Call for Information and Nominations: Discussion of Possible Virginia Call Area

Virginia Task Force Meeting
Bureau of Ocean Energy Management, Regulation and Enforcement

Old Dominion University Webb Center

Norfolk, VA

17 August 2011

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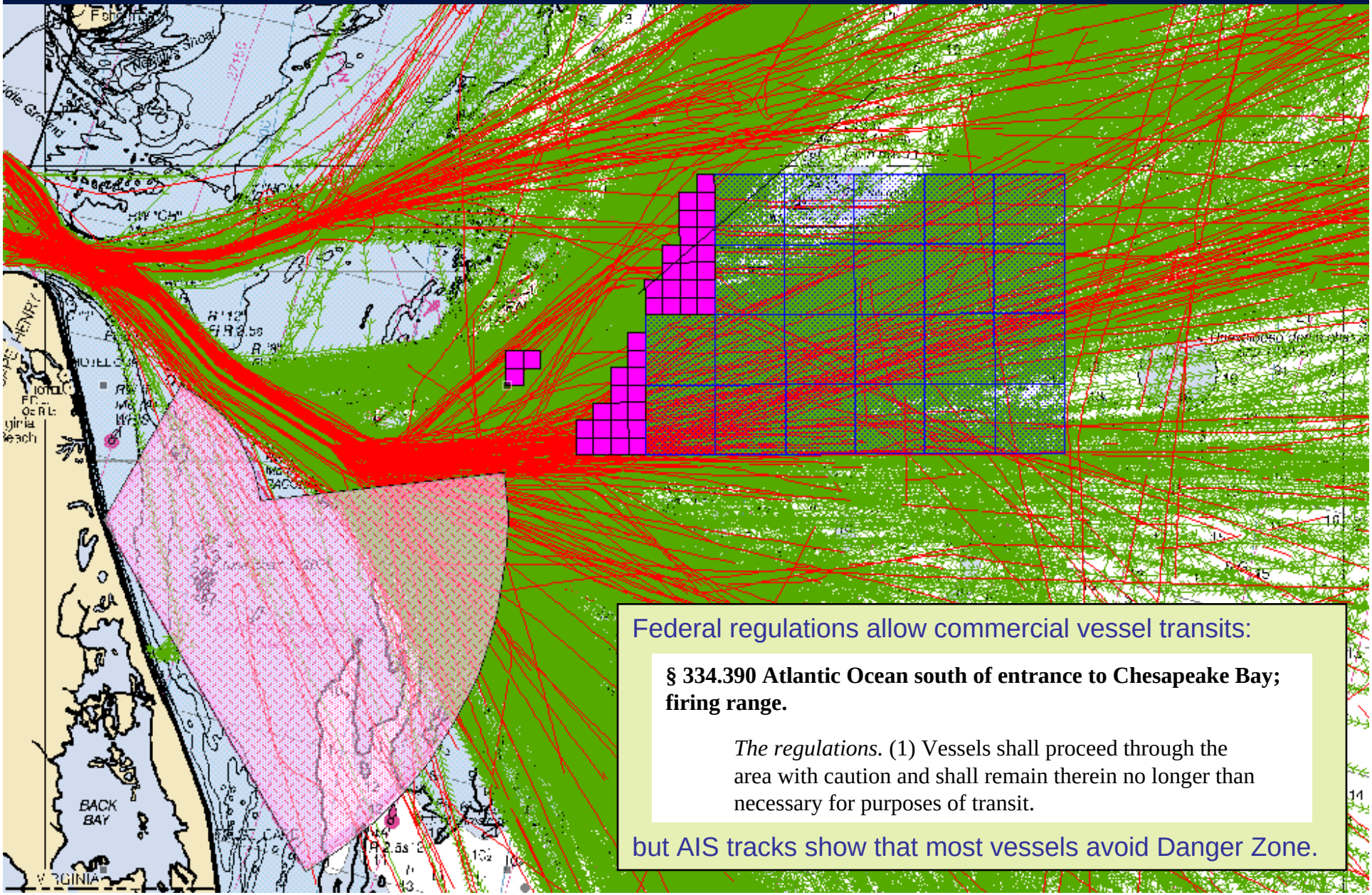
Recap of Commercial Navigation and Maritime Safety Concerns

Commercial shipping avoidance of Dam Neck Danger Zone sends traffic through proposed Virginia Wind Energy Area



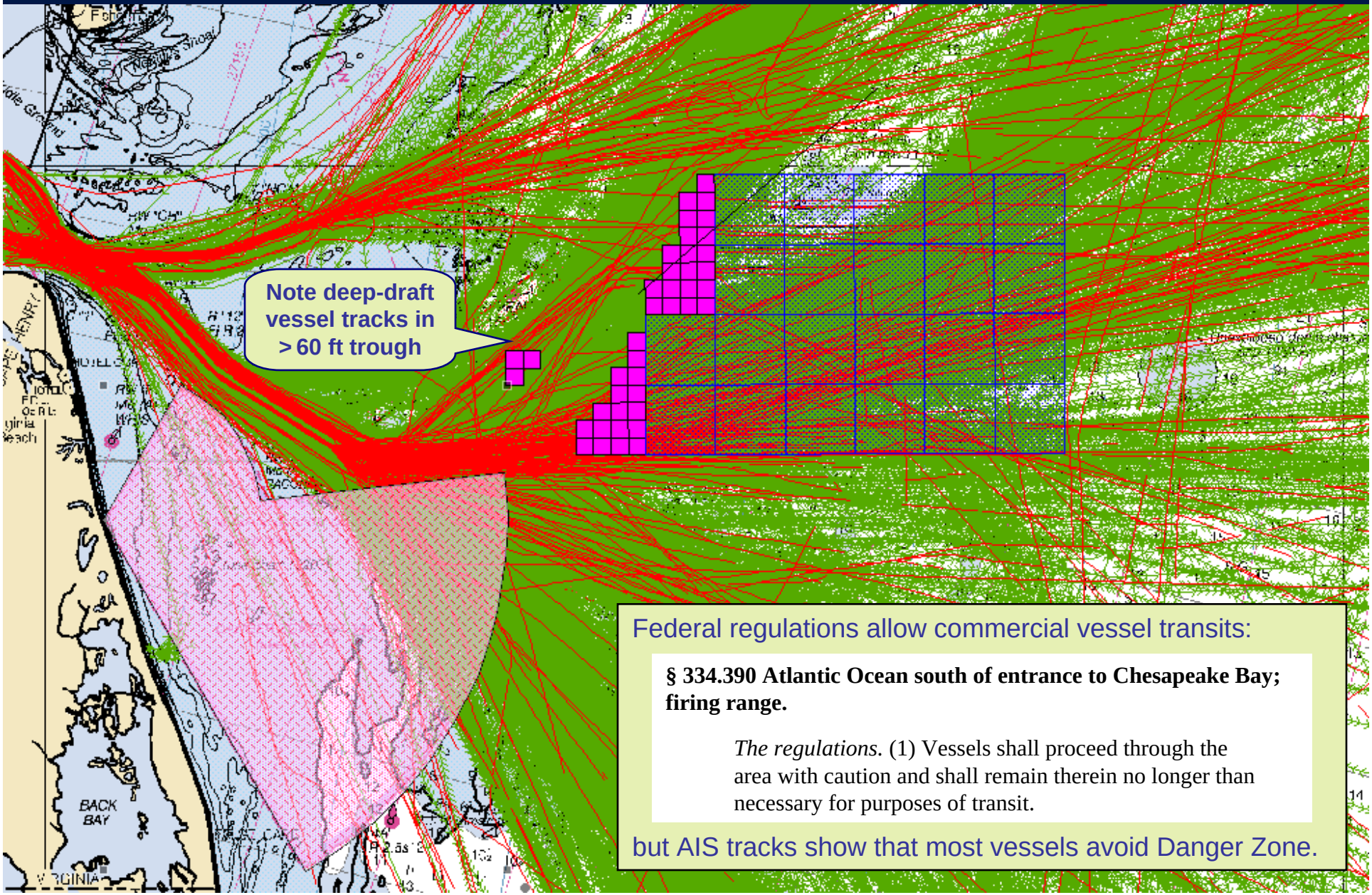
Federal regulations allow commercial vessel transits:

§ 334.390 Atlantic Ocean south of entrance to Chesapeake Bay; firing range.

The regulations. (1) Vessels shall proceed through the area with caution and shall remain therein no longer than necessary for purposes of transit.

but AIS tracks show that most vessels avoid Danger Zone.

Commercial shipping avoidance of Dam Neck Danger Zone sends traffic through proposed Virginia Wind Energy Area



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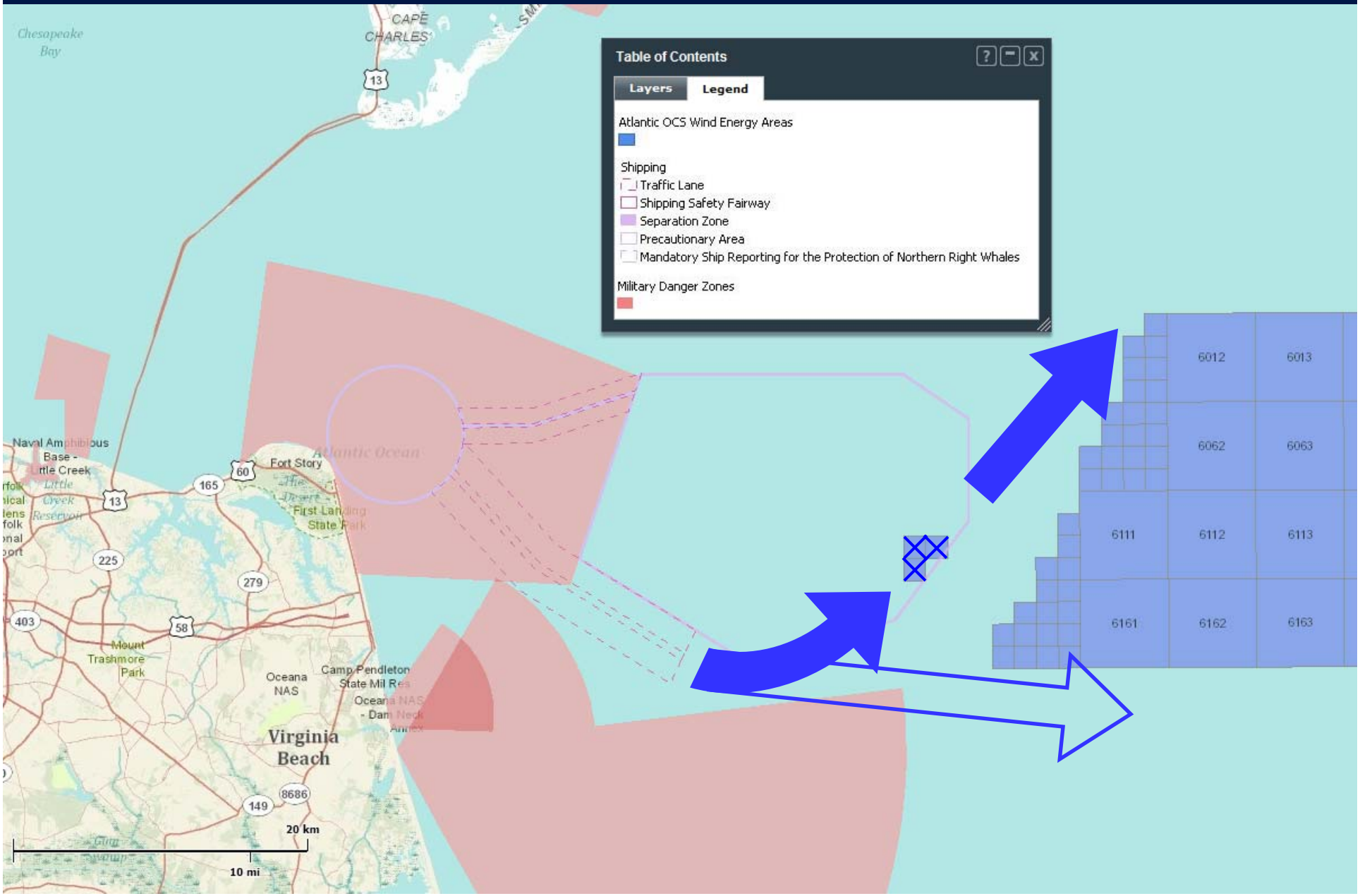
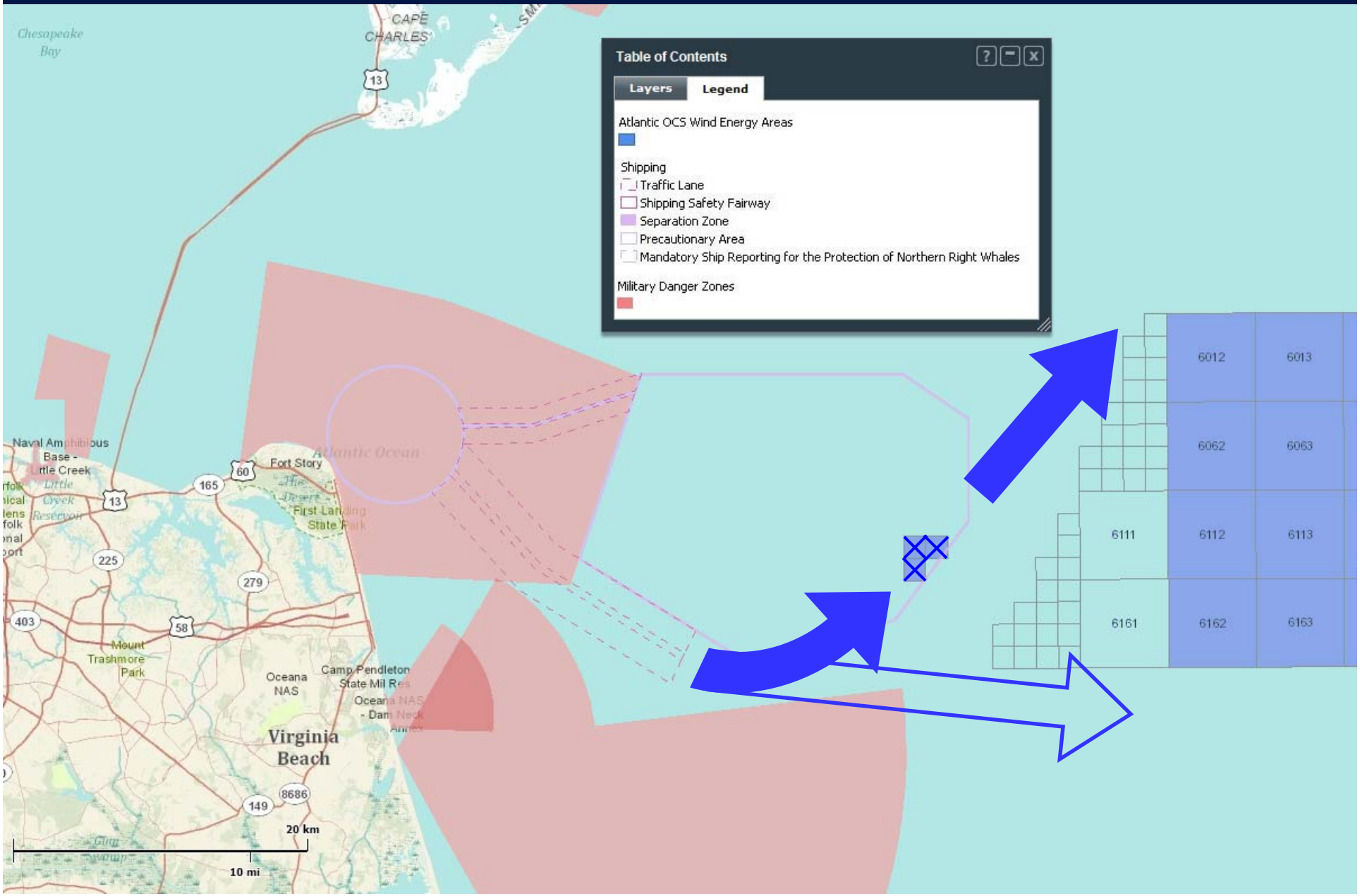
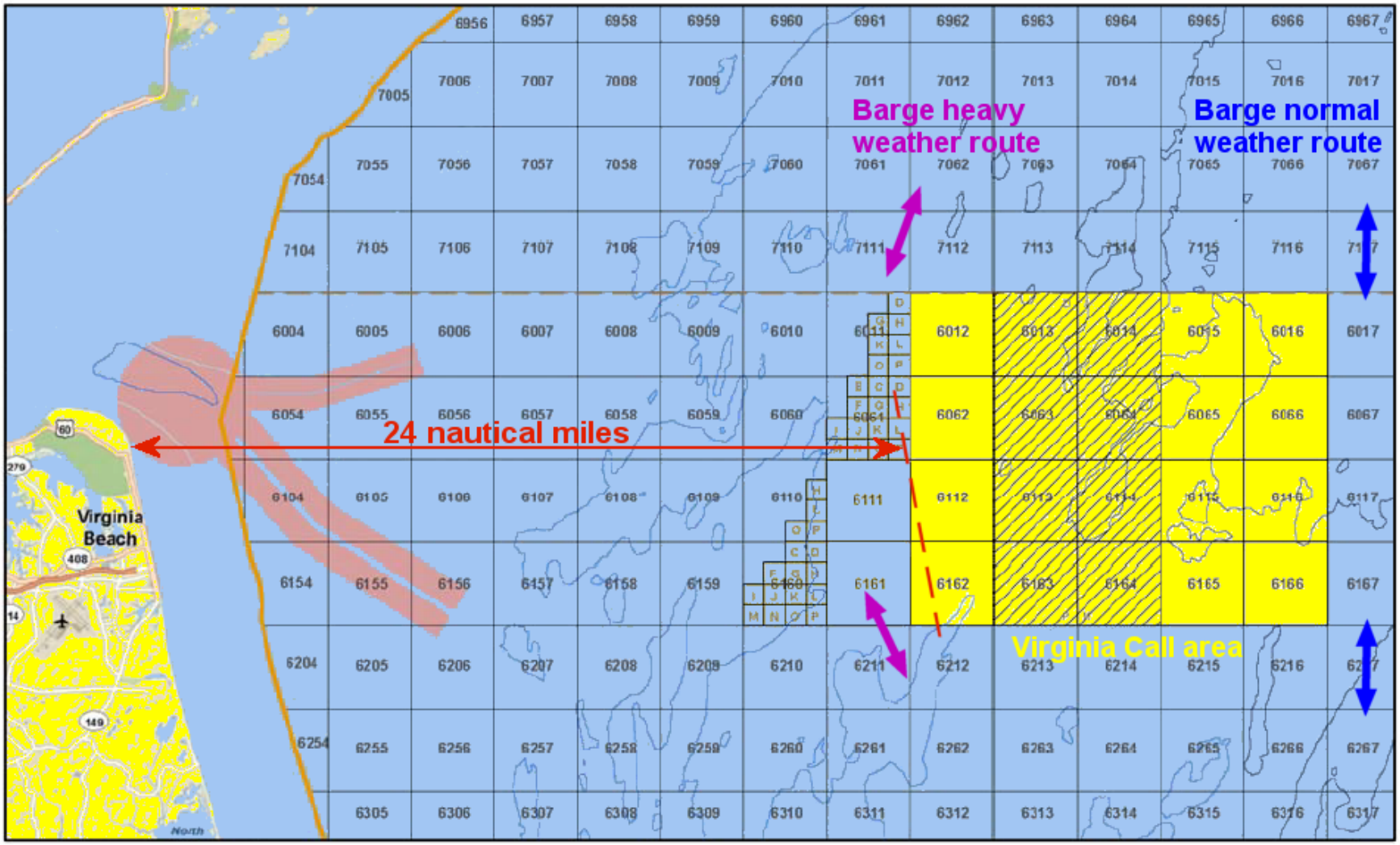
Existing Deep-Water Routes and Virginia Wind Energy Area (WEA) Alternative A



Existing Deep-Water Routes and Possible Virginia WEA to be Discussed Today

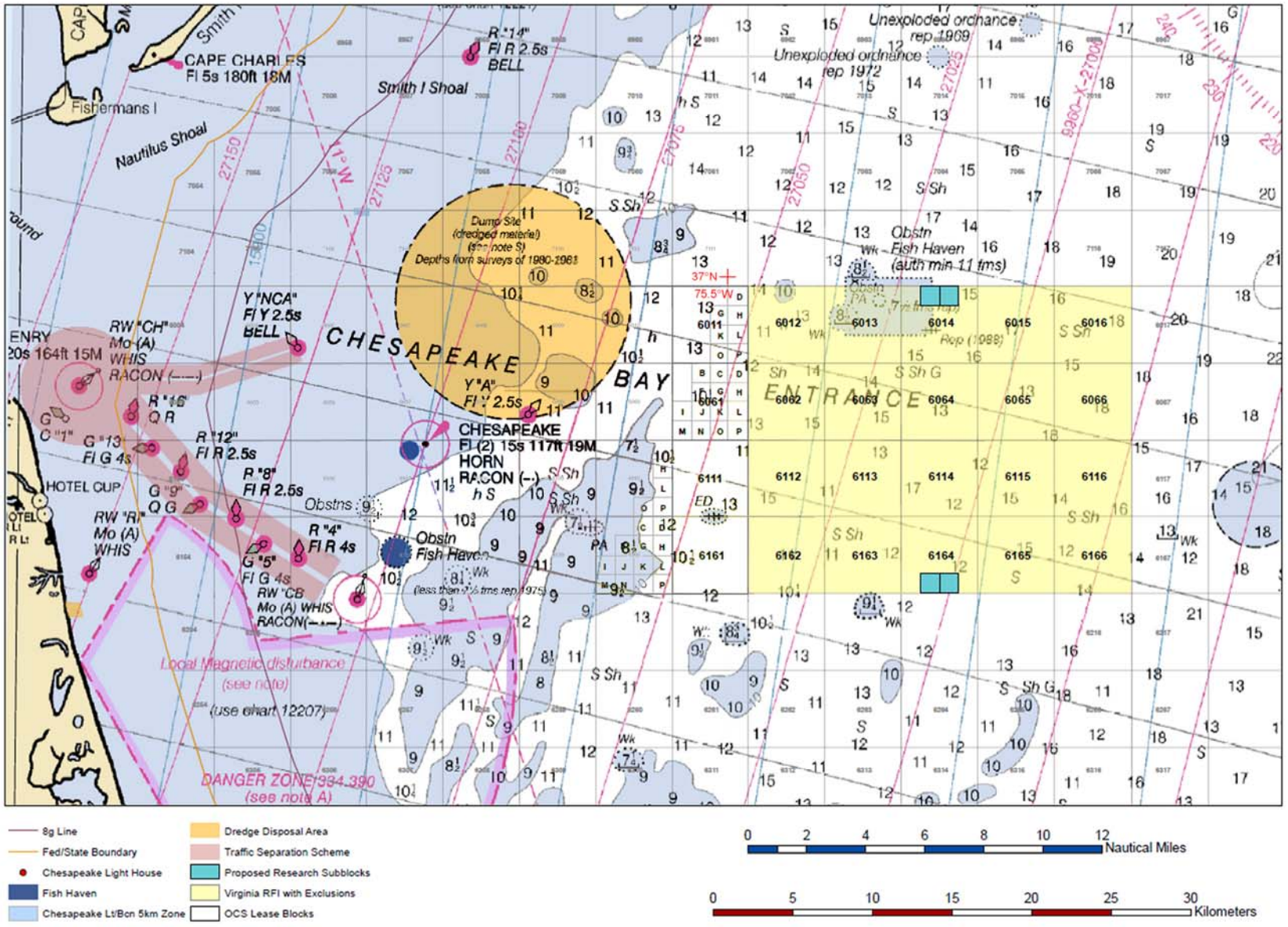


Existing Coastwise Barge Routes and Possible Virginia WEA to be Discussed Today



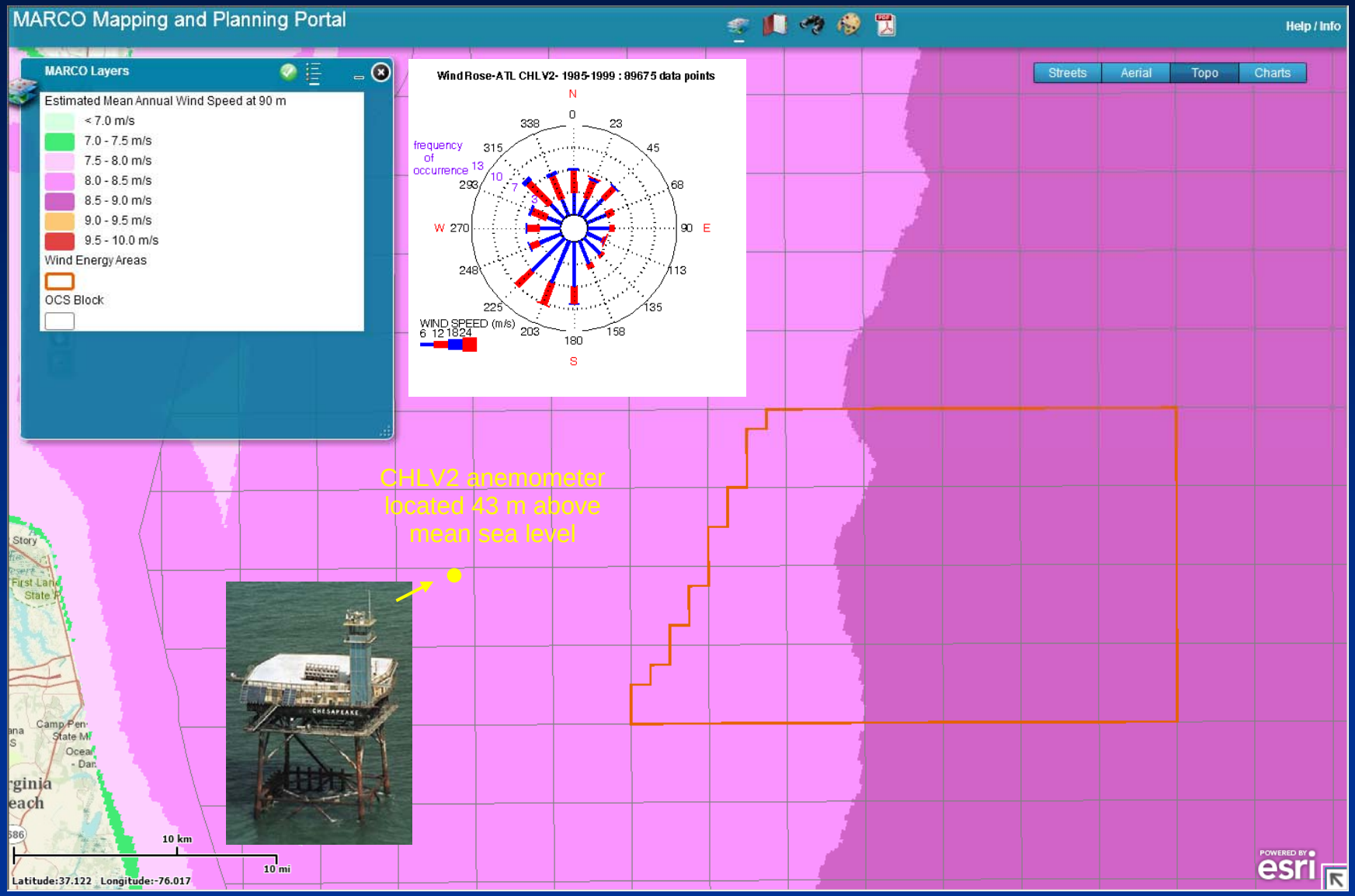
Nautical Chart View (Mariner's View) of Possible Virginia WEA to be Discussed Today

Possible Virginia Wind Energy Area, 17-Aug-2011

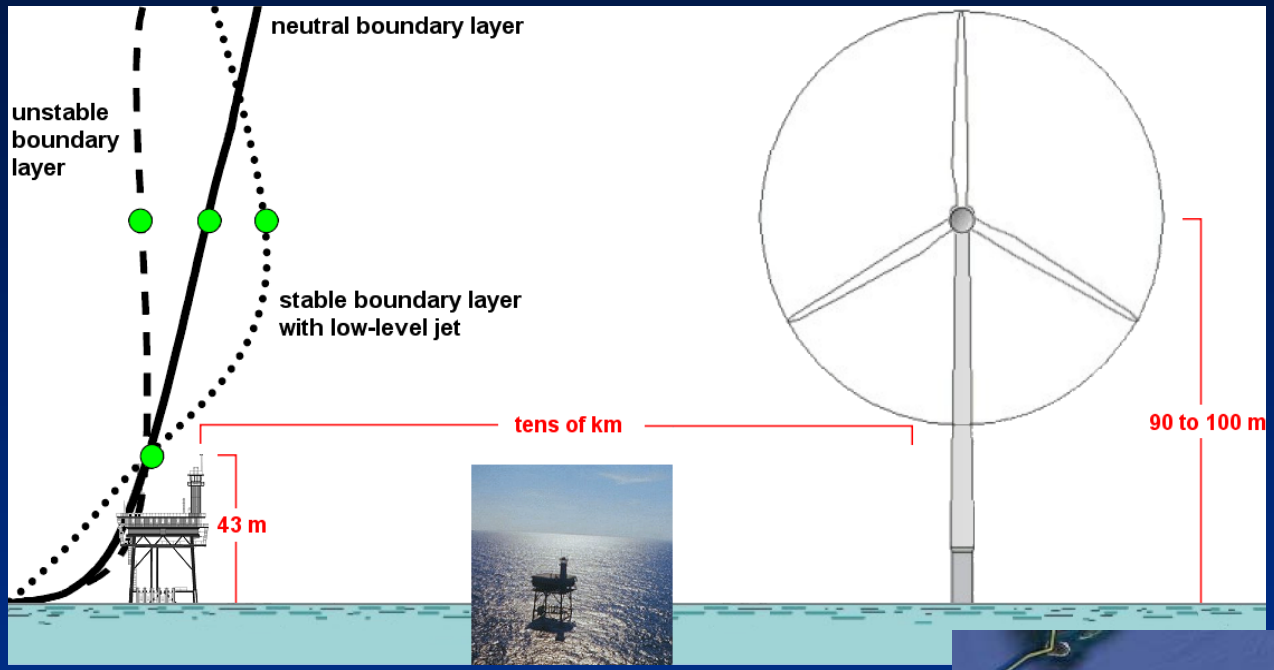


Significance of Research Lease Sub-Blocks for Early Metocean and Environmental Data Acquisition

Greatest Downside Risk is Lack of High-Fidelity Wind Resource Characterization

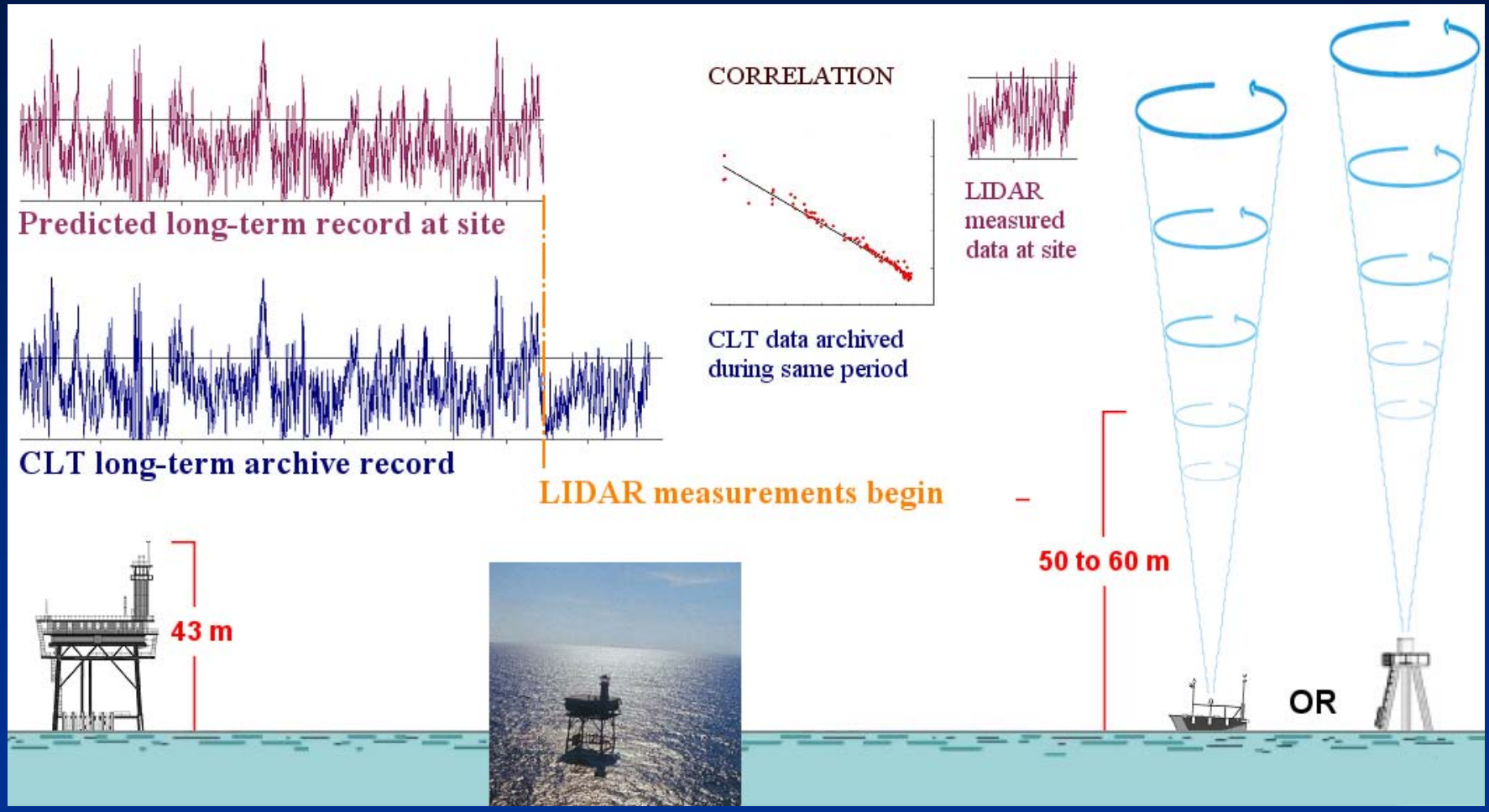


Existing Wind Measurement Stations are Inadequate to Secure Wind Project Financing



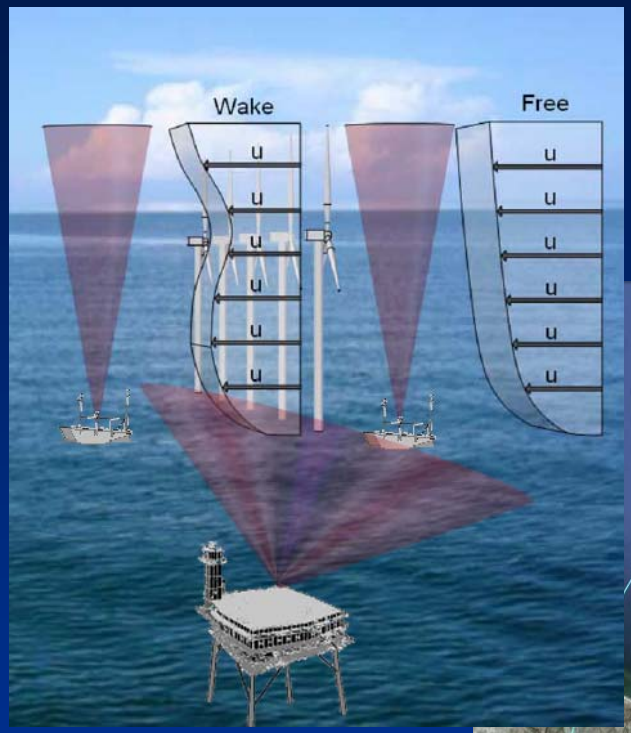
CHLV2 data can NOT be directly extrapolated to turbine hub heights in commercial lease area

Chesapeake Light Tower can be a Useful Long-Term Reference Station



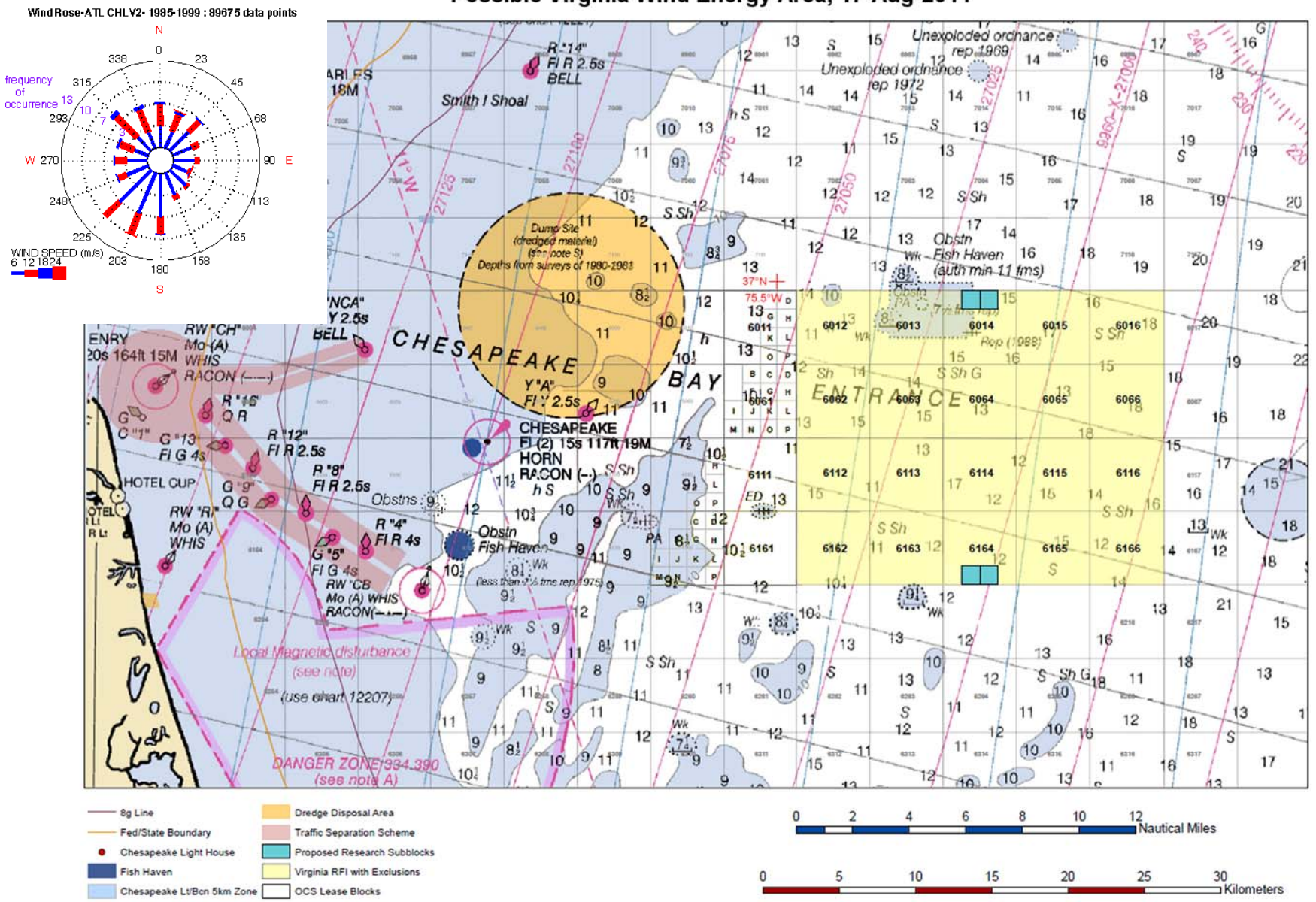
CHLV2 is the only Atlantic Coast offshore fixed anemometer that can be used as a long-term reference station to measure-correlate-predict annual energy production.

CLT also can Serve as a Reference Station for New Technology Validation and Qualification



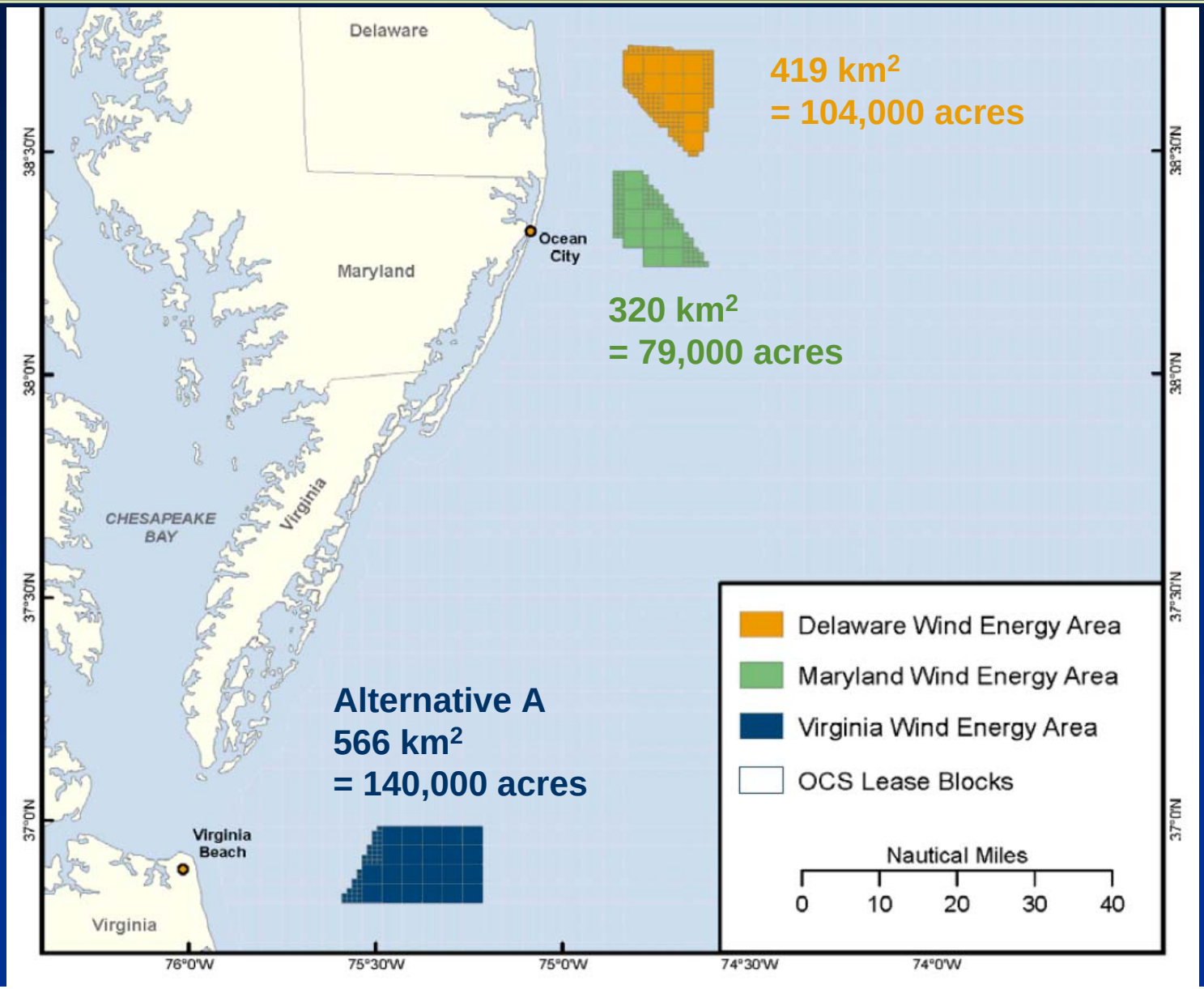
New multi-level anemometer mast on Chesapeake Light Tower can be used to validate buoy-based vertical LIDAR wind shear profiling and to validate volume-scanning LIDAR mapping of 3-D wind field

Virginia DMME Proposed Research Lease
Sub-Blocks for Metocean and Environmental Data Towers



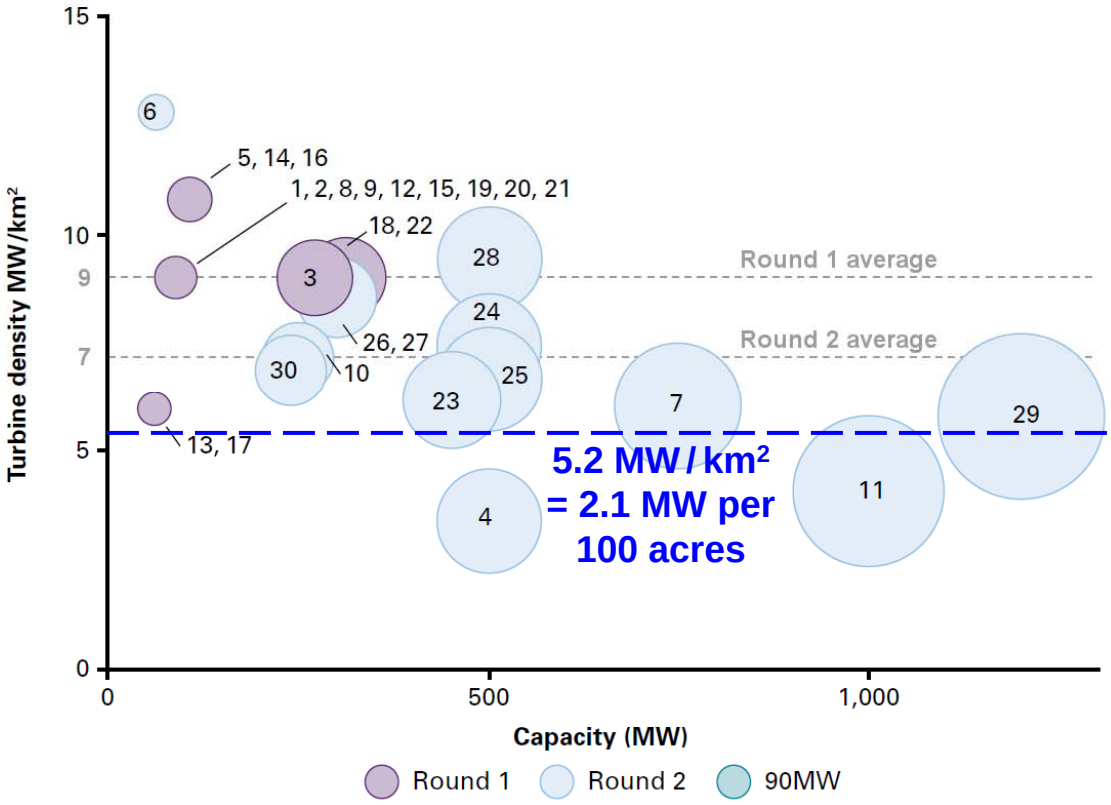
Offshore Wind Development Potential of Virginia Wind Energy Area Alternatives

Draft EA Offshore Wind Energy Areas



Assume 20 x 6 MW Turbines w/ 150m Rotor per Full Lease Block = 120 MW / (4.8 km)^2 = 5.2 MW / km^2

Chart 2e *Average turbine density and capacity of constructed and planned UK offshore wind farm developments*

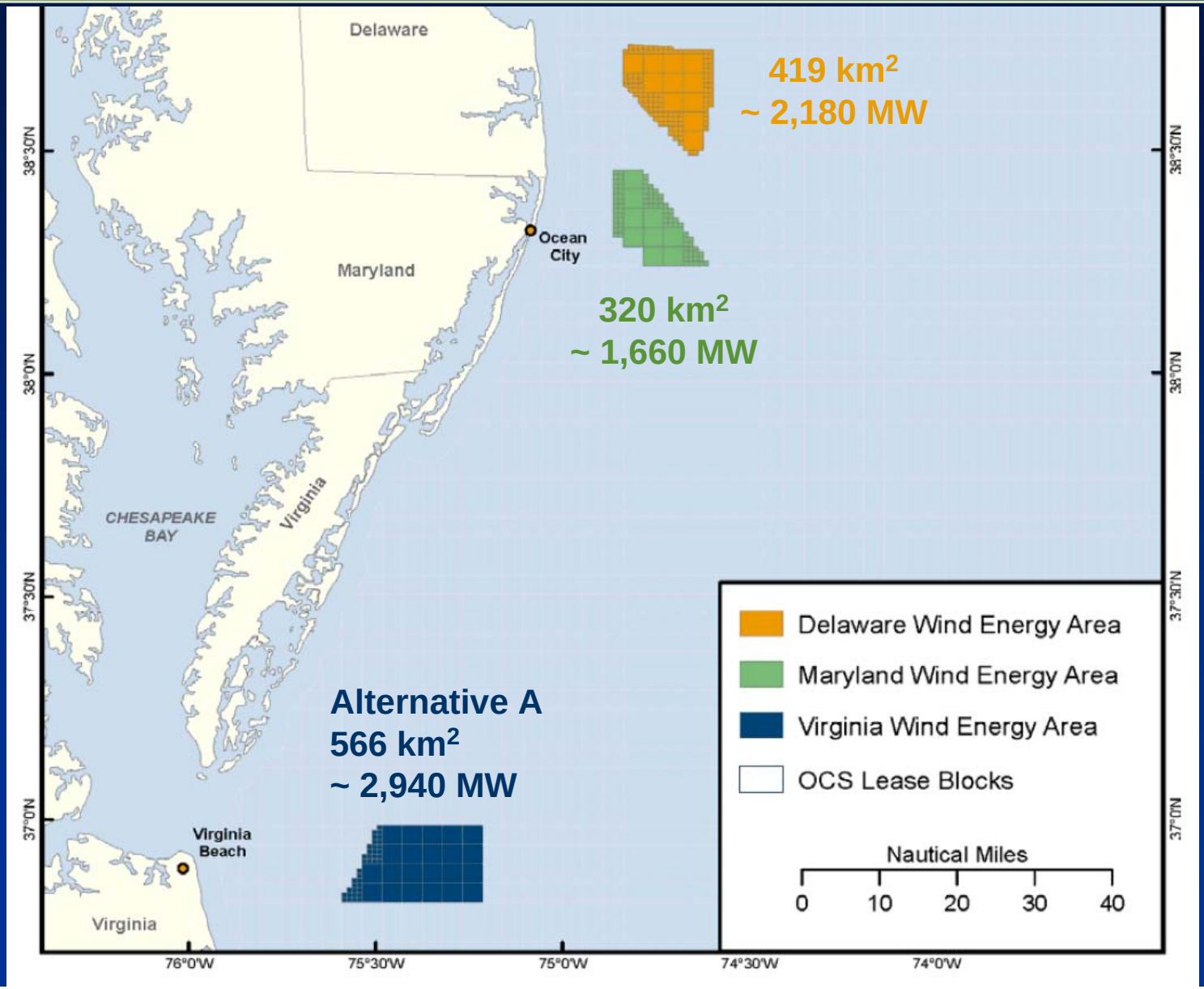


1 Barrow
2 Burbo Bank
3 Cirrus Array (Shell Flats)
4 Greater Gabbard
5 Gunfleet Sands I
6 Gunfleet Sands II
7 Gwent y Mor
8 Inner Dowsing
9 Kentish Flats
10 Lincs
11 London Array
12 Lynn
13 North Hoyle
14 Ormonde
15 Rhyl Flats
16 Scarweather Sands
17 Scroby Sands
18 Sheringham Shoal/SCIR
19 Solway Firth/Robin Rigg A
20 Solway Firth/Robin Rigg B
21 Teeside/Redcar
22 Thanet
23 Walney
24 West of Duddon Sands
25 Docking Shoal
26 Dudgeon East
27 Humber Gateway
28 Race Bank
29 Triton Knoll
30 Westernmost Rough

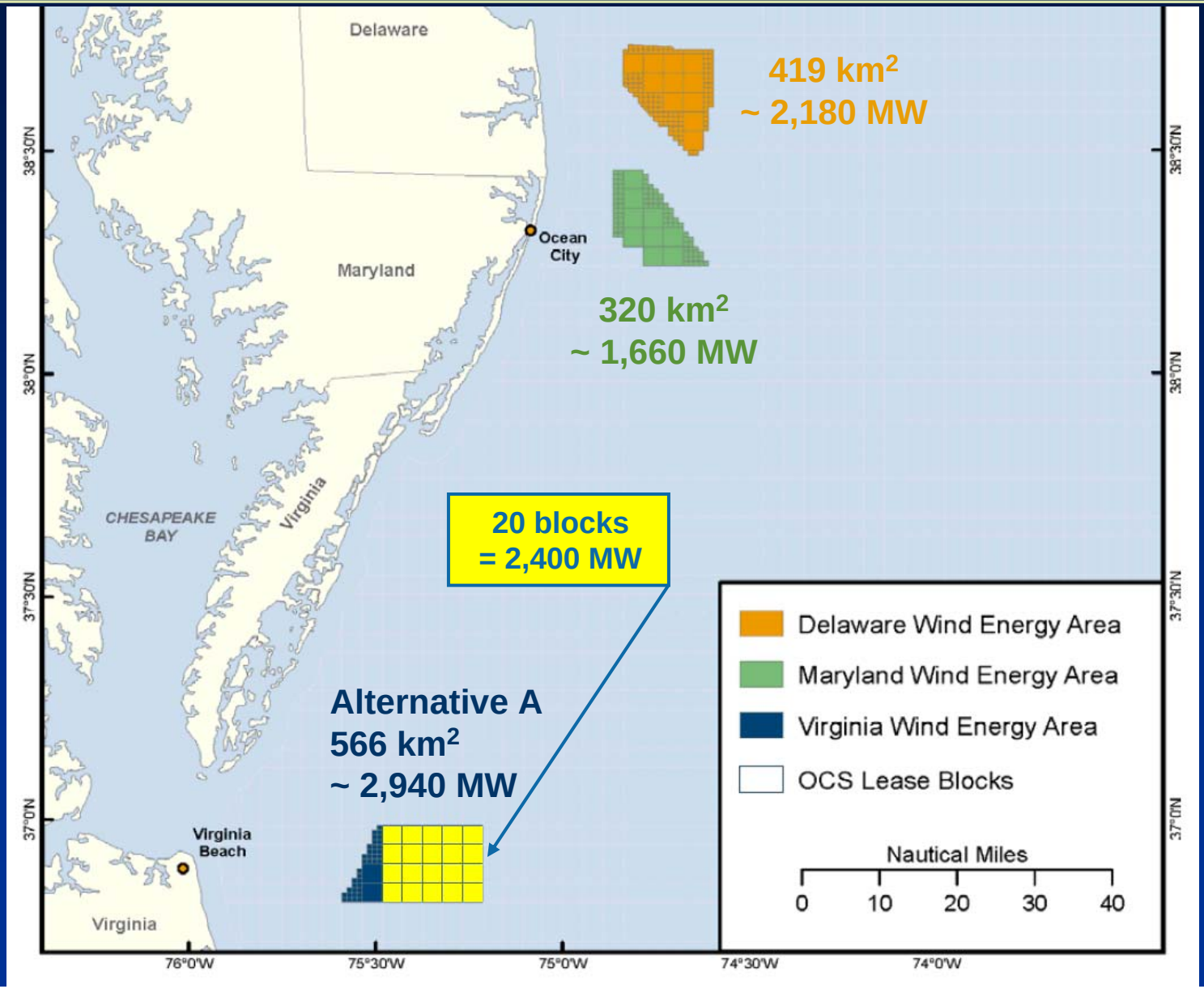
Note: Excludes very small offshore sites (Beatrice, Blyth) and abandoned applications (Cromer)
Source: BWEA, Crown Estate, BCG analysis

Source: www.carbontrust.co.uk/publications/pages/publicationdetail.aspx?id=CTC743

Potential Installed Capacity in Virginia Wind Energy Area Alternative A



Potential Installed Capacity in Possible Call Area to be Discussed Today



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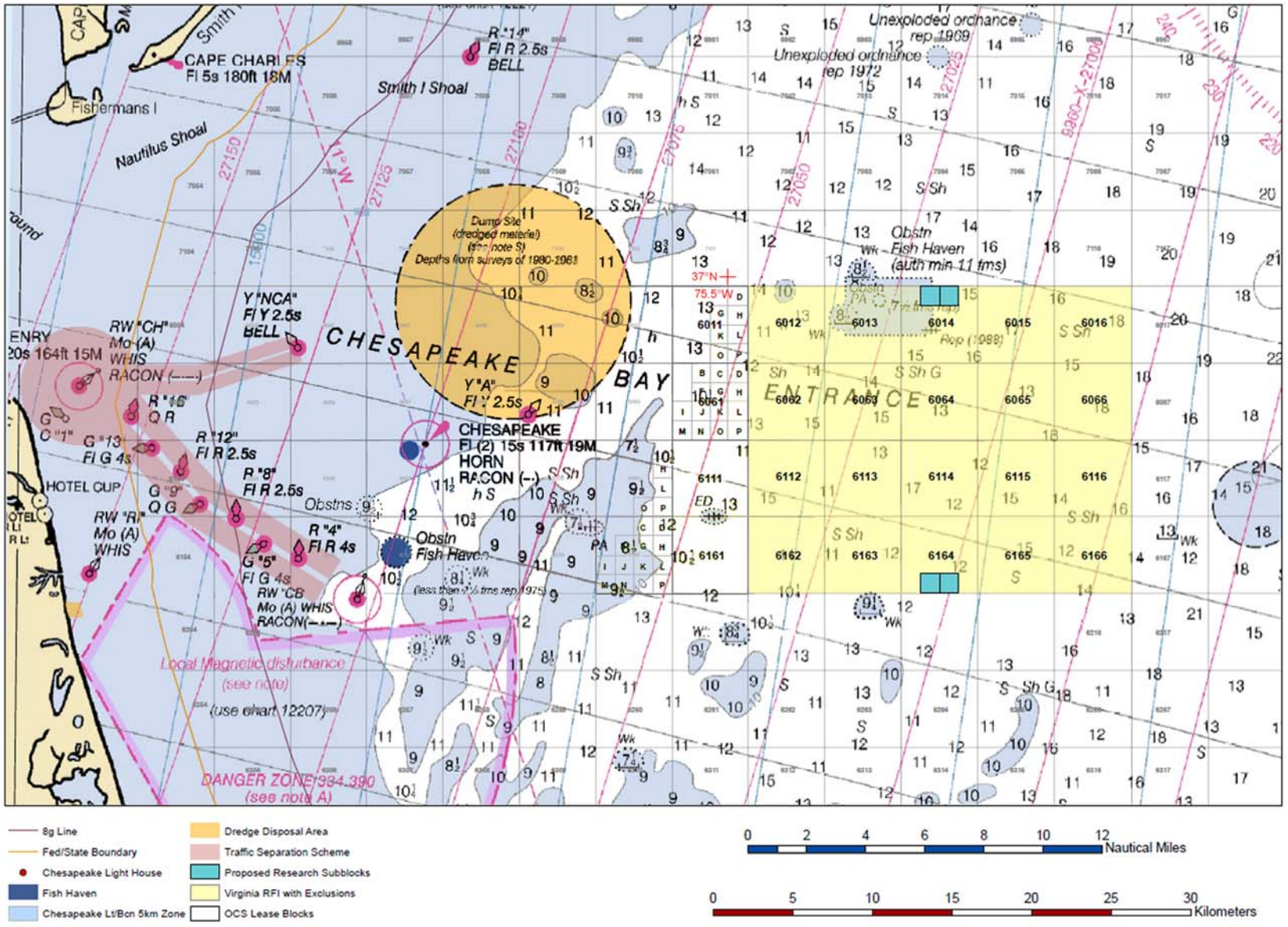
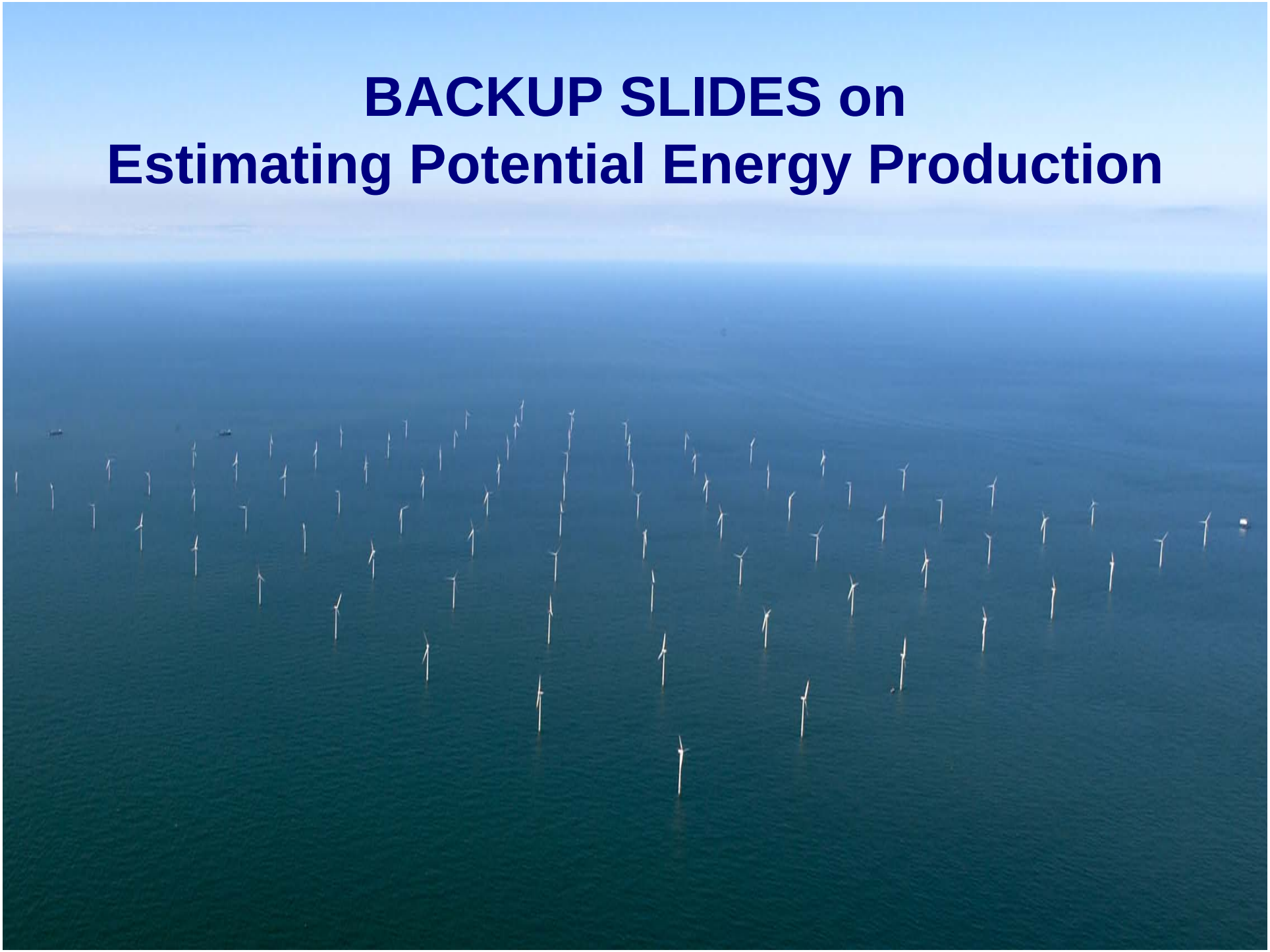
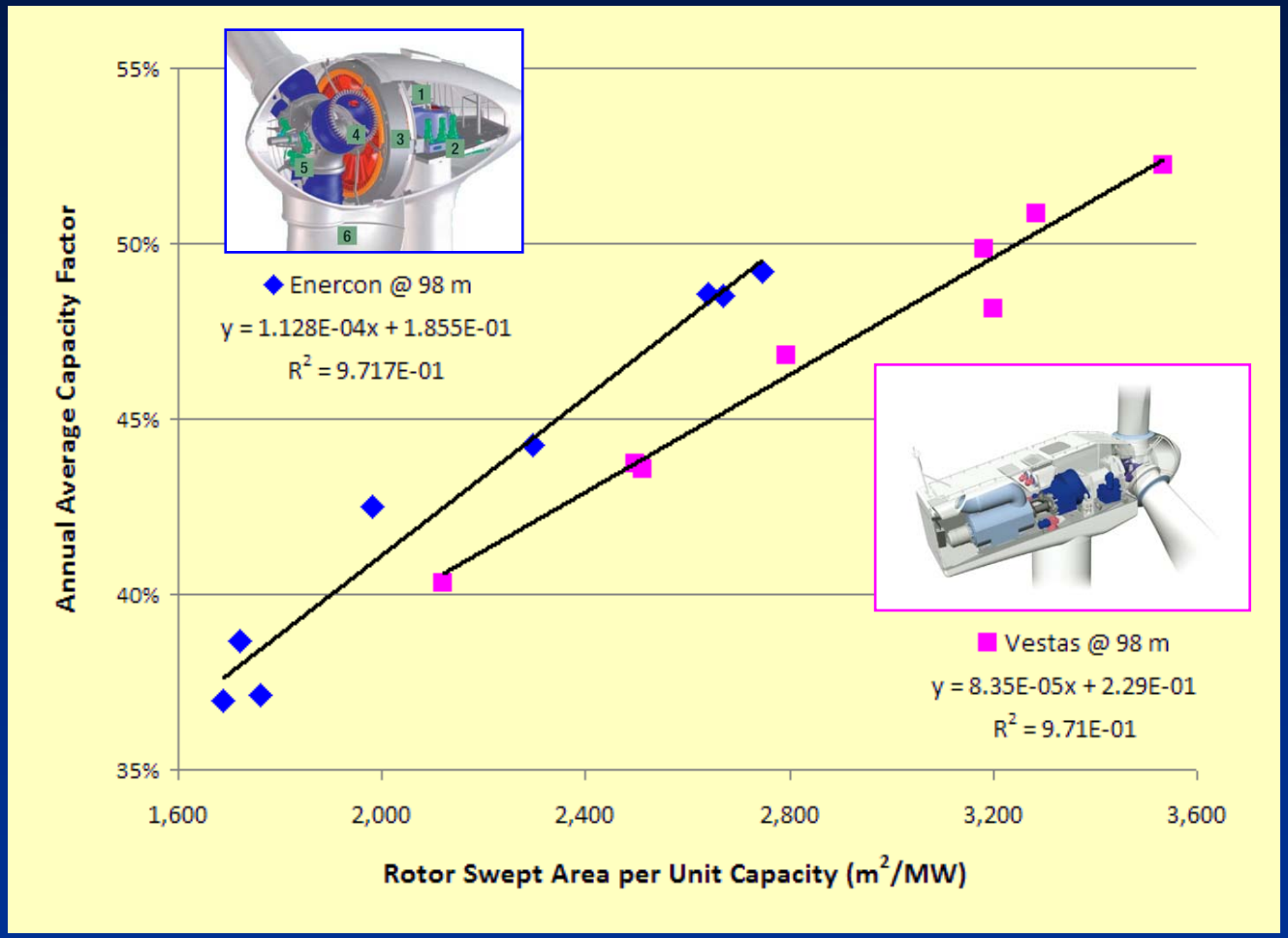


BACKUP SLIDES on
Estimating Potential Energy Production



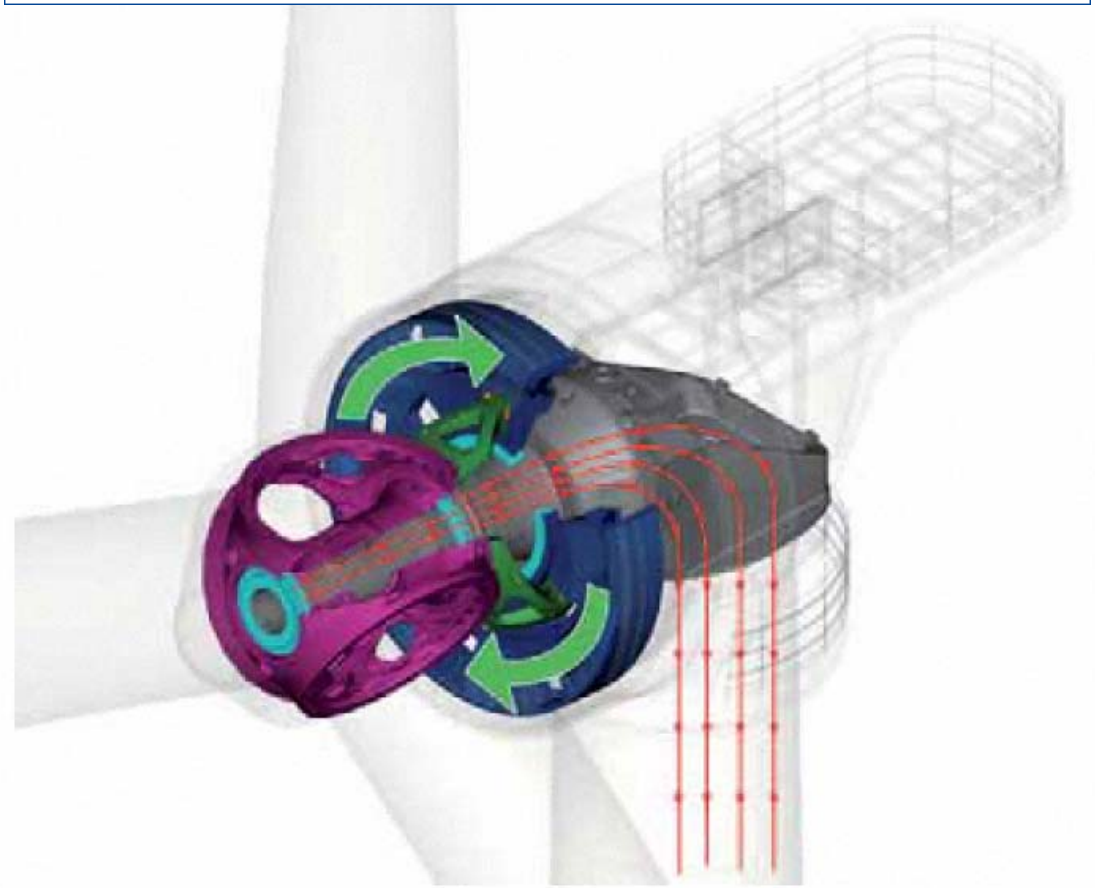
VCERC Analysis of Turbine Productivity Among Enercon Direct-Drive Fleet and Vestas Geared Fleet



Turbine annual energy production can be increased by using direct-drive permanent-magnet generators and by reducing generator rated capacity for given rotor diameter.

ALSTOM 6 MW Offshore Wind Turbine

Prototype phase: 2011/2012 Pre-series: 2013 Serial production: 2014



Two solid bearings transmit main bending loads safely to the tower (red arrows) while an elastic coupling ensures the generator rotor receives only pure torque (green arrows).

The turbine features an innovative electro-mechanical layout combining Alstom's unique and proven rotor support technology with a direct drive permanent magnet generator, providing outstanding reliability of the turbine's drive train.

The ALSTOM PURE TORQUE™ design protects the generator and improves its performance by diverting unwanted stresses from the wind safely to the turbine's tower through the main frame.

The design separates the turbine rotor and generator to ensure that only turning force – torque – is transferred to the generator. This allows the minimum sufficient air gap to be maintained between the generator rotor and stator at all times, offering the highest electrical efficiency.

ALSTOM Offshore Turbine, if Similar Performance to Enercon Fleet, Could Exceed 50% Annual CF