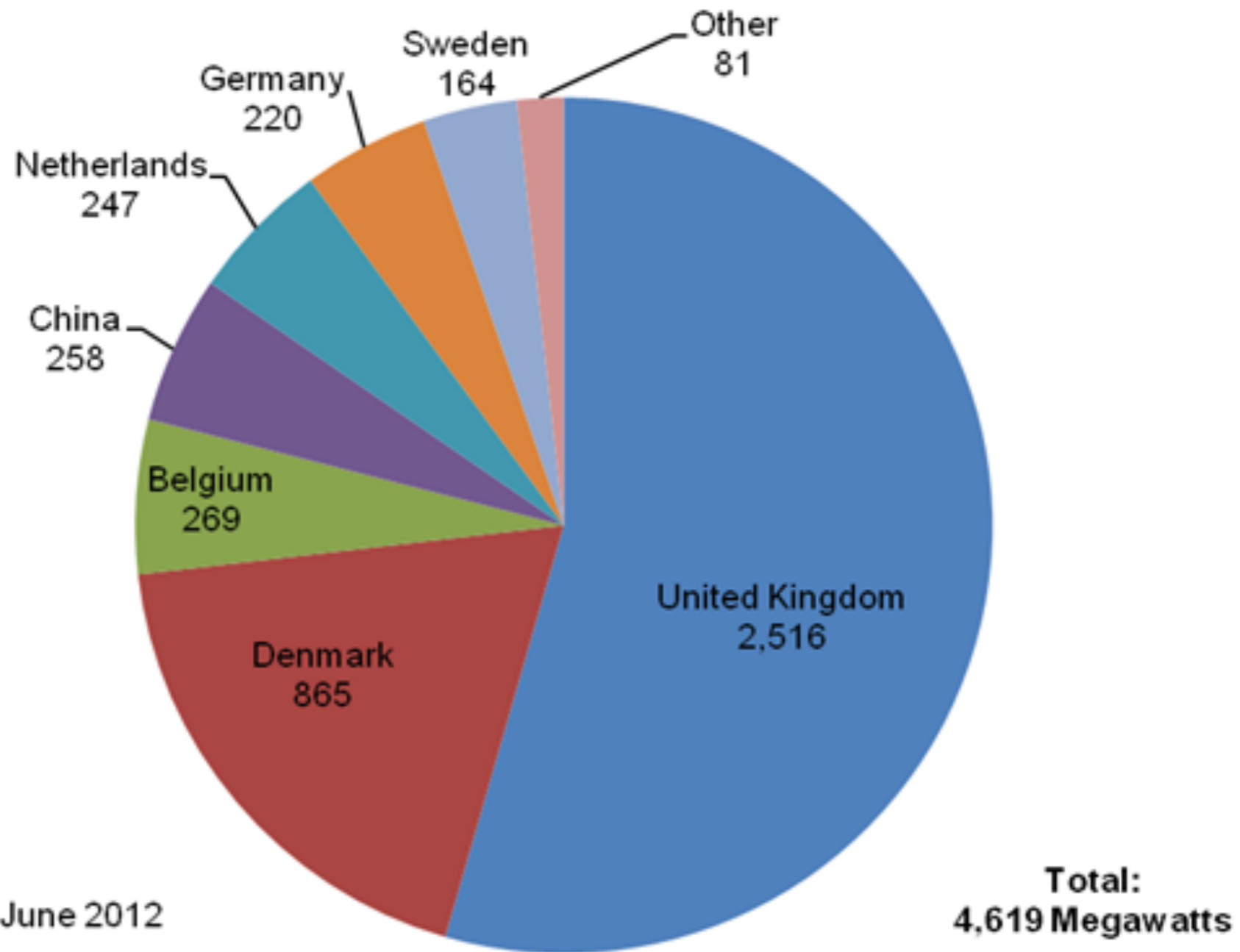
August 16, 2013

Agenda

- Welcome
- Building a Wind Farm
- Building an Industry: Connecting Public and Private Partners
- Importance of Operations & Maintenance
- Businesses to Lead this Industry
- The Danish Offshore Wind Success Story
- Questions and Answers.

Offshore Wind Industry Overview

Cumulative Offshore Wind Installations by Country, 2012* (Megawatts)



First Impressions of a Wind Farm



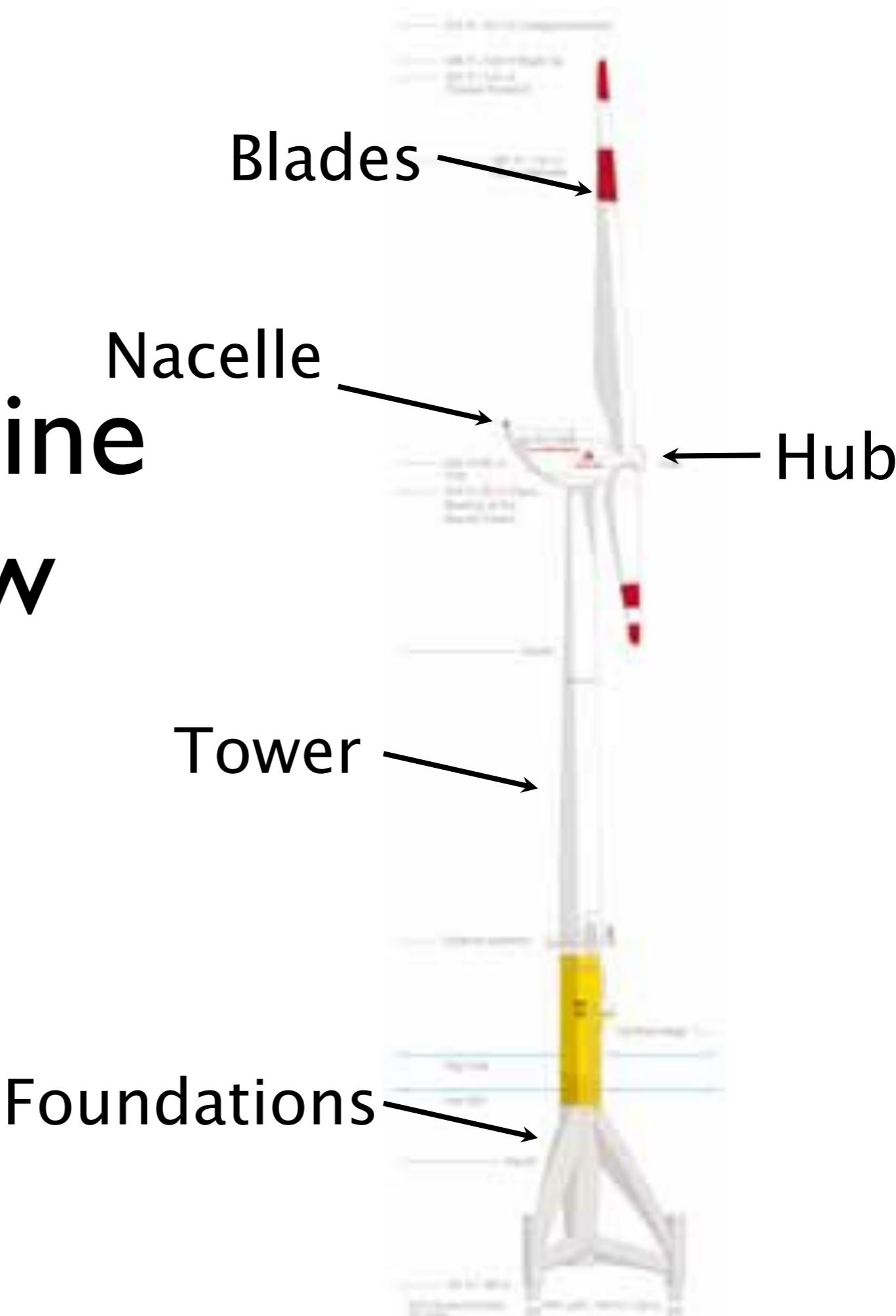
Comprehensive View of a Wind Farm

The Industry Sector Opportunities for an Offshore Wind Farm



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Wind Turbine Overview

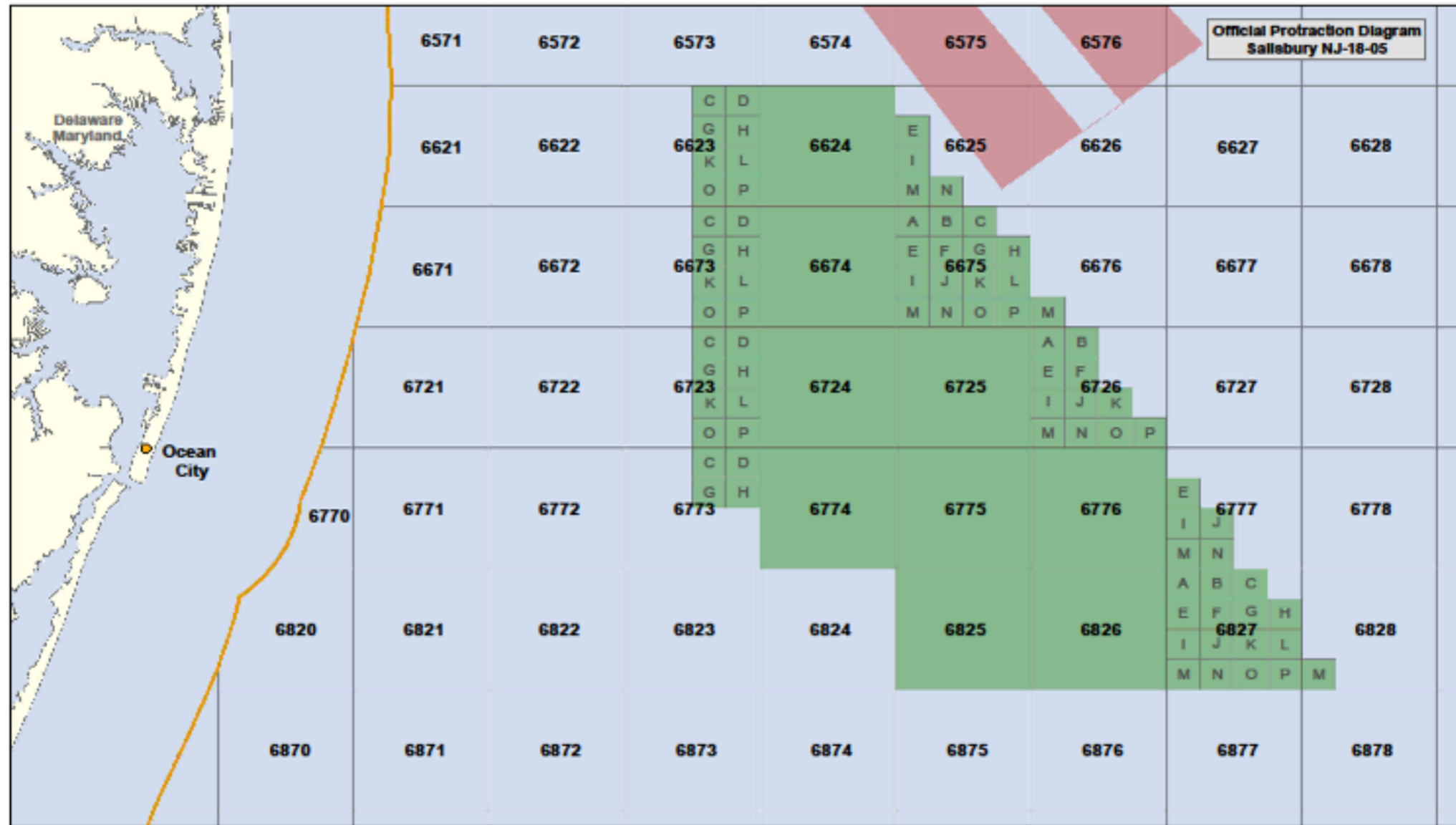


Wind Farm Stages

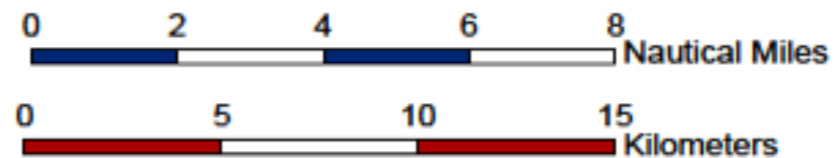
1. Planning and Permitting
2. Lay-down and Pre-assembly
3. Balance of Plant
4. Manufacturing and Supply Chain Development
5. Assembly and Installation
6. Operations and Maintenance
7. Decommission

Planning and Permitting

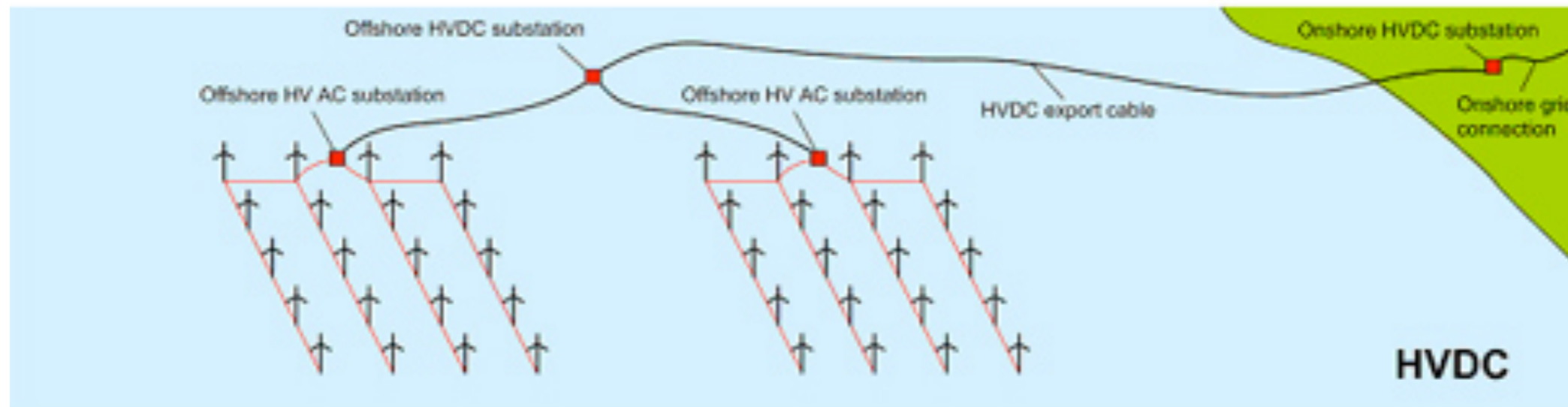
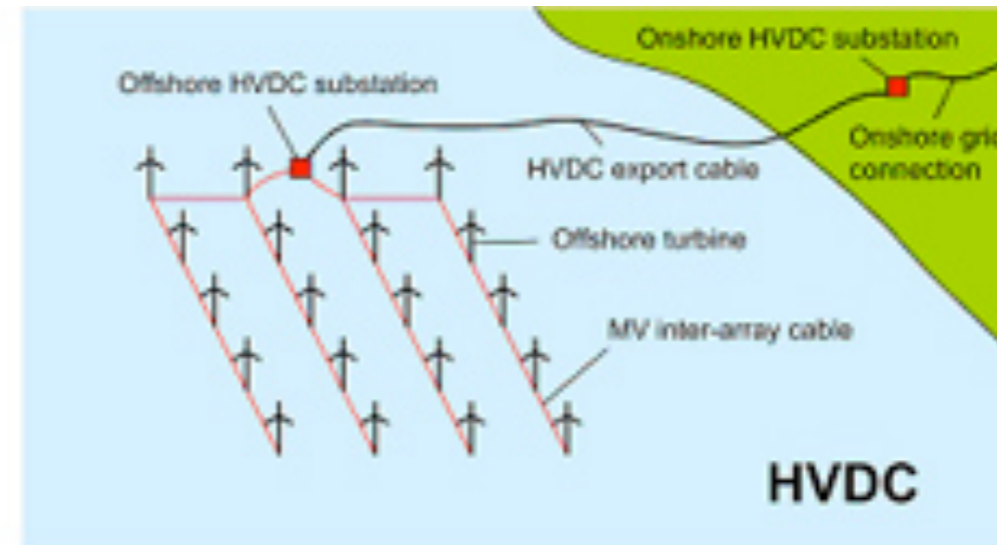
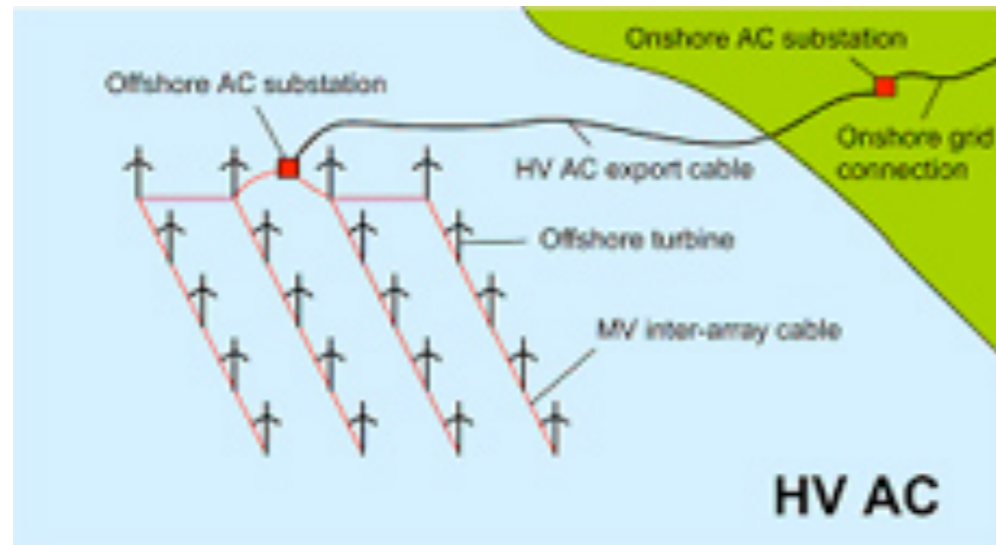
BOEM Maryland Call for Information and Nominations Area



- Fed/State Boundary
- Traffic Separation Scheme
- Maryland Call Area
- OCS Lease Blocks
- Official Protraction Diagram



Planning and Permitting



Lay-down & Pre-assembly

- Just-in-Time is replaced by “Just-before-Time”.
- Turbines require testing
- Towers need to be ‘dressed’
- Blades made ready
- Containers with tools and equipment portside



Lay-down & Pre-assembly



Balance of plant manufacture



Balance of Plant

- Foundations need to be build and stored
- Array cables made ready
- Substation prepared



Assembly & Installation



With a 'jack-up' vessel and on average 25 other vessels ...



Deployment!

Operations & Maintenance

Port operation

- Asset management
- Fabrication of pontoons
- Vessel charter
- Catering / accommodation

Offshore

- Long term activity – apprenticeships, on-the-job training, core maths and science skills)
- Cross-sector skills (electricians/plumbers/ex-military with transferable skills)
- Transfer vessels (skippers and deck hands)
- Helicopter pilots
- Health and safety/PPE

Supply chain

- Component replacement



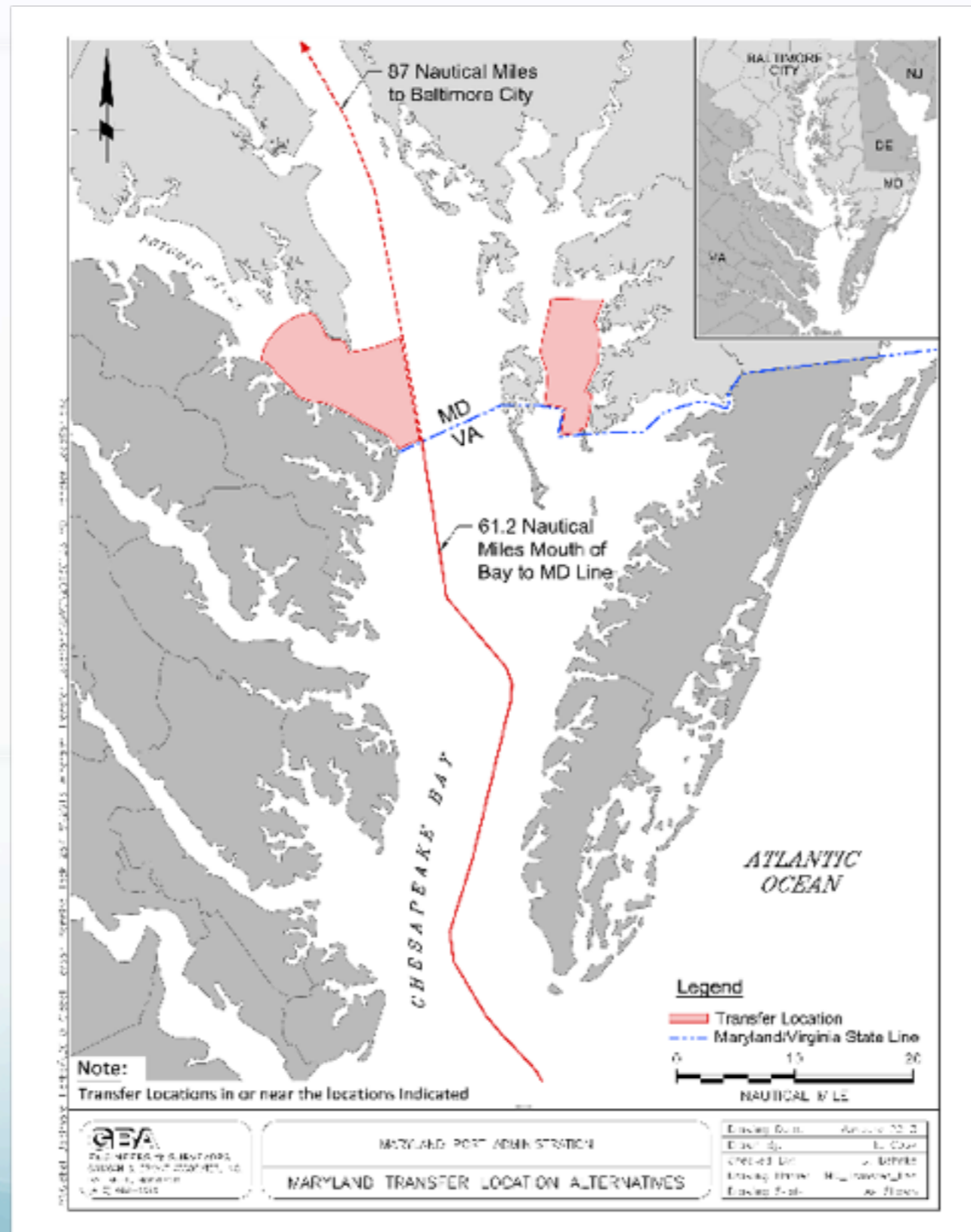
Preparing Maryland for Offshore Wind

Initiatives Already Started

- The passage of the Bill for ORECs as a financing support mechanism.
- BOEM and the auction of the lease blocks
- Geophysical survey
- Maryland Offshore Wind Energy Research grants for Maryland's public academic institutions



Assessing transfer station (barge to jack up vessel) closer to wind farm



Other Initiatives Underway

- Formation of the Committees:
 - Maryland Offshore Wind Development Fund Advisory Committee
 - Clean Energy Program Task Force
 - Clean Energy Technical Task Force
- Preparing to ‘market’ Maryland with public – private delegation to European Offshore Wind Conference (Frankfurt November)
- Working with DBED to evaluate Maryland’s economic development support for starting this new industry.

International Relationships: Denmark

Dialogue with Danish Government
Officials

The Port of Esbjerg, Esbjerg
Business Development Center,
Danish Offshore Wind Industry
Association, and DK Renewables

EngerinetDK, Denmark's
Transmission Operator

Several developers including Dong
Energy and Global Tech 1



International Relationships: Germany



- Dialogue with the Schleswig–Holstein Minister of Energy and his staff
- Meeting with WindComm, Northern German OSW Cluster group and Trade Association and OFFTec, Training
- Research, Testing and Data Collection Programs
- Bremerhaven Elected Officials, who led port redevelopment
- Companies specializing in Port Logistics, Financing
- Viewed first hand the manufacturing of the foundations, substations and their platforms, towers and turbine

Extended Vision for Best Preparing Maryland

Identify strategic investments we can make to prepare Maryland as the favored state to most best enable offshore wind. This includes:

- Understanding the functions needed and the timelines
- Giving all Maryland companies first opportunity to perform the functions
- To ensure the workforce receives suitable training at the correct time to meet industry demands
- Fostering effective public – private partnerships such as BizMDOSW

Selecting Optimal Transmission and Cabling Infrastructure



Observations About European OSW

The market continues to evolve with new technologies and new suppliers. This provides export potential for Maryland companies.

- There are limited secondary sources for turbine components
- Two areas of supply chain constraints: Substation and Export cables
- Logistics organize the supply chain and can save up to 50 percent in costs
- There is a need for advanced welding processes
-

Offshore Wind Operations & Maintenance: A Closer Look

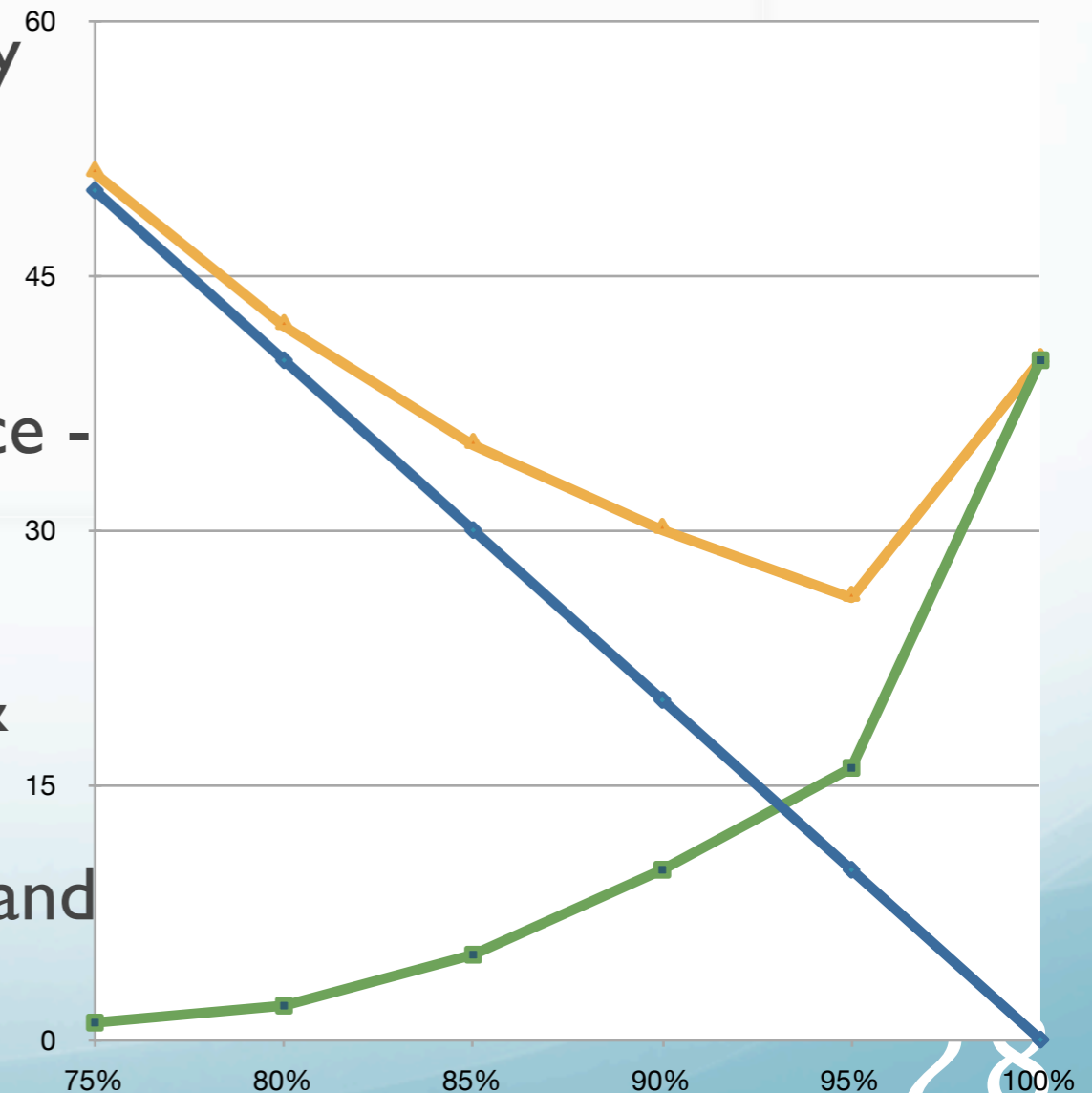
Purpose

- Ensure the safe and economic running of the project
- Obtain best balance between running cost and electricity output

All with consideration to the following 4 key factors:

- 1) Availability - as a measure of the asset performance
- 2) Scheduled and Unscheduled Maintenance - keeping everything running
- 3) Access - overcoming weather and sea constraints (TRANSIT TIME, VESSEL TYPE & No. OF TURBINES)
- 4) Cost reduction - a need to reduce cost and to add to profitability

Balance Between Cost & Lost Revenue



Importance & Opportunity

- Offshore wind farms typically achieve availability of between 90% and 95%. Note: Onshore wind farms, which face much lower O&M costs, typically achieve higher availability in the order of 97%.
- O & M is >25% of OSW lifetime (20 years) total cost. (UK estimates \$3 bn for 5500 turbines)
- Role for small and medium sized enterprises (SMEs) – particularly those with proximity, provide flexibility and have new ideas.
- Companies and ports that engage now will help shape the future ‘O & M Industry’. Workboats for near shore but new competitive strategies involving fixed or floating accommodation for distances over 70 nautical miles.

O & M with 7 functions

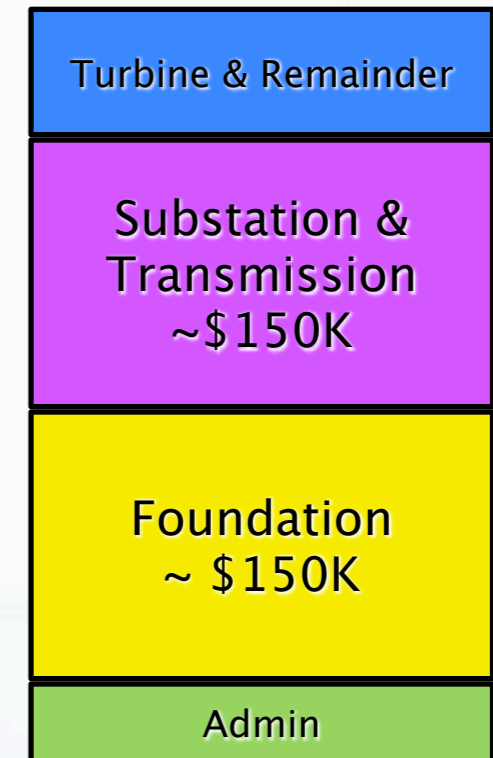
- Administration
- Onshore logistics
- Offshore Logistics (work boats and helicopter)
- Turbine Maintenance
- Export Cable
- Array cable
- Foundation Maintenance

O & M: Operations

- Small proportion of expenditure.
- Main contracts with wind farm owner and / suppliers of the turbines
- High level management of the asset such as:
 - remote monitoring
 - environmental monitoring
 - electricity sales
 - marketing
 - administration and other back office tasks.

O & M: Maintenance

- Largest portion of cost and risk.
- Historically, maintenance has been ad-hoc and reactive.
- Maintenance activity for physical plant and systems up-keep and repair - divided into:
 - preventative maintenance, and
 - corrective maintenance.



Total Spend ~ \$375K/
turbine / year

Maintenance: Preventative

This includes:

- proactive repair / replacement of known wear components
- routine inspections or information from condition monitoring systems
- routine surveys and inspections.

Maintenance: Corrective

This includes:

- reactive repair with replacement of failed or damaged components.
It may also be performed batch-wise when serial defects or other problems that affect a large number of wind turbines need to be corrected.
- The distinction is usually made between scheduled or proactive maintenance and unscheduled or reactive maintenance.

Stakeholders & Contracts

O & M Contracts are with key stakeholders:

- Developer or Project Owner
- Turbine Manufacturer (post warranty period, the contract could be extended, taken in-house by owner or with third party)
- Offshore Transmission Cable Owner

The need for State-of-the-Art O & M



O & M with the correct vessel and port infrastructure



'NOW' is the time – why?

The reasons:

- Developers will be seeking Turbine suppliers' bids for turbines and initial maintenance options.
- As the O & M comprises of 25–28% of the total lifetime cost, the details will be required by the financiers.
- Any port infrastructure changes / upgrades require planning and financing.
- Project finance needs to be secured 3–4 years prior to commissioning for design

**BizMDOSW: Business
to Lead this Industry**

Importance of Maryland Businesses to Engage

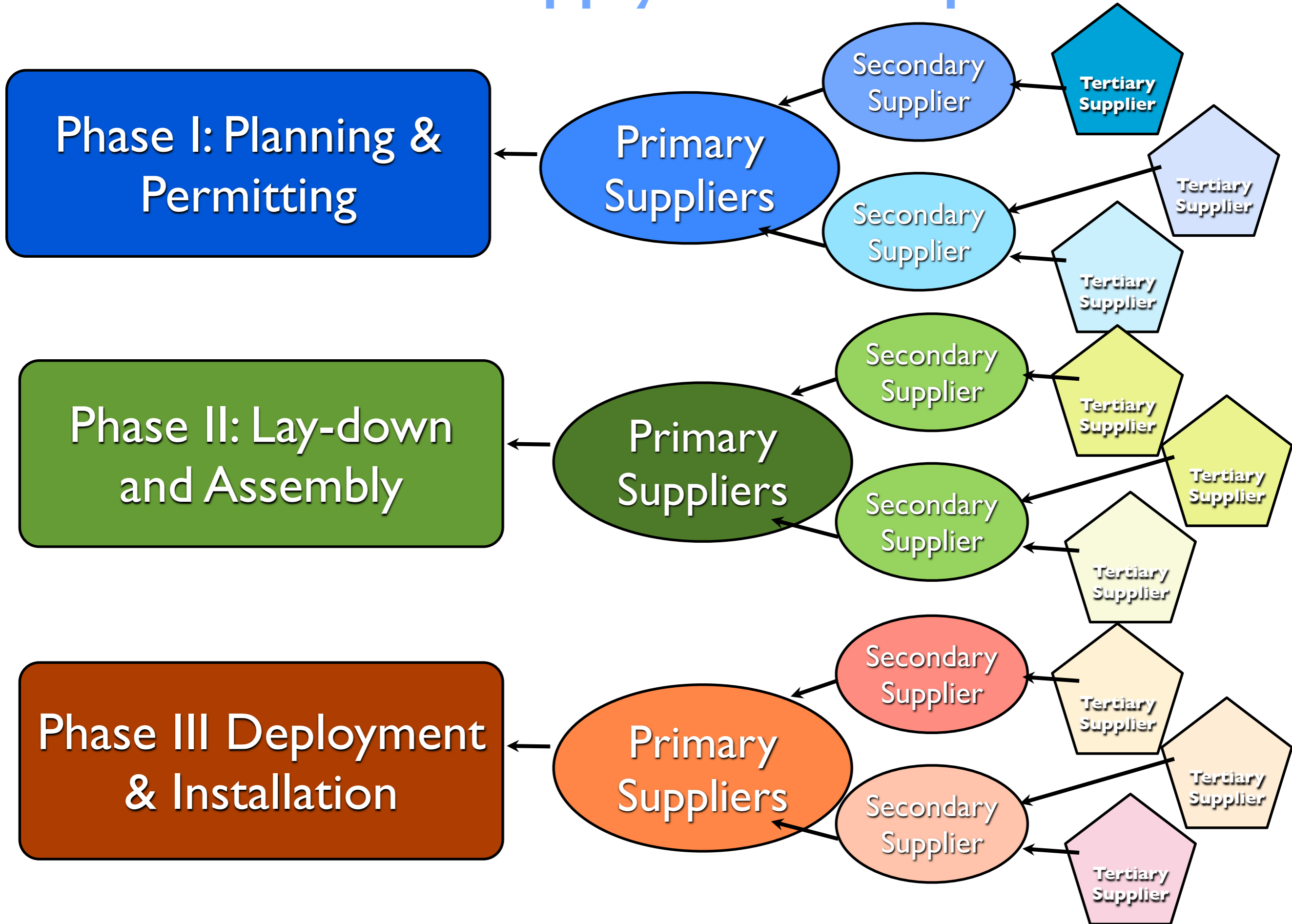
- Transitioning from Policy' to 'Project' a new mind set is needed.
- Understand the needs of the developer(s) and the major component manufacturers in order to start making Maryland as conducive for OSW industry.
- Expectations of our infrastructure such as lay-down and O & M ports, the logistics in handling very large and very expensive pieces
- Priority issues facing the industry—safety, safety, safety
- Role the business community plays in building the industry



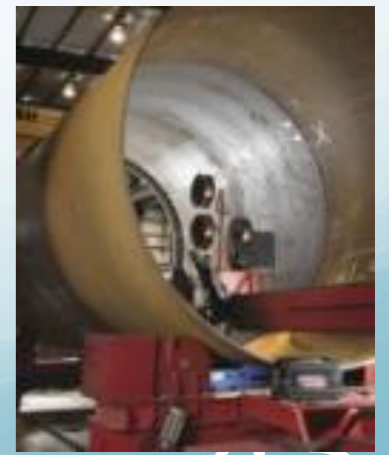
Supply Chain Opportunities

- Growth of European OSW is dependent on supply chain development
- There is a need for more companies to enter into the global OSW supply chain to drive down costs and increase innovation
- A lot of the supply chain exists today, companies just do not know it
- Developers and OEMs are open to partnerships—relationship building is key and a long process (size of company does not matter)
- A large amount of local content will come in the O&M area

Offshore Wind Supply Chain Map



Other Supply Chain Opportunities



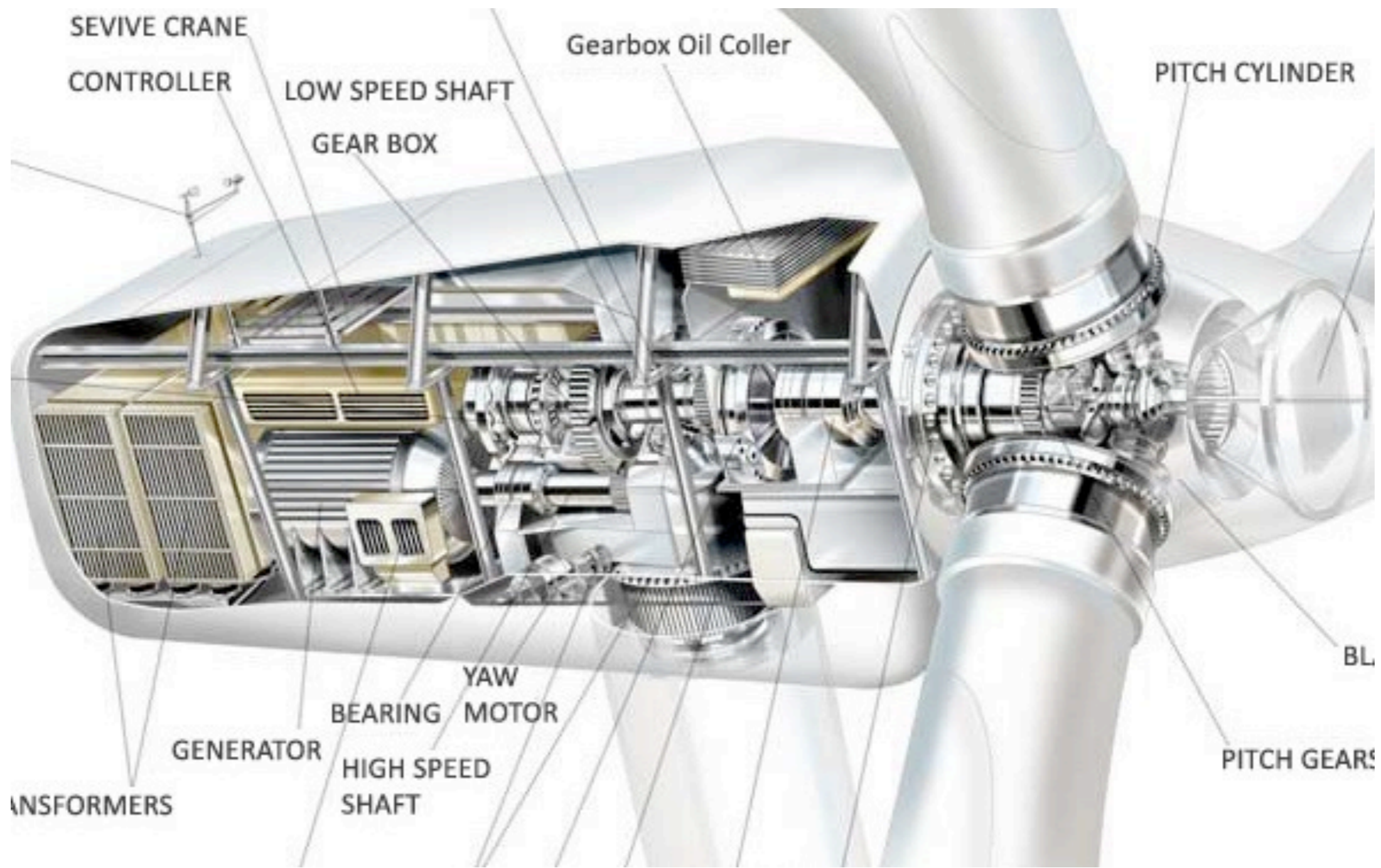
1200 tonnes Substation



95' tall: each is unique



Ultimately Manufacturing & Supply Chain Opportunities



Building the Industry in MD

- Collaboration is key! Locally, regionally and globally.
- Knowledge sharing, networking and advocating to grow the industry
- Assist in identifying areas where MD businesses can compete and provide innovation
- Help companies and organizations get started by facilitating partnerships—JVs and strategic alliances

The Danish Offshore Wind Success Story



Off Shore Wind Workshop – MACo 2013

Charlotte Nytoft, Senior Commercial Advisor, Washington DC
Claus Andersen, Director Wind Advisory Services, Chicago, IL



Maryland – Denmark... A perfect match

- Maryland
 - 12,407 sq miles
 - 5.8 mill inhabitants
 - GBP 2012 \$301
- Denmark
 - 16,640 sq miles
 - 5.5 mill inhabitants
 - GBP 2012 \$314

Renewable Energy – on & off shore wind

An Industry developed over 30 years

From agricultural local business to global industry

350 businesses & 25,000 employees

Today 28% of the Danish energy consumption comes from wind

In 2020 this number will be 50%

By 2050 the goal is to be entirely independent on fossil fuels



State of Green

The Danish resource for renewable energy info

<http://www.stateofgreen.com/en>

Movie: Mind Blowing Copenhagen

<http://www.stateofgreen.com/en/Wind-power>



Creating Business Opportunities Across the Pond !!



Get to know "what you don't know"

Sharing experiences from 30 years of developing the industry

Collaboration between the business communities in the supply chain

Servicing the project with hubs in Baltimore & Ocean City

Establish a O&M center of excellence in Maryland

Denmark has the resources needed for Maryland to realize the project and create a prosperous business community around the off shore wind project(s)

Question & Answers

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