Regional Port Approach To Supply Chain and Workforce Development

Business Network for Offshore Wind

2016 International Partnering Forum

Newport, RI

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SMART
SOUTHEAST MARITIME AND TRANSPORTATION CENTER

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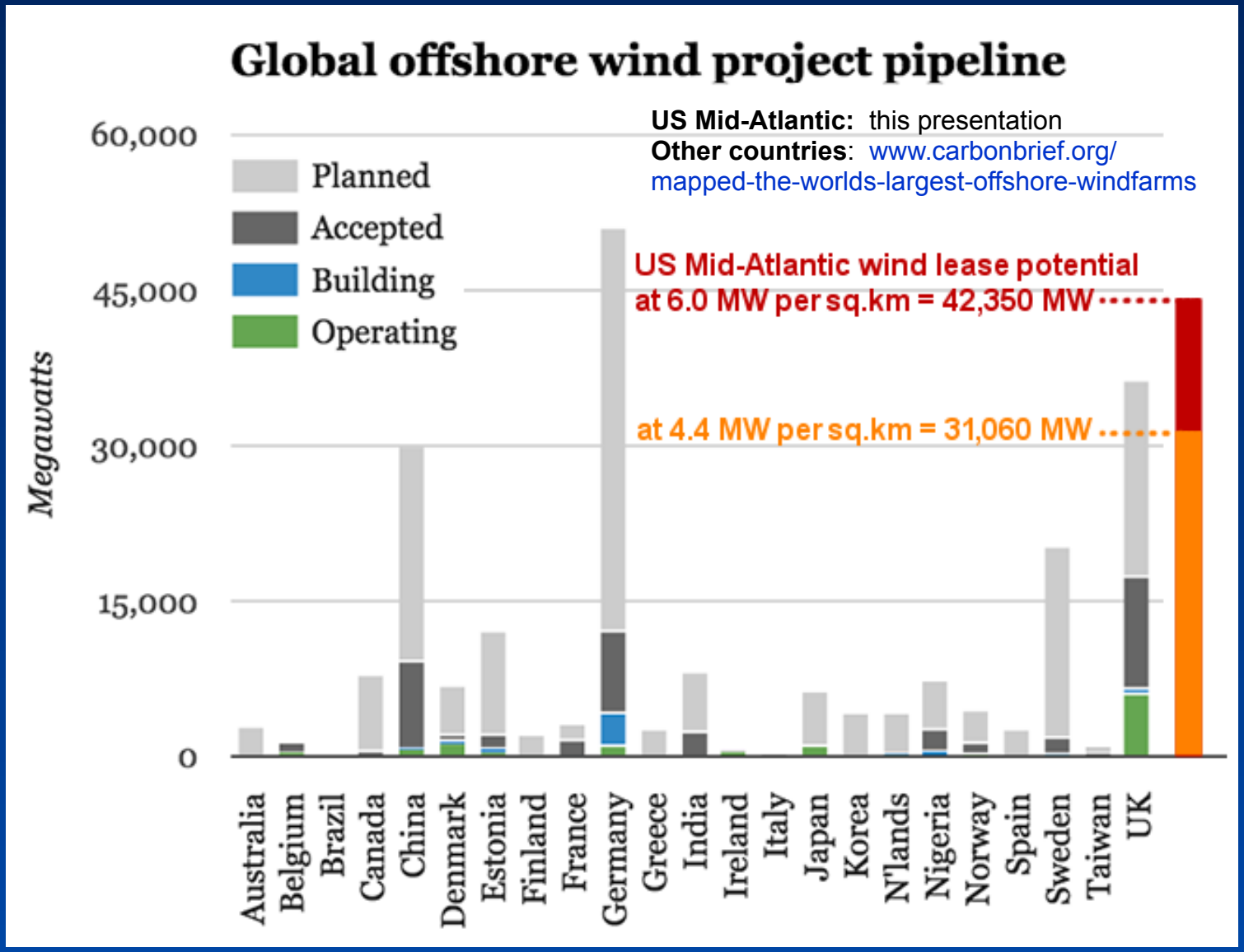
Offshore Wind Potential Project Pipeline off the U.S. Mid-Atlantic Coast

(How many regional supply chains?)

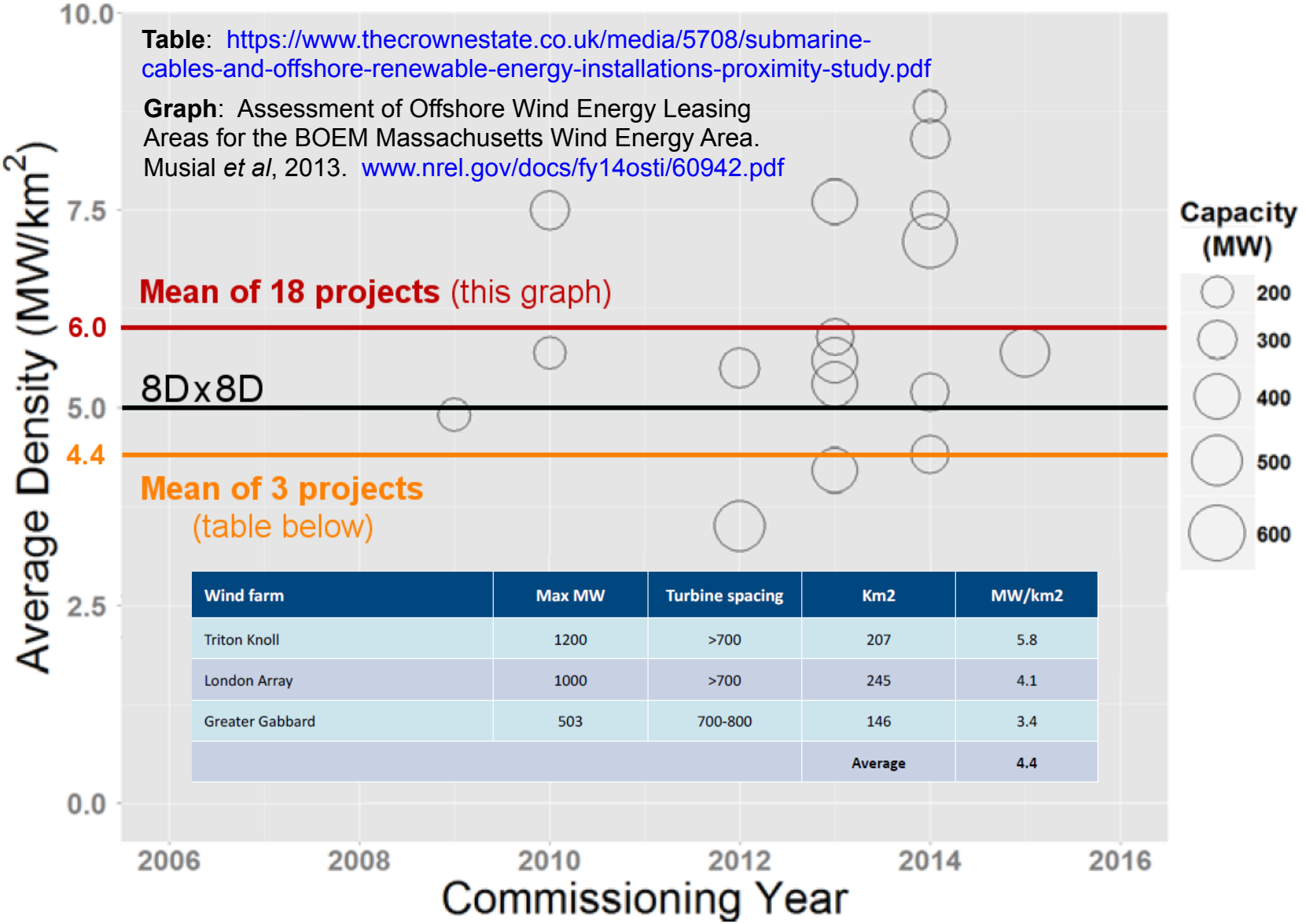
Mid-Atlantic Offshore Wind Potential is Among Top Five Pipelines Globally



Converting BOEM Offshore Wind Lease Area Estimates to Potential MW Capacity Estimates

Table: https://www.thecrownestate.co.uk/media/5708/submarine-cables-and-offshore-renewable-energy-installations-proximity-study.pdf

Graph: Assessment of Offshore Wind Energy Leasing Areas for the BOEM Massachusetts Wind Energy Area. Musial *et al*, 2013. www.nrel.gov/docs/fy14osti/60942.pdf



Wind farm	Max MW	Turbine spacing	Km2	MW/km2
Triton Knoll	1200	>700	207	5.8
London Array	1000	>700	245	4.1
Greater Gabbard	503	700-800	146	3.4
			Average	4.4

At 4.4 MW / km^2, Active Mid-Atlantic Leases can Support Two 1-GW-per-Year Hubs for 9 to 11 Years

US Mid-Atlantic Offshore Wind Lease Areas
(Cape Cod, MA to Cape Hatteras, NC)

State	Lease No.	Lease Holder / Developer	Area (acres)	Area (sq.km)	Date of Lease Sale	Lease Effective Start Date	
MA	OCS-A 0500	DONG Energy	187,520	759	29-Jan-2015	01-Apr-2015	
MA	OCS-A 0501	Offshore MW LLC	166,890	675	29-Jan-2015	01-Apr-2015	
MA	OCS-A 0502	offered, but no bids (farther offshore)	248,020	1,004	29-Jan-2015		
MA	OCS-A 0503	offered, but no bids (farthest offshore)	140,550	569	29-Jan-2015		
RI	OCS-A 0486	Deepwater Wind New England	97,500	395	31-Jul-2013	01-Oct-2013	
RI	OCS-A 0487	Deepwater Wind New England	67,250	272	31-Jul-2013	01-Oct-2013	
NY	OCS-A 0512	Proposed Sale Notice 06 June 2016	81,130	328	Dec-2016		
			Northern sub-total:	4,002	sq.km		
			leased:	53%	x 4.4 MW per sq.km =	9,245	MW
NJ	OCS-A 0499	US Wind Inc.	160,480	649	09-Nov-2015	01-Mar-2016	
NJ	OCS-A 0498	DONG Energy	183,350	742	09-Nov-2015	01-Mar-2016	
DE	OCS-A 0482	NRG Bluewater Wind	96,430	390	n/a	16-Nov-2012	
MD	OCS-A 0489	US Wind Inc.	32,740	132	19-Aug-2014	01-Dec-2014	
MD	OCS-A 0490	US Wind Inc.	46,970	190	19-Aug-2014	01-Dec-2014	
VA	OCS-A 0483	Dominion Virginia Power	112,800	457	04-Sep-2013	01-Nov-2013	
NC	OCS-A 0508	Proposed Sale Notice 12 Aug 2016	122,405	495	~ Apr-May 2017		
			Southern sub-total:	3,056	sq.km		
			leased:	84%	x 4.4 MW per sq.km =	11,268	MW
		unleased:	592,105	2,396	34%		
		leased:	1,151,930	4,662	66%		
		TOTAL:	1,744,035	7,058	x 4.4 MW per sq.km =	31,056	MW

Source: www.boem.gov/Renewable-Energy-State-Activities

At 6.0 MW / km^2, Active Mid-Atlantic Leases can Support Two 1-GW-per-Year Hubs for 12 to 15 Years

US Mid-Atlantic Offshore Wind Lease Areas
(Cape Cod, MA to Cape Hatteras, NC)

State	Lease No.	Lease Holder / Developer	Area (acres)	Area (sq.km)	Date of Lease Sale	Lease Effective Start Date	
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NY	OCS-A 0512	Proposed Sale Notice 06 June 2016	81,130	328	Dec-2016		
			Northern sub-total:	4,002	sq.km		
			leased:	53%	x 6.0 MW per sq.km =	12,606	MW
NJ	OCS-A 0499	US Wind Inc.	160,480	649	09-Nov-2015	01-Mar-2016	
NJ	OCS-A 0498	DONG Energy	183,350	742	09-Nov-2015	01-Mar-2016	
DE	OCS-A 0482	NRG Bluewater Wind	96,430	390	n/a	16-Nov-2012	
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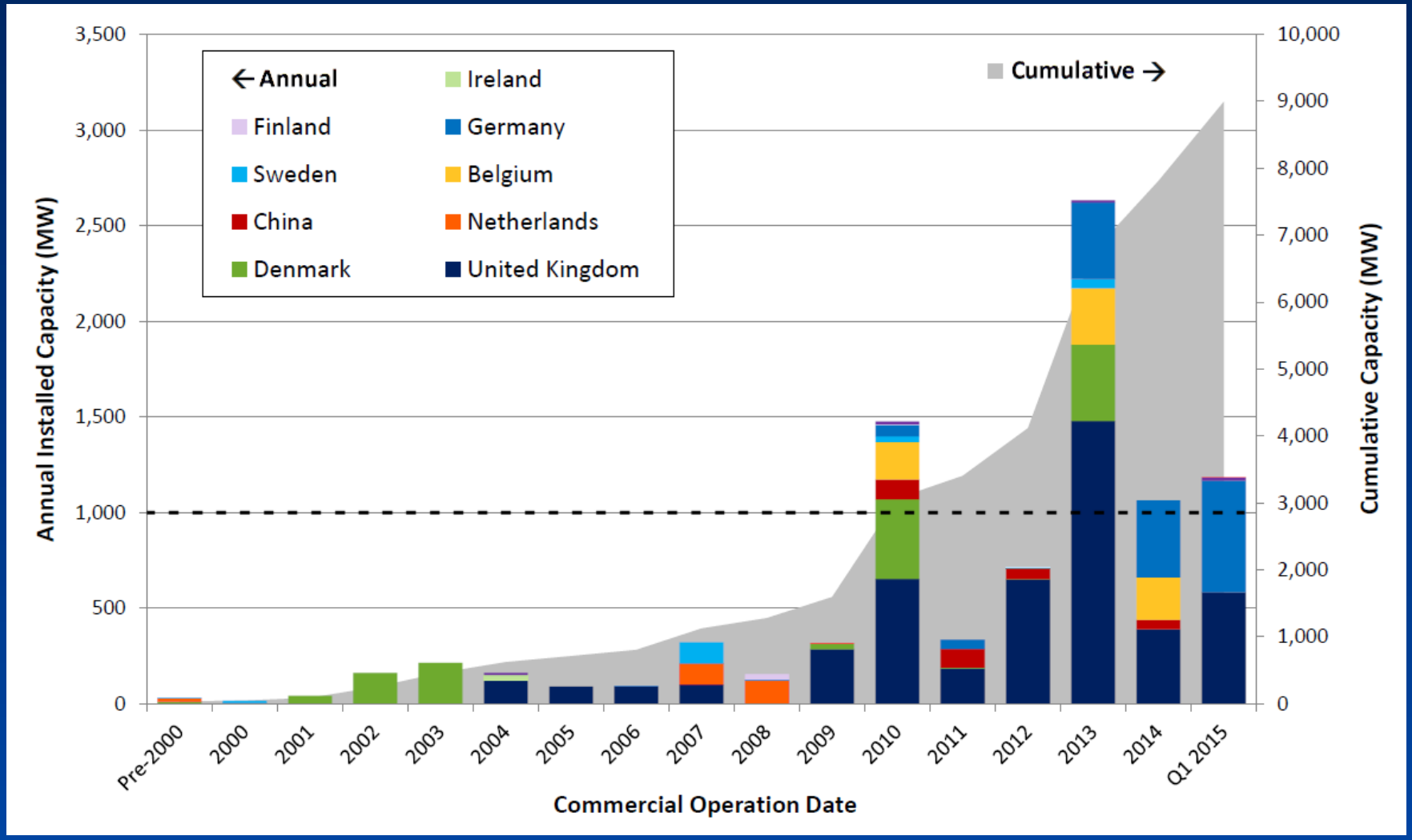
			Southern sub-total:	3,056	sq.km		
			leased:	84%	x 6.0 MW per sq.km =	15,365	MW
		unleased:	592,105	2,396	34%		
		leased:	1,151,930	4,662	66%		
		TOTAL:	1,744,035	7,058	x 6.0 MW per sq.km =	42,349	MW

Source: www.boem.gov/Renewable-Energy-State-Activities

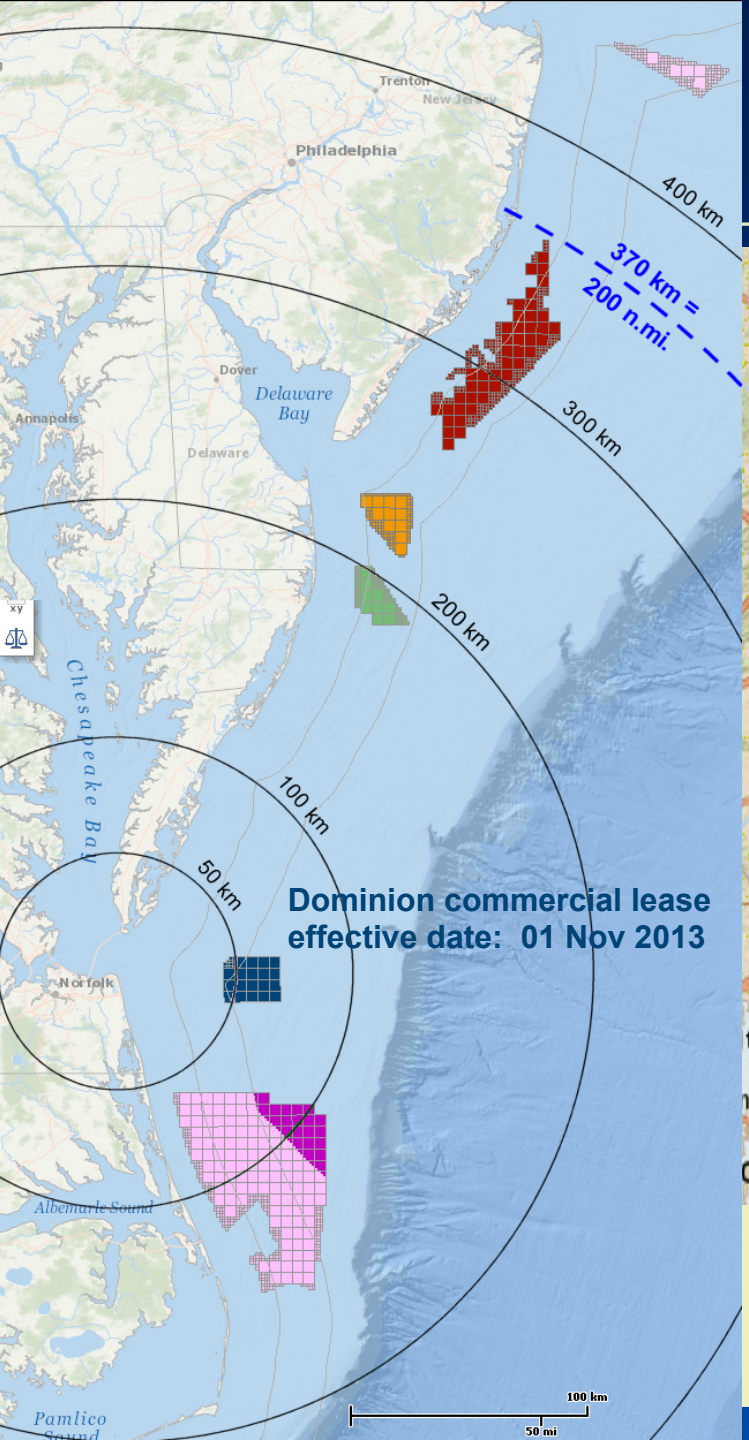
Comparing Annual Installation Rate of 1 GW per Year to Northern European Build-Out



Source: http://energy.gov/sites/prod/files/2015/09/f26/2014-2015-offshore-wind-technologies-market-report-FINAL.pdf

Long-Term U.S. Pipeline can be Assured by Regional Collaboration

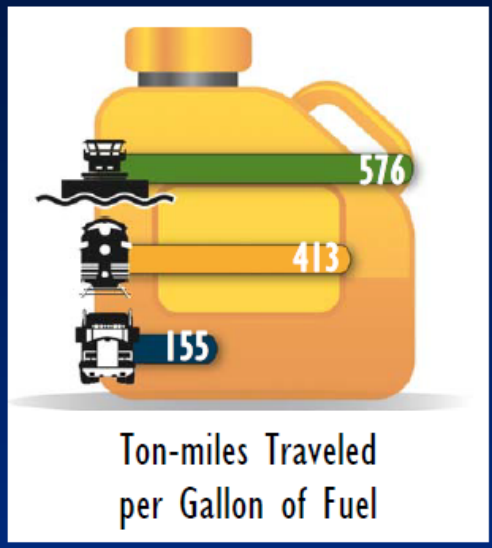
Concept of Two Regional OSW Supply Chain Hubs

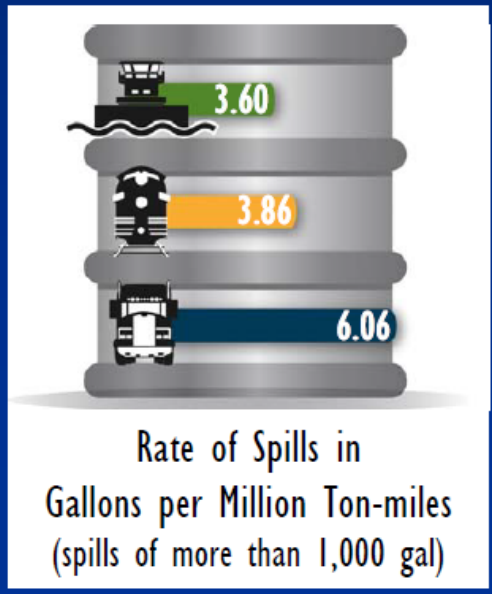


By comparison *L/B Michael Eymard* and other lift boats used at Block Island Wind Farm had a transit distance of 1,800 n.mi. as did the three barges transporting foundation substructures from Gulf Island Fabrication in Houma, Louisiana

Advantages of Waterborne Supply Chain for Southern Mid-Atlantic Regional Hub

Southern Mid-Atlantic region can be served by fuel-efficient waterborne transport between major manufacturing centers, minimizing risk of supply chain disruption on heavily travelled existing road and rail corridors. (Source of graphics and statistics: "A Modal Comparison of Freight Transportation Effects on the General Public, Texas A&M University, December 2007)





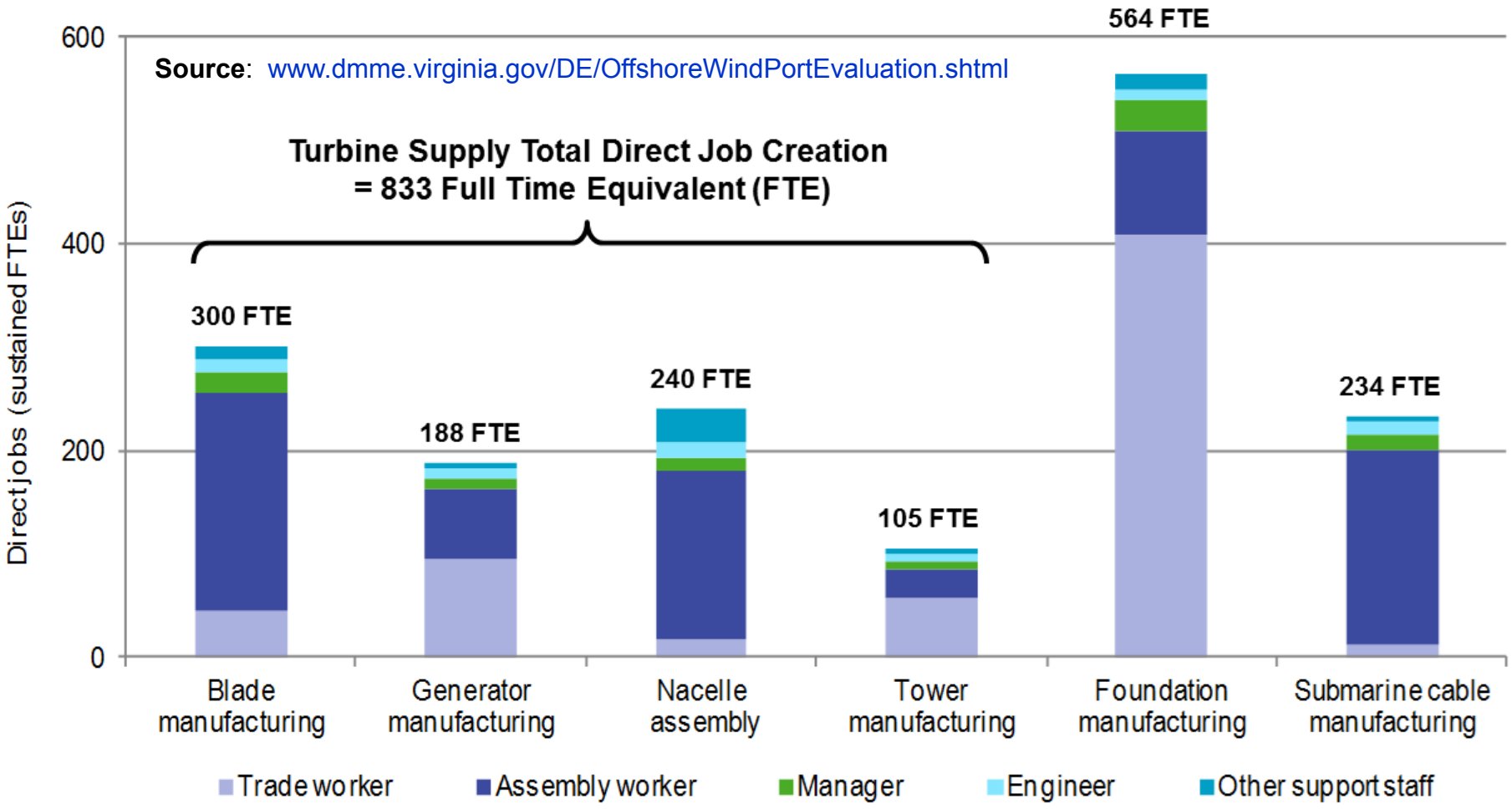
Advantages of Waterborne Supply Chain for Southern Mid-Atlantic Regional Hub

Moving a rotor's worth of blades the hard way

Advantages of Waterborne Supply Chain for Southern Mid-Atlantic Regional Hub

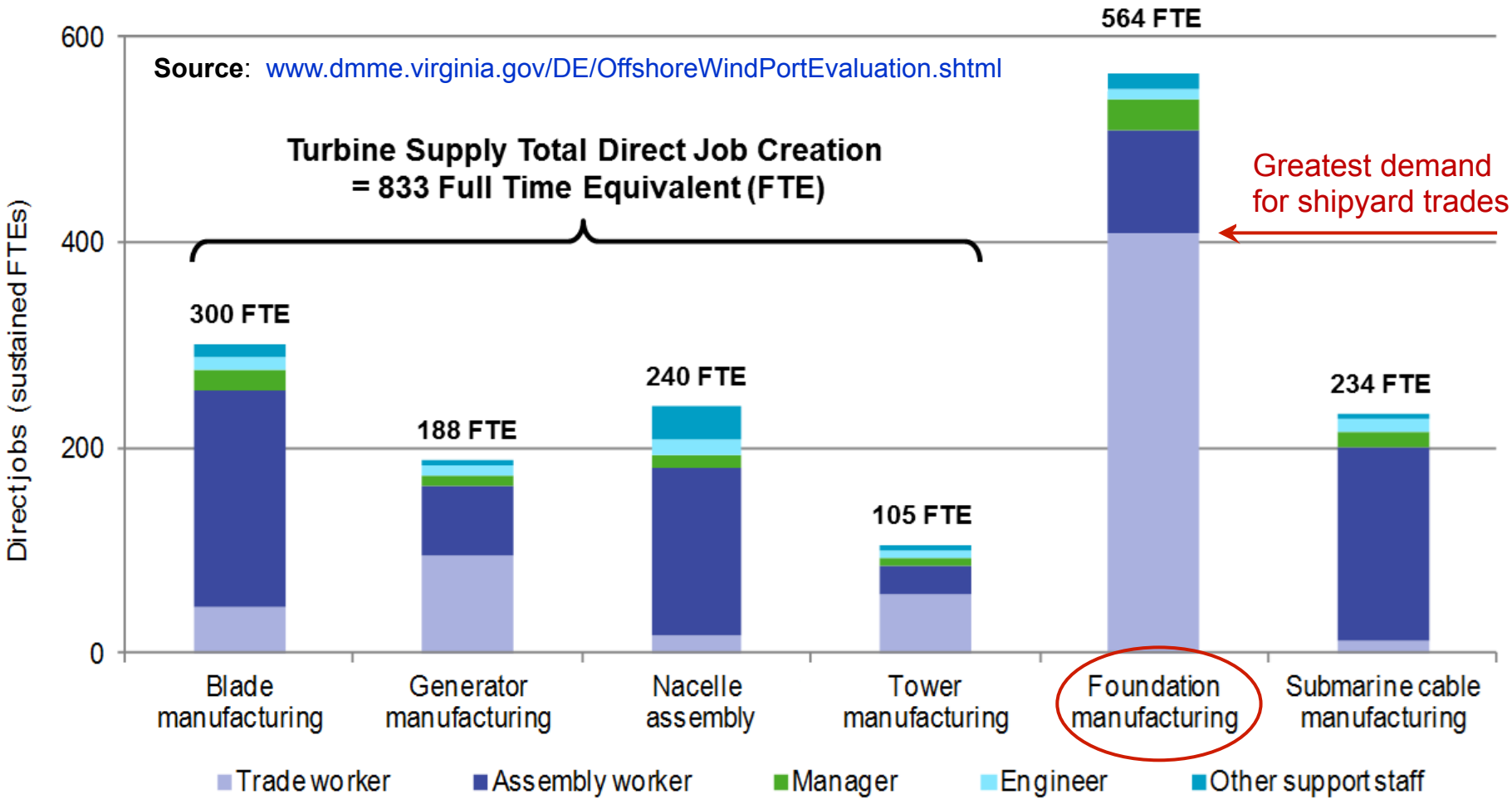
Moving a rotor's worth of blades the easy way

Waterborne Transport Enables Wider Distribution of Manufacturing Facilities



Virginia offshore wind port study (in 2015) estimated numbers of direct jobs created at six different purpose-built facilities to produce 100 turbines annually (i.e., 0.5 to 0.8 GW per year)

Waterborne Transport Enables Wider Distribution of Manufacturing Facilities



For waterborne supply chain hub distributed around southern Mid-Atlantic region, Virginia could focus on foundation fabrication, which best leverages existing shipbuilding capacity

Distributed Workforce Training a Promising Regional Scenario

Distributed Training Footprint Leverages Existing Capabilities

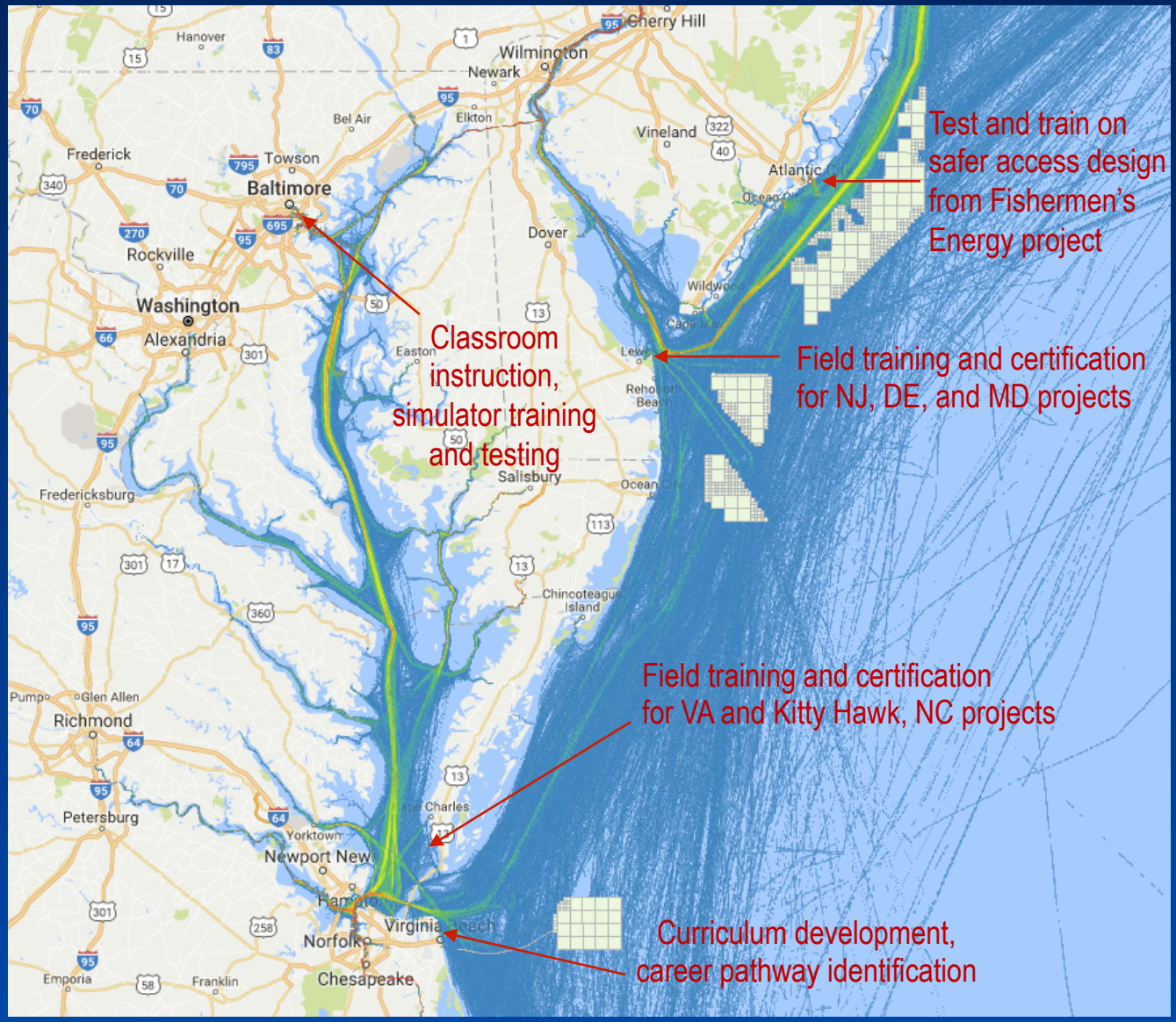
Safer turbine access design for Fishermen's Energy project off Atlantic City, NJ

Classroom, simulator, and lodging facilities on MITAGS training campus in Lithicum, MD

2MW shore-based wind turbine on coast at the University of Delaware in Lewes, DE

5MW near-shore turbine permitted in state waters off Cape Charles, VA

Maritime curriculum development at Tidewater Community College in Virginia Beach, VA



Leverage NSF-Funded Curriculum Development in VA: Southeast Maritime and Transportation (SMART) Center

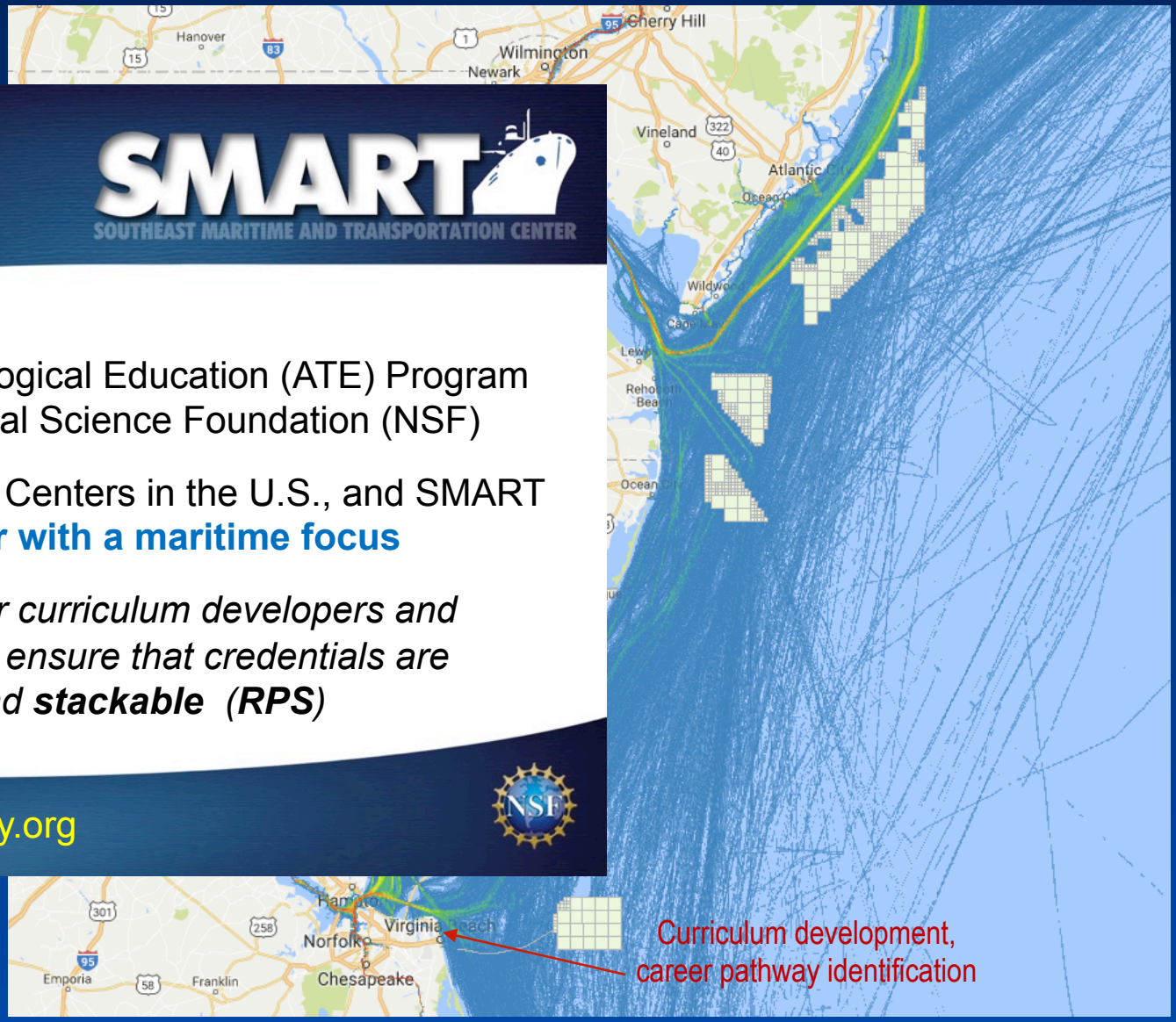
SMART
SOUTHEAST MARITIME AND TRANSPORTATION CENTER

The Advanced Technological Education (ATE) Program is funded by the National Science Foundation (NSF)

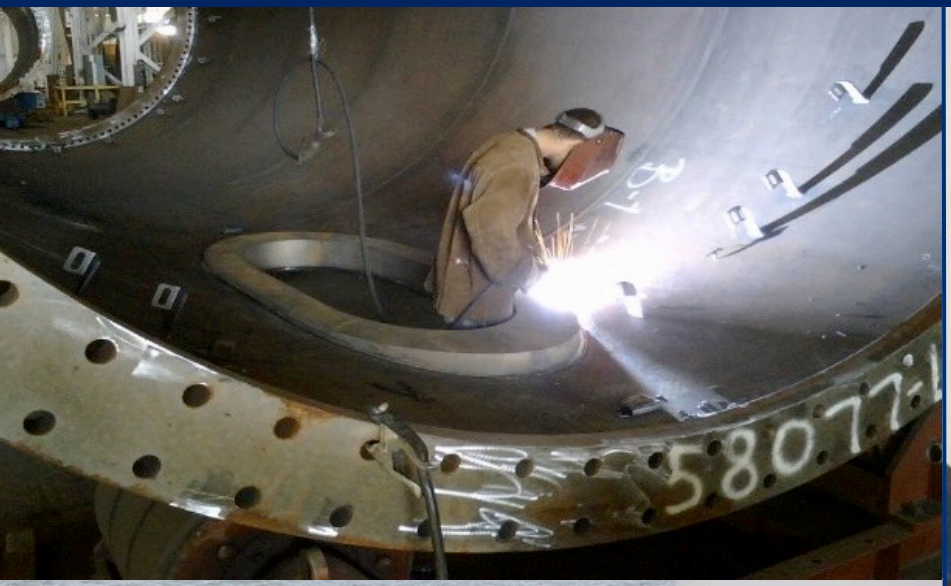
There are 42 NSF ATE Centers in the U.S., and SMART is **the only ATE Center with a maritime focus**

SMART brings together curriculum developers and maritime employers to ensure that credentials are ***relevant***, ***portable***, *and* ***stackable*** *(**RPS**)*

www.maritime-technology.org



Delivery of U.S. Offshore Wind Projects must Safely Engage All SMART Core Industry Sectors

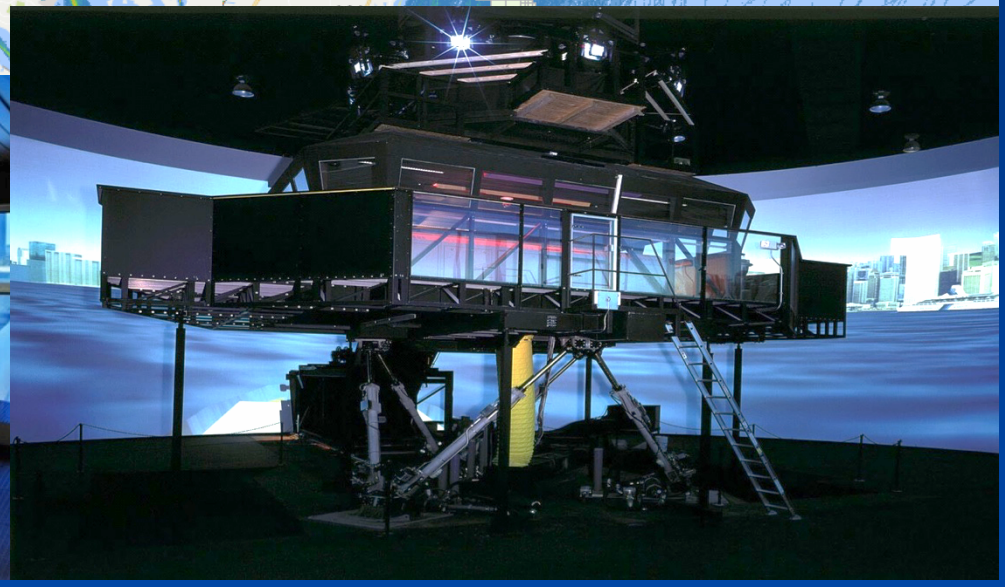


VESSEL OPERATIONS:
Just-in-time component delivery

SHIPBUILDING & SHIP REPAIR:
Steel fabrication quality control – components from two completely different yards first meet offshore !!

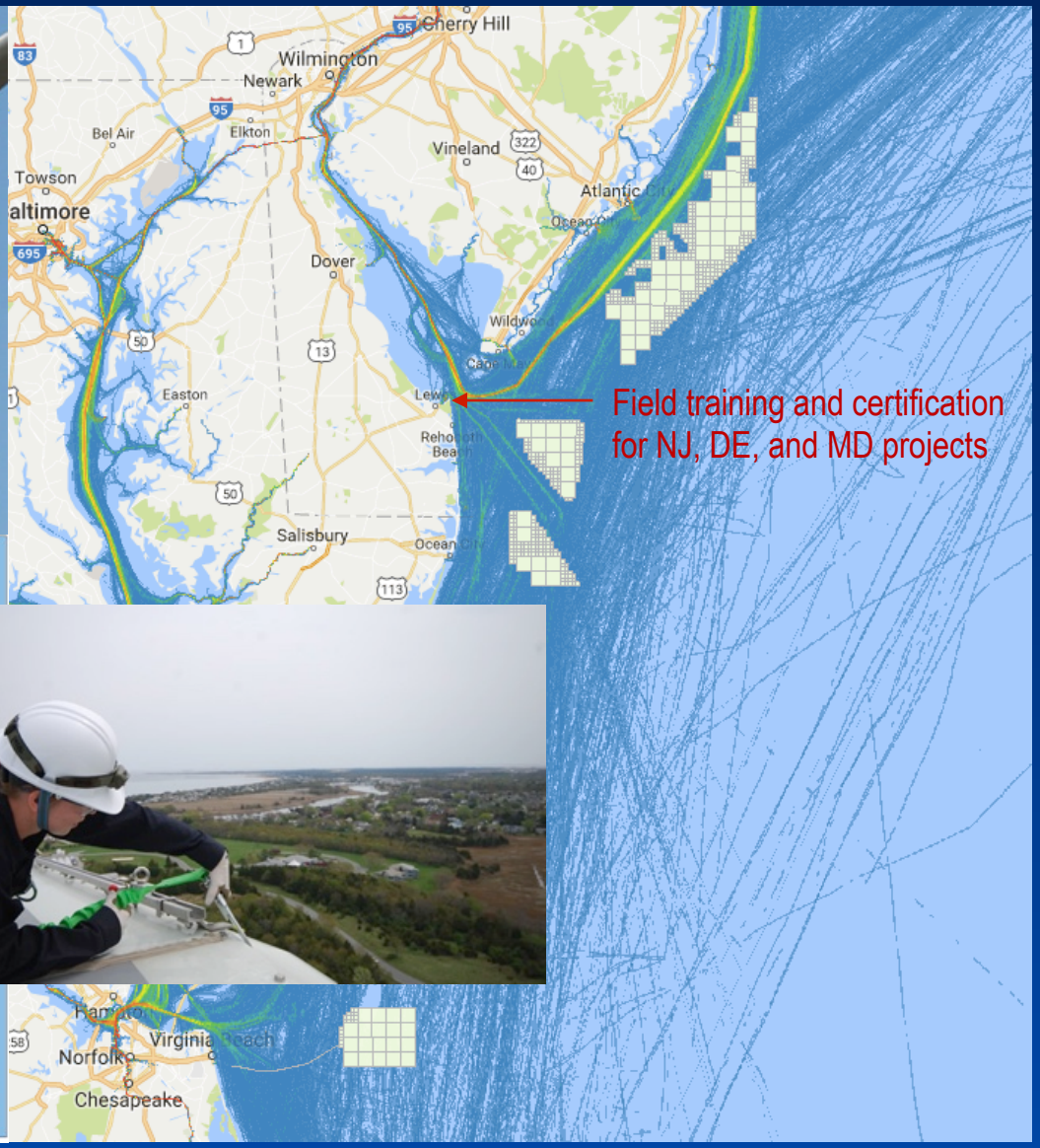
PORTS & LOGISTICS:
Staging a year's worth of manufacturing output for a summer's ocean installation

Leverage MM&P-Funded Training Campus in MD: Maritime Institute of Technology and Graduate Studies (MITAGS)



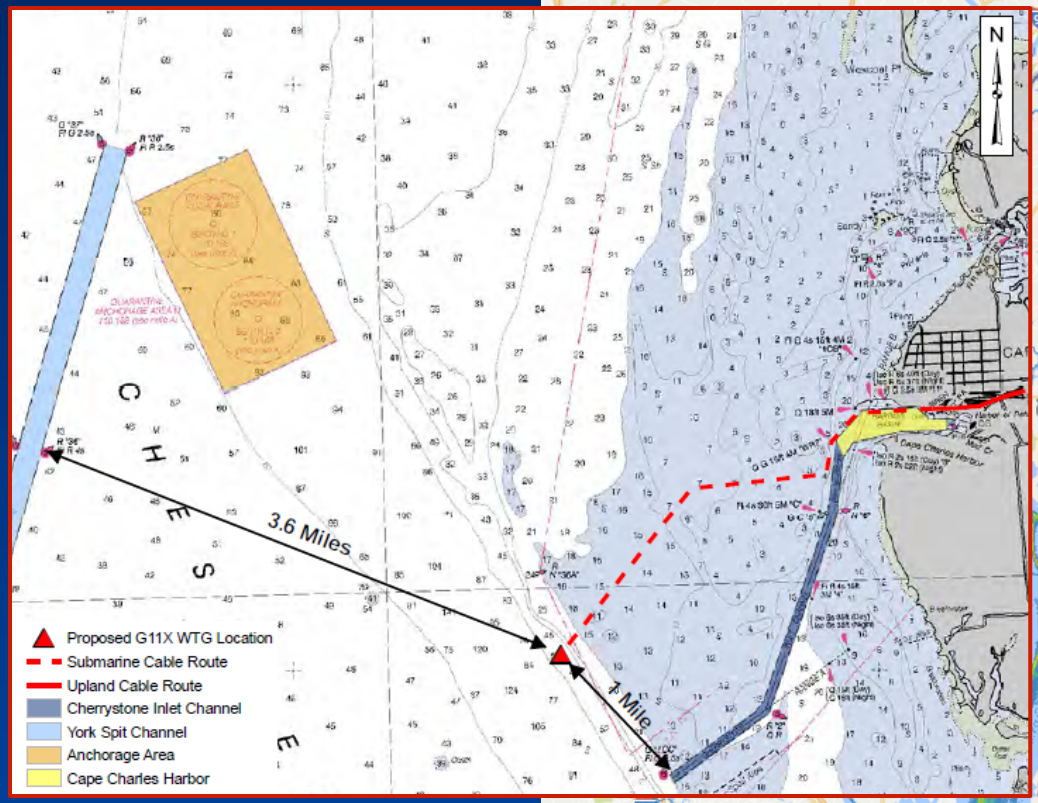
Leverage 2MW Shore-Based Turbine in DE:
UD College of Earth, Ocean, and Environment (CEOE)

www.ceoe.udel.edu/lewesturbine



Field training and certification for NJ, DE, and MD projects

Leverage 5MW Near-shore Permitting in VA: VMRC-permitted single-turbine site in Chesapeake Bay



www.govtech.com/technology/Wind-Turbine-Offshore-Virginia.html

Field training and certification for VA and Kitty Hawk, NC projects

Leverage DOE-Funded Safer Access Design from NJ: by Fishermen's Energy and Keystone Engineering

http://energy.gov/eere/articles/thanks-energy-department-funding-safer-access-offshore-wind-turbine-platforms

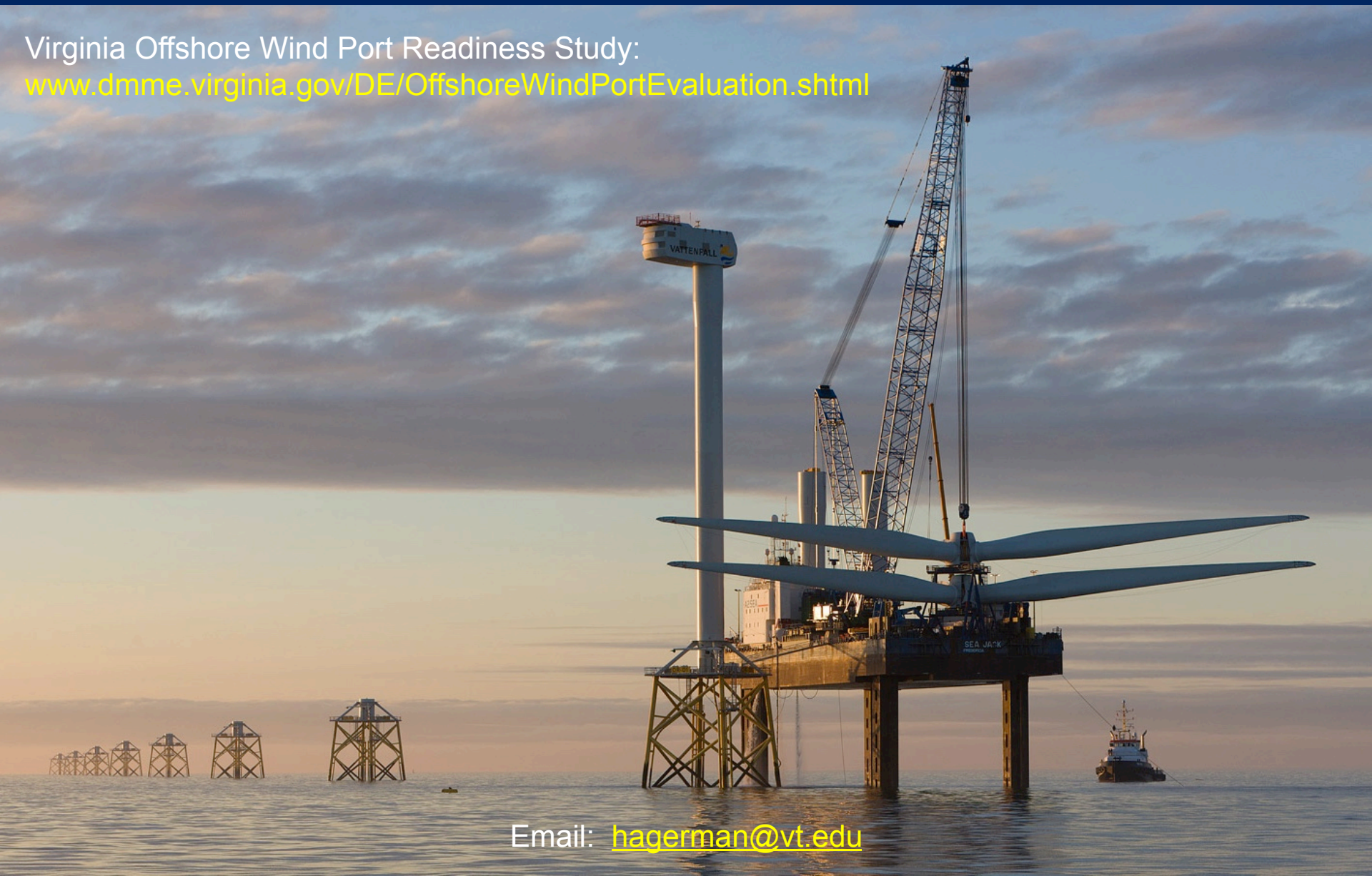
Test and train on safer access design from Fishermen's Energy project

Side step from ladder to bow of transfer vessel while facing to starboard side of vessel

Back step from ladder to bow of transfer vessel while looking backward over shoulder

Thank You!

Virginia Offshore Wind Port Readiness Study:
www.dmme.virginia.gov/DE/OffshoreWindPortEvaluation.shtml



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