



Learning from the Experts Webinar Series

# Port Development Considerations for Offshore Wind



**Brent D. Cooper, P.E.**  
Project Manager  
COWI

January 12, 2022

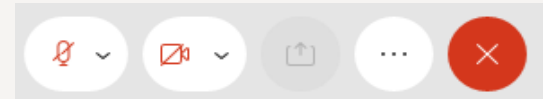
**COWI**


# Meeting Procedures

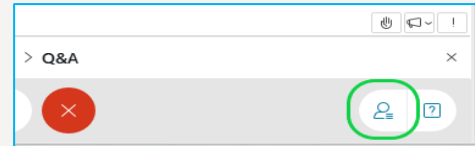
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# Learning from the Experts

**This webinar series is hosted by NYSERDA's offshore wind team and features experts in offshore wind technologies, development practices, and related research.**

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# Port Considerations for Offshore Wind





# Outline

- > Introductions
- > Introduction to OSW Ports
- > Typical Facility Specifications
- > New York State OSW Port Activities and Support
- > U.S. OSW Port Activities
- > Federal Incentives
- > Conclusions and Takeaways



# Introductions



## **Brent D. Cooper, P.E.**


- > Project Manager
- > 14 years experience with coastal / waterfront / offshore engineering



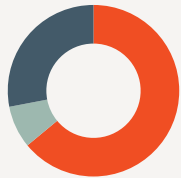
# COWI North America by the numbers

## FACTS & FIGURES:

 **250** EMPLOYEES

 **9** OFFICES

 ENGINEERS **BY PRACTICE**



■ 64% BRIDGE  
■ 8% TUNNEL  
■ 28% ENERGY & MARINE



# Services for Offshore Wind Energy Projects

## PROJECT DEVELOPMENT PHASE



- > Project development
- > Environmental impact assessments
  - > Feasibility studies
    - > Wind modelling, siting and energy production
    - > Port Facility Identification
      - > Met-ocean studies
      - > Geotech survey support
      - > Design and engineering of foundations and offshore substation(s)
      - > Design and engineering port facility improvements
      - > Package management (offshore substation, WTGs, foundations, array cables, export cables, grid connection)
        - > Procurement and tendering
          - > Construction management and support
          - > Optimization of wind farm performance





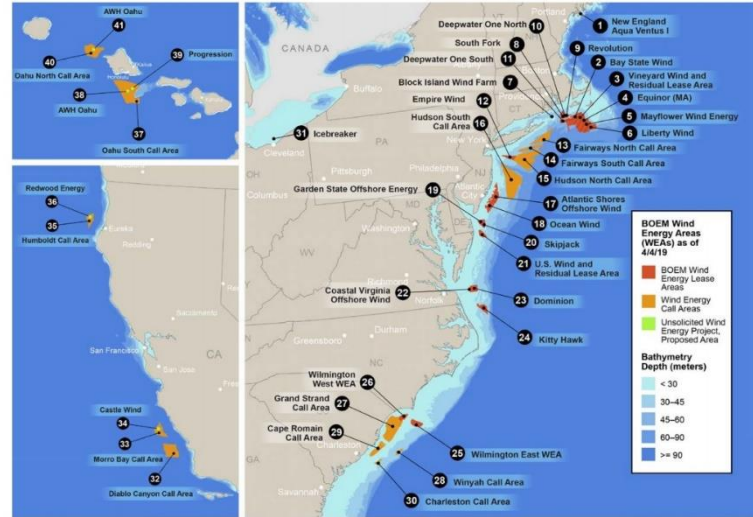
# Introduction to OSW Ports



# The Role of Ports within Offshore Wind



## U.S. Offshore Wind Development Activity



# “Traditional” Ports vs Offshore Wind Ports

## Typical Characteristics

Characteristic	“Traditional” Port	Offshore Wind Staging Port
Cargo	Container, Liquid, Bulk, Breakbulk, Passenger	Foundations, Towers, Nacelles, Blades, Cables
Location	As far inland as possible (near population centers)	As close to the offshore project site as possible
Water Depth	>50 ft.	>30 ft.
Air Draft	>180-215 ft.	Unlimited
Berth Length	1300 ft. (18,000 TEU)	600 ft. (WTIV)
Berth Access	Shared	Inbound: Shared Outbound: Exclusive
Staging Area	250+ acres (container terminal)	40+ acres
Live Load Capacity at Berth	500 – 2000 PSF	4,000-6,000 PSF with locally stronger crane pads ( $\geq 10,000$ PSF)
Live Load Capacity Storage	500 – 1000 PSF	2,000 – 3,000 PSF

# Types of Offshore Wind Ports

- > Manufacturing / Fabrication
- > Staging
- > Operations and Maintenance





# Controlling Port Characteristics

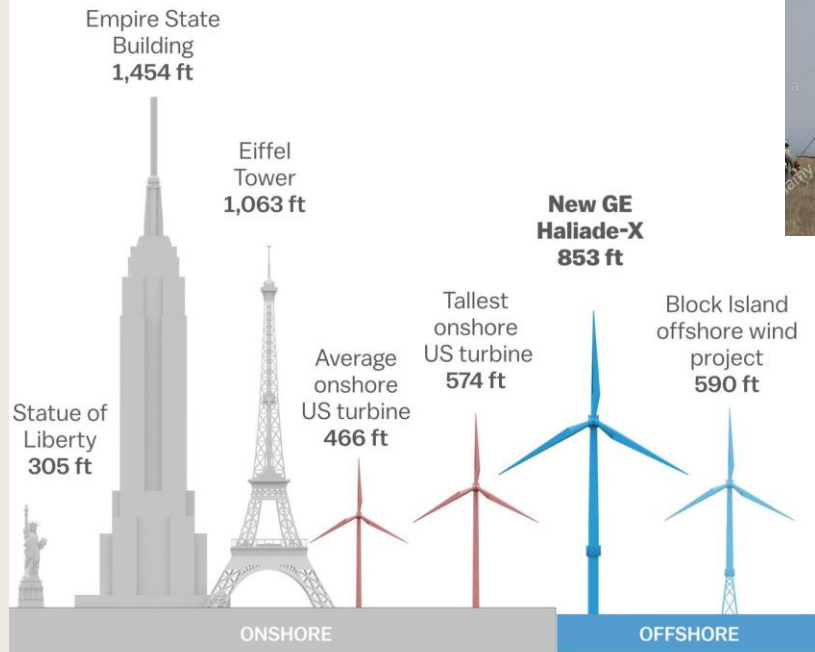
- Staging Area
- Dedicated Wharf Frontage
- Live Load Capacity
- Navigable Depth
- Air Draft
- Geographic Location
- Proximity to Project
- Access to / cost of labor
- Intermodal connectivity





# Manufacturing and Fabrication - Turbine

## How the Haliade-X compares



Source: GE, Vox research

**Vox**

# Manufacturing and Fabrication Ports

## Owner/Operators:

- > Component Suppliers
  - > Turbine OEM
  - > Foundation Fabricators
  - > OSS Fabricators
  - > Cable Manufacture



## Key Characteristics:

- > Assembly Area
- > Quay Load
- > Water Depth
- > Labor availability
- > Intermodal Connectivity



# Manufacturing and Fabrication - Foundation



## EEW Special Pipe Constructions

### New rolling machine

- **Capability:**
  - Diameter: up to 10 m
  - Wall thickness: 150 cm
  - Plate weight: up to 50 to
- In operation since June 2013





# Manufacturing and Fabrication Ports - Foundation



# Manufacturing and Fabrication – Electrical

- > Cables
  - > MVAC
  - > HVAC
  - > HVDC





# Manufacturing and Fabrication – Electrical

- > Offshore Substations
  - > Transformer Platform
  - > Converter Platform



# Staging Ports



## Owner/Operators:

- > Port Authorities
  - > Public or Private
- > OSW Project Developers
- > EPCI contractors



## Key Characteristics:

- > Staging Area
- > Quay Load
- > Air Draft
- > Quay Length / Exclusive Vessel Access



# Operations and Maintenance Ports

## Key Characteristics:

- > Proximity to project
- > Open and covered staging area
- > Office Space
- > Housing for Staff



## Owner/Operators:

- > OSW Project Developers
- > Service Providers
- > Turbine OEMs



# Typical Facility Specifications





# What Specifications to use?

**TABLE 3. COMPOSITE OFFSHORE WIND INFRASTRUCTURE NEEDS FOR MASSACHUSETTS PORTS ENGINEERS ASSESSMENT OF THE OFFSHORE WIND PORT INFRASTRUCTURE NEEDS**

Attribute	Mooring Foundations				Jacket Foundations				Gravitational Foundations				Tower Sections				Blades				
	Minimum		Preferred		Minimum		Preferred		Minimum		Preferred		Minimum		Preferred		Minimum		Preferred		
	USCO	Metric	USCO	Metric	USCO	Metric	USCO	Metric	USCO	Metric	USCO	Metric	USCO	Metric	USCO	Metric	USCO	Metric	USCO	Metric	
Total Site Area (acres / hectares)	20	12	50	20	50	20	100	40	25	10	20	12	50	20	12	50	20	25	14	75	20
Capacity Length (feet / meters)	200	100	200	200	100	100	1,200	360	60	400	122	200	60	400	122	200	60	200	100	100	200
Lead Bearing Pressure Size (psf / tons)	2,000	10	4,000	20	2,000	10	4,000	24	2,000	10	4,000	20	2,000	10	4,000	17	1,500	5	6,000	20	20
Lead Bearing Pressure Size (psf / tons)	1,500	7	4,000	20	2,000	10	4,000	24	2,000	10	4,000	20	1,500	7	4,000	10	300	2	3,000	10	10
Laydown Area (acres / hectares)	15	6	20	12	25	10	40	10	4	20	8	15	8	20	12	25	10	20	10	20	10
Outboard Storage Area (acres / hectares)	10	4	10	6	10	6	20	8	5	2	10	4	10	4	10	6	5	2	20	6	6

**Table 18. Turbine Manufacturing and Fabrication Facility Parameters**

	Upland Staging Area	Wharf Live Load Capacity	Air Draft	Navigable Channel Depth	Wharf Length*
Nacelle	10 hectares (25 acres)	20MT/m <sup>2</sup> (4,000 psf)	120m (400 ft.) <sup>a</sup> 15m (50 ft.) <sup>b</sup>	12m (38 ft.) <sup>a</sup> 4m (13 ft.) <sup>b</sup>	50m (165 ft.)
Tower	10 hectares (25 acres)	10MT/m <sup>2</sup> (2,000 psf) 5MT/m <sup>2</sup> (1,000 psf) <sup>b</sup>	120m (400 ft.) <sup>a</sup> 15m (50 ft.) <sup>b</sup>	12m (38 ft.) <sup>a</sup> 4m (13 ft.) <sup>b</sup>	50m (165 ft.)
Blade	10 hectares (25 acres)	10MT/m <sup>2</sup> (2,000 psf) 2MT/m <sup>2</sup> (500 psf) <sup>b</sup>	120m (400 ft.) <sup>a</sup> 15m (50 ft.) <sup>b</sup>	12m (38 ft.) <sup>a</sup> 4m (13 ft.) <sup>b</sup>	120m (400 ft.)

**Table 21. Staging and Installation Facility Parameters**

	Upland Staging Area	Wharf Live Load Capacity	Air Draft	Navigable Channel Depth	Wharf Length
Staging and Installation	10 hectares (25 acres)	20MT/m <sup>2</sup> (4,000 psf)	120m (400 ft.)	12m (38 ft.) <sup>a</sup> 4m (13 ft.) <sup>b</sup>	200m (650 ft.) <sup>a</sup> 130m (430 ft.) <sup>b</sup> 100m (330 ft.) <sup>b</sup>



Parameter	Phase I	Phase II
	Wharf Length	(1) x 120m (400 ft) Total = 120m (400 ft.)
Live Load - Wharf/Staging	20T/m <sup>2</sup> (4,000 PSF)	30T/m <sup>2</sup> (6,000 PSF)
Live Load - Storage	10 T/m <sup>2</sup> (2,000 PSF)	15 T/m <sup>2</sup> (3,000 PSF)

Activity	Vessels used	Land parcel size	Waterside infrastructure	Road and rail access
Blade manufacturing	General cargo vessel Tug and barge as compromise	150,000 to 250,000m <sup>2</sup> (37 to 62 acres)	Quay length: 200m Bearing capacity: 20m <sup>2</sup>	Need access to major highways Rail connection highly desirable
Generator manufacturing	General cargo vessel	60,000 to 75,000m <sup>2</sup> (15 to 19 acres)	Quay length: 200m Bearing capacity: 50m <sup>2</sup>	Need access to major highways Rail connection highly desirable
Nacelle assembly	General cargo vessel	70,000 to 100,000m <sup>2</sup> (15 to 25 acres)	Quay length: 300m Bearing capacity: 100m <sup>2</sup>	Need access to major highways Rail connection highly desirable
Tower manufacturing	General cargo vessel Tug and barge as compromise	120,000 to 200,000m <sup>2</sup> (30 to 50 acres)	Quay length: 300m Bearing capacity: 50m <sup>2</sup>	Need access to major highways Rail connection highly desirable
Foundation manufacturing and staging	Tug and barge Jack-up vessel Offshore heavy-lift derrick	120,000 to 200,000m <sup>2</sup> (30 to 50 acres)	Quay length: 125m Bearing capacity: 50m <sup>2</sup>	Need access to major highways Rail connection highly desirable
Submarine cable manufacturing	Cable lay vessel. Tug and barge as compromise	80,000 to 90,000m <sup>2</sup> (20 to 22 acres)	Quay length: 125m Bearing capacity: 20m <sup>2</sup>	Need access to major highways Rail connection highly desirable
Substation manufacturing	<i>Substations will be built in commercial shipyards and have a different set of requirements. See Table 4.13</i>			
Construction staging	Jack-up vessel	150,000 to 200,000m <sup>2</sup> (40 to 50 acres)	Quay length: 200m Bearing capacity: 100m <sup>2</sup>	Need access to major highways Rail connection highly desirable

Attribute	Nacelles				Cables				Operation & Maintenance					
	Minimum		Preferred		Minimum		Preferred		Minimum		Preferred			
	USCO	Metric	USCO	Metric	USCO	Metric	USCO	Metric	USCO	Metric	USCO	Metric		
Total Site Area (acres / hectares)	15	6	20	12	20	8	20	12	50	20	7	3	15	6
Capacity Length (feet / meters)	40	20	120	20	400	122	200	60	400	122	200	60	200	100
Lead Bearing Pressure Size (psf / tons)	2,000	10	4,000	20	2,000	10	4,000	15	4,000	15	4,000	15	N/A	N/A
Lead Bearing Pressure Size (psf / tons)	2,000	10	4,000	20	1,500	7	2,000	10	3,000	15	4,000	20	N/A	N/A
Laydown Area (acres / hectares)	8	3	20	12	10	4	15	6	20	8	2	1	4	2
Outboard Storage Area (acres / hectares)	5	2	15	6	5	2	8	3	10	4	10	4	2	1

## Massachusetts

## New York

## Virginia

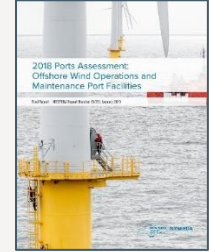
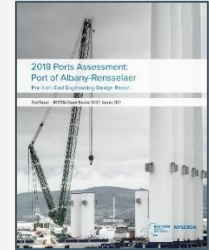
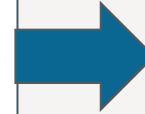
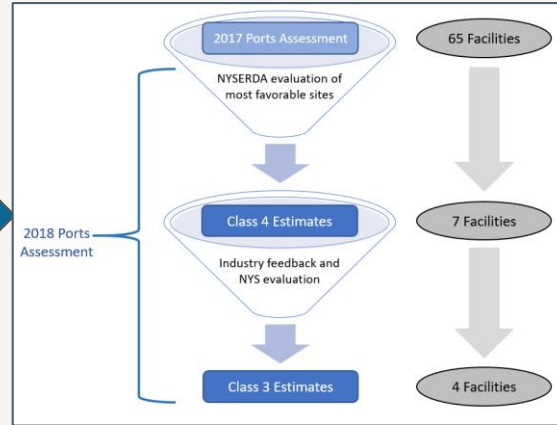
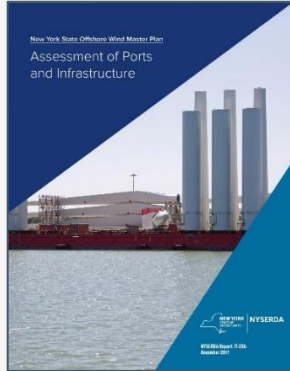




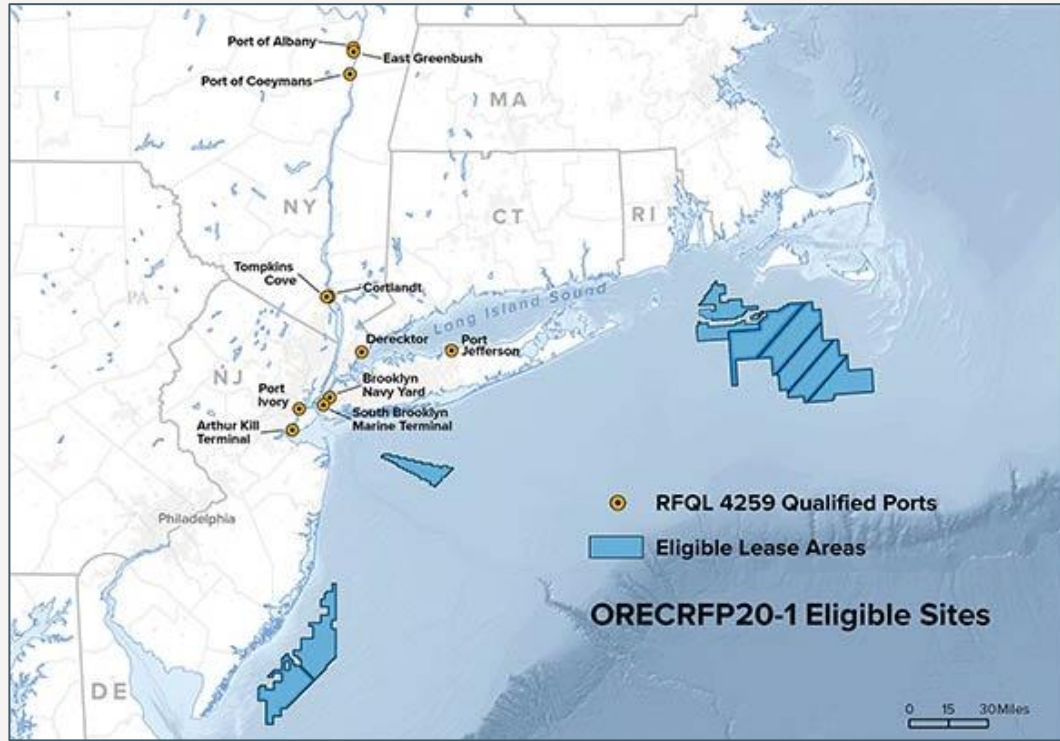
# New York State OSW Port Activities and Support



# Ports & Infrastructure Studies



# RFQL 4259: Offshore Wind Port Infrastructure



# OREC RFP20-1



# Port of Albany –Rensselaer: Beacon Island Expansion



- Operator: Marmen Welcon allied with Smulders
- Use: Manufacturing Wind tower / Transition Piece Manufacturing
- Key Characteristics:
  - 81 acres
  - 500 LF of 6,000 PSF wharf
- Status: Construction Expected 2022
- Investment: \$350M
- Jobs: 550 direct jobs (increased from 350 jobs, due to demand)



# Port of Coeymans



- Owner/Operator: Carver Companies
- Use: Manufacturing & Fabrication
  - \$86M contract, Riggs Distler & Company, Inc. to construct foundation components for Sunrise Wind (Ørsted and Eversource)
- Key Characteristics:
  - 125 Acres – Port Side
  - 275 Acres – Industrial Park
  - 30 ft. Draft
  - 300 ft. Heavy Lift Main Dock
  - 900 Ton Marine Travel Lift

# South Brooklyn Marine Terminal

- Owner: NYCEDC
- Operator: SSBMT (Red Hook + Industry City)
- Initial Lease: Equinor
- Use: Staging and O&M
- Investment: \$350M
- Jobs: 350 direct jobs



# Port Jefferson



- Owner/Operator: Ørsted
- Use: O&M (SOV)
- Status: in development
- Key Characteristics:
  - Homeport to SOV (Sunrise and South Fork)
  - 60,000 square foot office and warehouse facility
  - 100 permanent direct jobs



# Arthur Kill Terminal



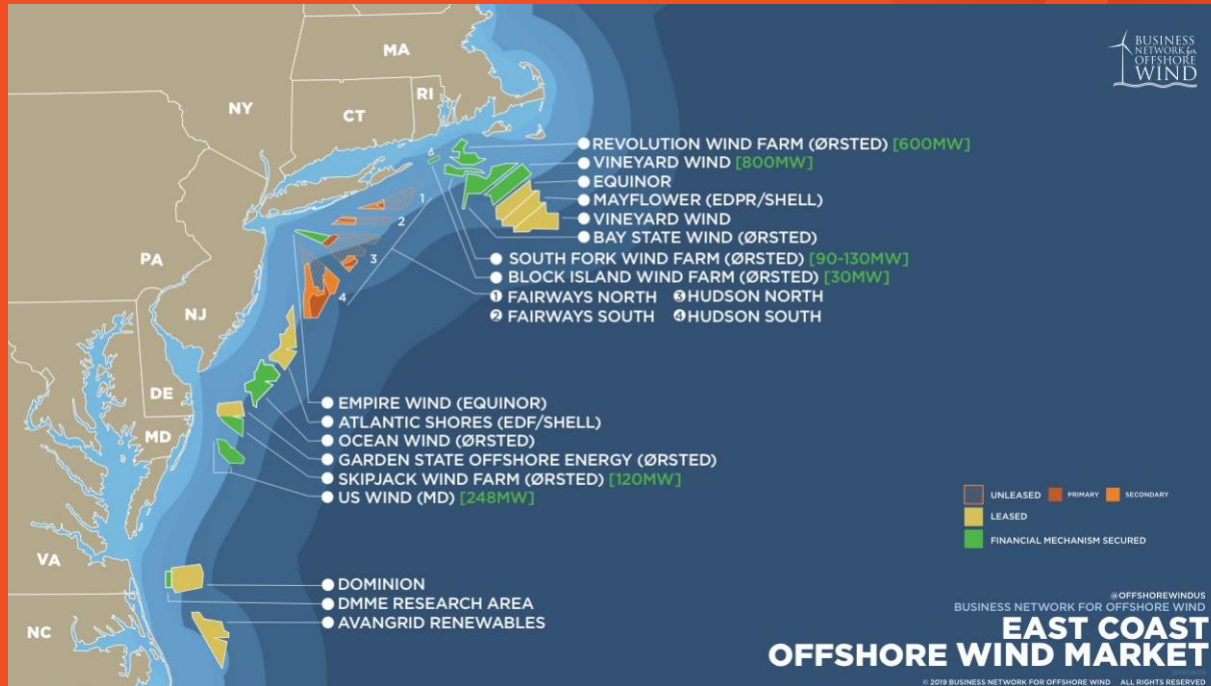
- Developer: Atlantic Offshore Terminals
- Use: Staging
- Key Characteristics:
  - Purpose-built
  - 32 acres
  - 1,350 ft. quay (inbound + outbound berths)
- Status:
  - Detailed Engineering and Permitting underway
  - Construction anticipated 2023
  - Operational 2025

# New York State Offshore Wind Ports – What's Next?

- Governor Hochul 2022 State of the State Address
  - \$500M to support OSW port infrastructure and supply chain/manufacturing investments as a key element of third RFP for OSW.



# U.S. OSW Ports Activities



# Maine



- Searsport Feasibility Study

# Massachusetts



- New Bedford Marine Commerce Terminal (Staging)
- Salem (Staging)
- Brayton Point (Interconnect, Cable Manufacturing)
- Vineyard Haven (Vineyard O&M)
- Borden and Remington (Mayflower O&M)

# Rhode Island



- Quonset Development Corp – Port of Davisville(Staging)
- ProvPort
- Senesco (Fabrication)

# Connecticut



- State Pier (Staging)
- Bridgeport (Staging)

# New Jersey



- NJ Wind Port (Staging + Nacelle Assembly – MHI Vestas, )
- Paulsboro (Monopile fabrication – EEW)
- Atlantic City (O&M – Ørsted)

# Maryland



- Tradepoint Atlantic / Sparrows Point Terminal (Fabrication)
- Ocean City (O&M – Ørsted)



# Virginia



- Portsmouth Marine Terminal (Staging)
- Portsmouth Blade Facility (Blade Manufacturing – SGRE)

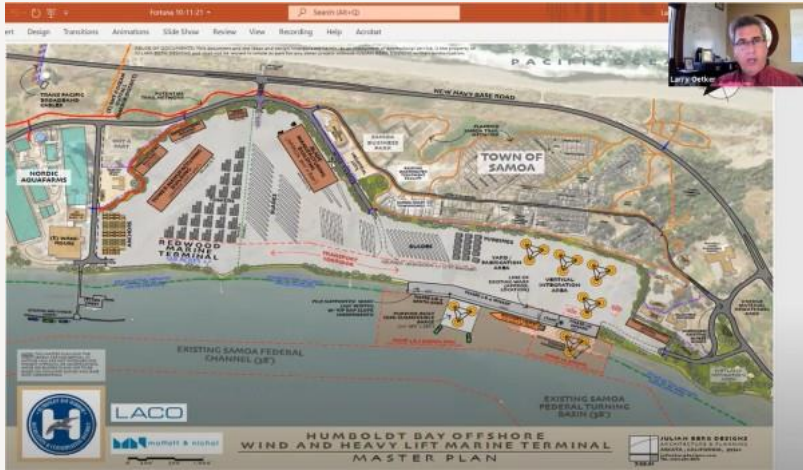
# North Carolina



- Supply Chain Study



# California



- BOEM “Infrastructure to Support Offshore Floating Wind”
- Redwood Marine Terminal 1 (floating OSW)

# Federal Incentives

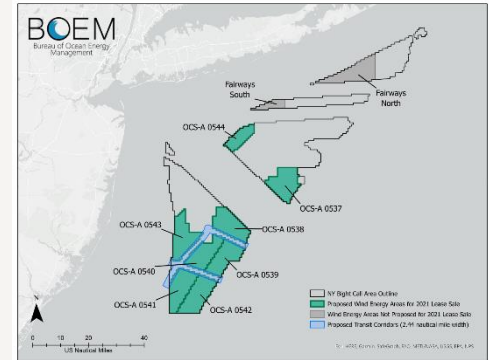
# MARAD Port Infrastructure Development Program (PIDP) Grants



- 2021 Program Funding: \$230M
  - Albany, NY: OSW Tower Manufacturing Port Project \$29.5M
  - New York, NY: SBMT 35<sup>th</sup> Street Pier Expansion Project, \$25M
  - Portsmouth, VA: PMT OSW Development, \$20M
- 2022 through 2026 Annual Program Funding: \$450M

## BOEM Lease Program

- Proposed Sale Notice seeks feedback on:
  - “Mechanisms to provide benefits to underserved communities and investments in a domestic supply chain, consistent with goals and objectives of OCSLA.”



# Conclusions and Key Takeaways

# Conclusions and Takeaways

- OSW requires purpose-built, high-capacity port facilities
- States are beginning to prepare port facilities for OSW use
- OSW Pipeline will require a large number of improved and/or new port facilities
- The OSW projects that can be built first and the bulk of local economic development will be centered around the facilities that are ready to use
- New York has and is continuing to make great strides to facilitate development of the industry







# Thank you

Brent D. Cooper, [BRCO@COWI.com](mailto:BRCO@COWI.com)

# Coming Next:

January 26, 1:00 p.m. ET  
**Harbor Safety and Navigation**  
Sean Kline, Chamber of Shipping  
of America

February 9, 2022, 1:00 p.m. ET  
**A Panel on Nature Based  
Design Enhancements for  
Offshore Wind**  
Carl LoBue, The Nature  
Conservancy

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