NEW YORK STATE OF OPPORTUNITY. | NYSERDA

Maritime Technical Working Group

Meeting

April 17, 2024 | Zoom Webinar

Purpose of today's meeting

1. To share State and member updates
2. Hear an update on the Master Plan 2.0 Study
3. Discuss M-TWG priorities for 2024

New York State Offshore Wind

Offshore Wind Program Master Plan 2.0 Updates

Tess Arzu, NYSERDA

April 17, 2024 – Maritime Technical Working Group Meeting

New York Offshore Wind Fourth Solicitation

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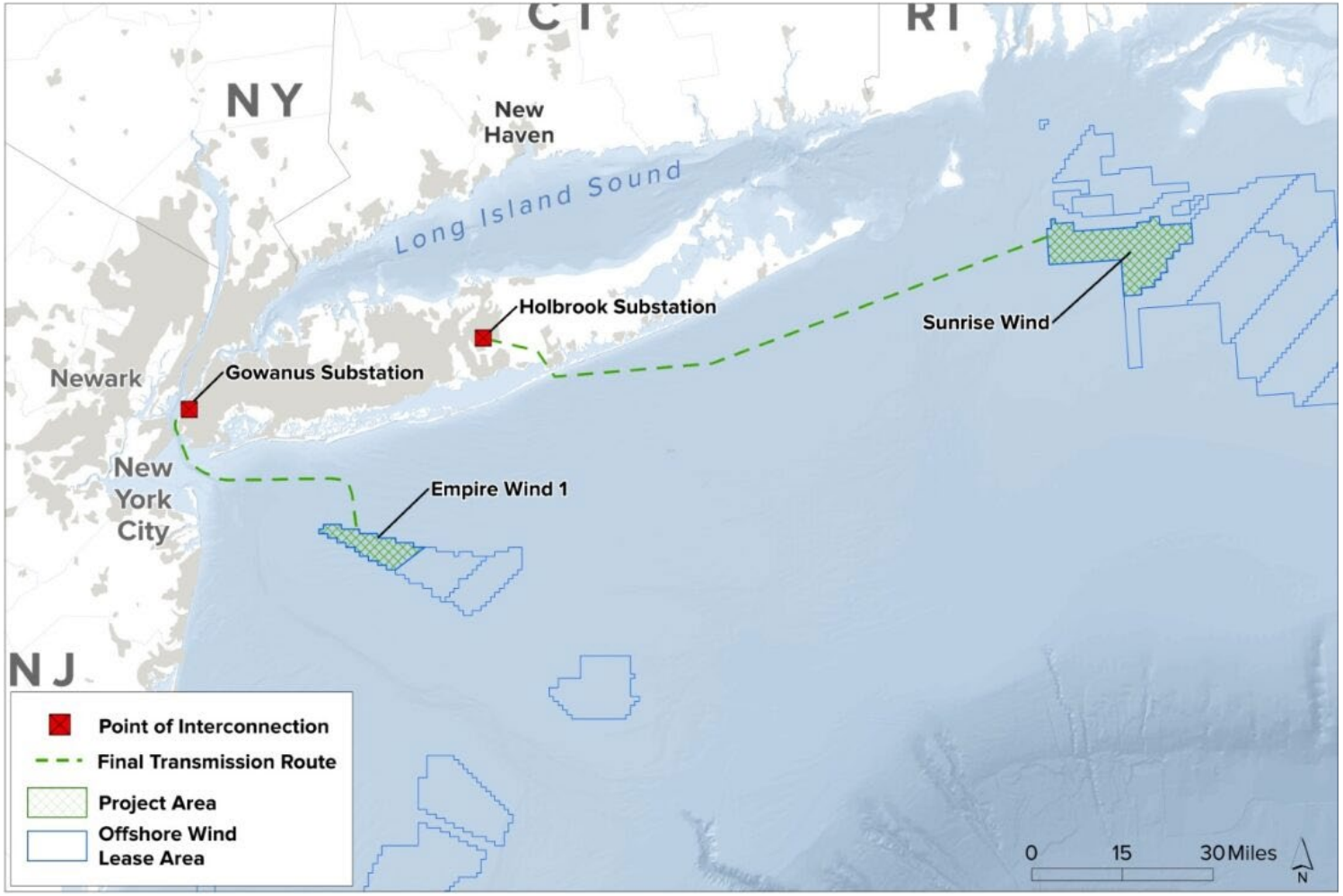
New York's 4th OSW Solicitation
2 OSW Projects

Empire Wind One (810 MW)
Sunrise Wind (924 MW)

- Enough energy to power 1 million homes
- $6 billion in anticipated in-state spending, including $1 billion in commitments to spending in Disadvantaged Communities
- More than $16.5 million to support wildlife and fisheries research, mitigation, and enhancement
- Support 1,000 jobs over project lifetime with $43 million in workforce investments

Supply Chain and Port Investments

- Construction at South Brooklyn Marine Terminal and Port of Coeymans
- $188 million in U.S. Iron and Steel



Master Plan 2.0

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Master Plan 2.0 Timing

Track 1:

9 Studies inform future BOEM Offshore Wind Lease Areas

Request for Additional Wind Energy Areas off the New York Bight to Bureau of Ocean Management (BOEM)

Track 2:

6 Studies inform Master Plan 2.0

Master Plan 2.0 Synthesis Document

TWG Action Items

- **March 29:** Spring **F-TWG** Meeting
- **April 12: JSC-TWG** Meeting
- **April 17:** Spring **M-TWG** Meeting
- **May 2:** Spring **E-TWG** Meeting
- **May 14: EJ-TWG** Meeting

2023 → **2024** → **2025**

Overview of Master Plan 2.0 Studies

2023 – Track 1
(To be released April 2024)

Maritime Activity

- Maritime Assessment: Commercial and Recreational Uses Study

Technology

- Offshore Wind Resource Assessment
- Deepwater Wind Technologies: Technical Concepts Study

Feasibility

- Technology Assessment and Cost Considerations Study

The Environment

- Birds and Bats Study
- Fish and Fisheries Study
- Marine Mammals and Sea Turtles Study
- Benthic Habitats Study
- Environmental Sensitivity Analysis

"New York State Request for Additional Wind Energy Areas off the New York Bight" to Bureau of Ocean Energy Management (BOEM)

2024 – Track 2
(In Progress)

Supply Chain

- Vessel Analysis for Deepwater Wind Development and Operation
- Port and Supply Chain Study

Feasibility

- Deepwater Cost Reduction Study

Workforce

- Navigating Workforce Opportunities and Challenges of Scaling Up Offshore Wind Targets in New York State

Disadvantaged Communities

- Empowering Potential: Cataloging Existing Community Assets for Harnessing Offshore Wind Opportunities in New York State's Disadvantaged Communities

The Environment

- Characterizing Oceanographic Conditions and Analyzing Extreme Weather Risks and Potential Interactions with New York State's Offshore Wind Infrastructure

2024 Technical Working Group (TWG) Engagement

2024

Late 2024/ Early 2025

Jan. '24:

> Jan. 22: **M-TWG** Meeting held.

> **Late Jan./Early Feb.:** NYSERDA/Contractor MP2.0 Trk 2 Study Kick-Off Calls occurred.

Feb. '24:

Feb. 14: JSC-TWG Supply Chain Sub-Committee Meeting – summary presentation held on Port and "**Supply Chain**" Study.

Mar. '24:

> **Mar. 29:** Spring **F-TWG** Meeting.

Apr. '24:

> **Apr. 12: JSC-TWG** Main Meeting; Draft "**Vessel Analysis**" anticipated for 2-week NYSERDA, **M-TWG**, and PAC review.

> **Apr. 15:** Deepwater "Cost Reduction" Study Preliminary Draft Report anticipated.

> **Apr. 17: HDR provides mini-presentation of Port and Supply Chain to M-TWG; ERM provides presentation of Vessel Analysis key findings to M-TWG.**

> Request Report to BOEM anticipated to be submitted.

May'24:

> Expect rebid **Workforce Study** contract to be executed.

> **May 2:** Spring **E-TWG** Meeting.

> Vessel Analysis MTWG Comment Scoping Meeting to be scheduled.

> **May 14:** Environmental Justice (**EJ-TWG**) Meeting.

Late May / Early June 2024:

> Draft **Supply Chain Study** anticipated. Final **Vessel Analysis** anticipated.

Mid to Late July:

> Empowering Potential Draft Report anticipated **(Potential to engage TWG).**

> **Jul. 12:** Cost Reduction Study Final Report anticipated.

> Anticipated Cost Reduction Study review by NYS agencies.

August 2024:

> Draft Extreme Weather Study anticipated, 2-week TWG/State agency review time thereafter.

September / October 2024:

> Final product of Supply Chain Study; and Final Empowering Potential Report anticipated.

> Late October: Anticipated closeout of Workforce Study.

December 2024/Early 2025:

> **Master Plan 2.0 Synthesis Document to be finalized for publication.**

Vessel Analysis for Deepwater Wind Development and Operation

Study Timeline

April 3 2024

All Contractors Call.

April 2024

MTWG Meeting Presentation; Request for Additional Wind Energy Areas off the New York Bight anticipated to be submitted to BOEM.

May 27 2024

Draft Report submitted for 2-weeks Technical Review/State agency Reviews.

July/August 2024

Study undergoes Legal and Marketing Reviews.

Late June 2024

Final Report of Study anticipated.

Late 2024/Early 2025

Study will be incorporated as part of Synthesis Document published.

April 12 2024

Draft Report to be received for 2-week M-TWG review and comments.

May 2024

ERM reviews M-TWG comments, addresses comments with response. PAC Meeting takes place.

Information on upcoming and past studies is available on NYSERDA's website:

https://www.nyserda.ny.gov/All-Programs/Offshore-Wind/About-Offshore-Wind/Master-Plan

Thank You

Tess Arzu
Special Projects Manager, Offshore Wind
Tess.Arzu@nyserda.ny.gov

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OFFSHORE WIND PORT & SUPPLY CHAIN STUDY

MASTER PLAN 2.0

Improving the Odds for Success in Offshore Wind

On behalf of NYSERDA

HDR AND GREEN DUCKLINGS

OSW Port & Supply Chain Study for Master Plan 2.0

Project Background

- Master Plan 2.0 shall build off and expand upon New York State's first Master Plan that was completed in 2017.
- Master Plan 2.0 seek to **inform development opportunities for floating offshore wind in regional waters deeper than 60m.**
- Through the development of Master Plan 2.0, NYSERDA seeks to ensure that best-available scientific information and stakeholder engagement shall guide New York State to meet its nation-leading offshore wind goals in a transparent, responsible, and cost-effective manner.

Study Overview

- The study will **characterize the port and supply chain needs to maximize the long-term State benefit from development of the Northeast offshore wind industry with consideration to deep water technologies**.
- Identify **synergies of fixed bottom & floating wind development** in New York
- Identify **supply chain needs, potential supply gaps, and costs, to generate a recommended ranking of foundation types that maximize New York State's supply chain opportunity**
- The study will be providing the **basis for strategic decision making for NYSERDA** and areas for investment.

SCOPE

Offshore Wind Port & Supply Chain Study

Descriptions of Chapters.

Activities

1 Define Floating Wind Requirements for Developers and OEMs

- Develop characteristics and functional requirements of ports for deepwater OSW projects
- Establish Framework for assessing floating wind port suitability and structuring the supply chain
- Verify requirements by conducting interviews with Developers, turbine OEMs, and foundation contractors

2 Regional Port Mapping and Evaluation

- Identify active and potential OSW ports across the Northeast and develop a GIS mapping database
- Conduct Interviews with selected ports
- Use Requirements Framework to Assess suitability of the ports using a Red/Amber/Green rating
- Shortlist most qualified ports and facilities for marshalling and assembly of WTGs, manufacturing; marshalling and assembly foundations; and marshalling and assembly of mooring/anchoring systems and O&M

4 3 Holistic Supply Chain Mapping and Evaluation

- Compile companies list for deepwater OSW development & apply relevant NAICS codes
- Consolidate databases for a comprehensive OSW supply chain
- Assess local companies to potentially satisfy Tier 1 and 2 supply chain needs
- Define the NYS Supply Chain Landscape
- Shortlist the floating OSW suppliers with highest potentials.

5 Assess Local Assets Alignment with Key Floating Foundation Technologies

- Identify foundation types, describe their supply chain requirements
- Assess and prioritize foundation technologies and materials based on local conditions and resource availability
- Identify the alignments of floating wind foundation technologies within NYS

SCOPE

Offshore Wind Port & Supply Chain Study

Draft Chapters.

	6	7	8	9
	Comparison of Cost: Floating vs Fixed-Bottom Wind	**Investment Recommendations in OSW Infrastructure**	**Evaluation of State's ability to Maximize Local Content for Deepwater OSW**	**Case Study of Successful Application of Local Content & Support**
Activities	• Provide a cost estimate for floating wind projects • Break down cost elements, comparing bottom-fixed wind projects • General bankability and insurability risk of local supply chain and technology elements • Mitigating floating wind risks, enhancing bankability, highlighting "Top 10" financial risks for developers	• Updated view on critical bottlenecks for State's 2035 target, focusing on the most critical local supply chain elements • High-level supply-demand considerations building on State Supply Chain Investment Plans (SCIPs). • Longer term considerations on regional market development (US East Coast) and related supply chain bottlenecks	• Recommendations on key focus areas for maximizing local content at acceptable cost and risk. • Focus on the NYS supply chain elements that would be able to tap into the floating OSW supply chain. • Quantification of the related job creation for the selected focus areas • Longer term considerations on regional market development (US East Coast) and related supply chain bottlenecks.	• Considerations on local content programs. • Applying a developer's "hub strategy" perspective to provide recommendations for a regional coordination of local content and support.
Deliverables				

INTERVIEW ANALYSIS

Stakeholder insight gathered on the most critical port requirements

The most critical port characteristics for floating offshore wind projects were investigated across the four main port activity areas and sub activities to define port requirements.

Port activity	Main activity scope
Fabrication	• Floating foundation fabrication (steel or concrete) • Floating foundation assembly (steel or concrete)[1] • Wet storage (for floater foundations)
Integration Port	• WTG component storage • Floating foundation assembly (steel) • WTG-Foundation Mating • WTG (Pre)commissioning • Wet storage (for floater foundations both before and after turbine mating)
Storage (before final load-out)	• Mooring storage • Anchor storage • Inter-array cable storage • Export cable storage
Operations and Maintenance	• Scheduled O&M • Major component exchange (i.e. tow-to-port operations)

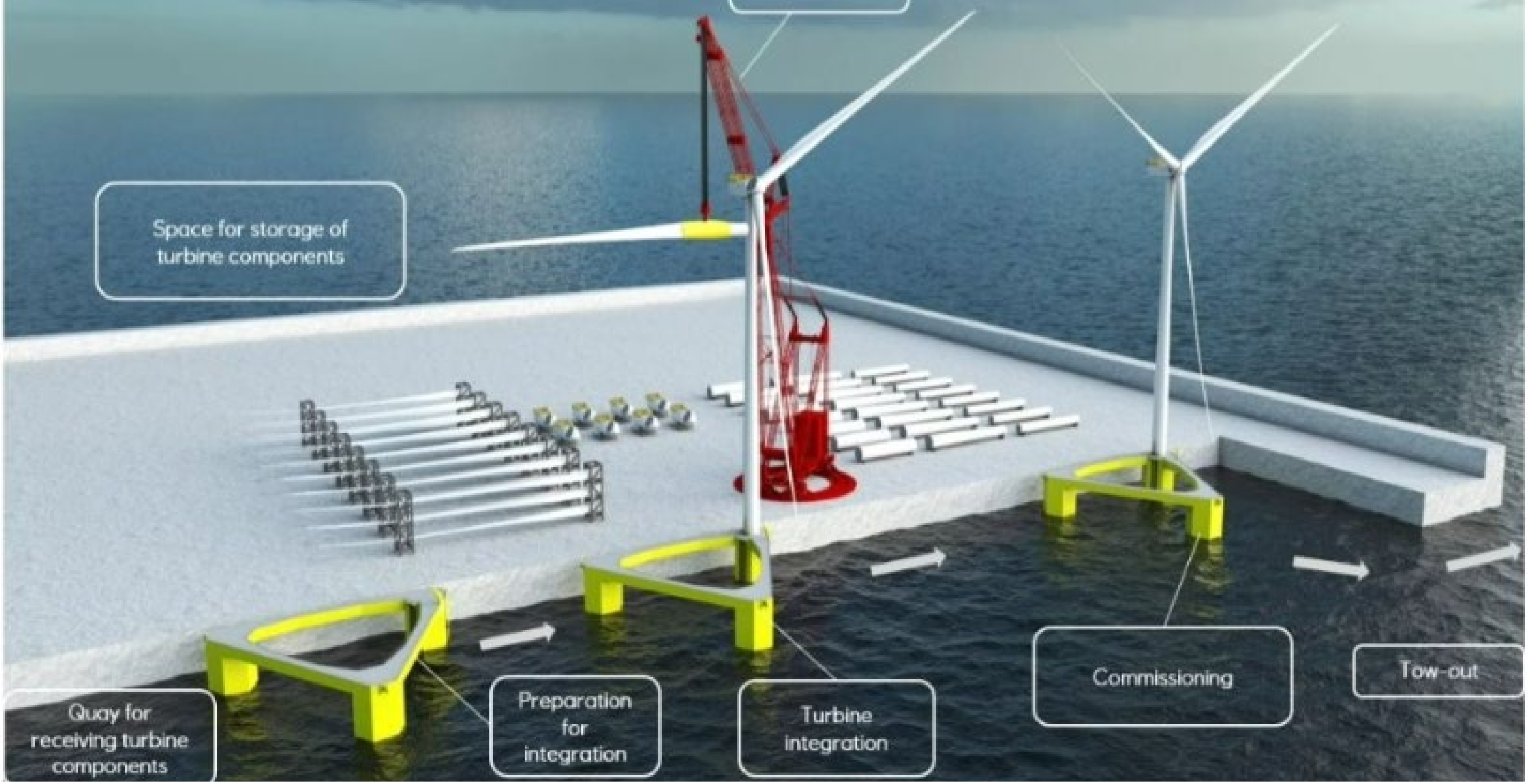
					Concrete		Steel							
		Integration port			Fabrication port				Storage port					
Criteria	Unit	WTG storage	WTG Mating	WTG (Pre)commissioning	Floating foundation fabrication	Floating foundation assembly	Floating foundation fabrication	Floating foundation assembly	Mooring	Anchor	Inter-array cable storage	Export cable storage	O&M – Scheduled	O&M - MCE
Tidal Range	m	2,5				2,5-6								1
Horizontal water access	m	25-75	350	75-350	50-75	50-75	75	75	50	50	75	75		25-350
Water depth quay side	m	10-12	10		10	10-20	10	10-20	9-10	9-10	10-12	10-12	8-12	10-20
Water depth channel (Approach)	m	10-15	10		10-15	12-25	12-15	12-15	9-10	9-10	10-15	10-15	10-15	8-25
Quay length	m	150-300	150-400	100	150-300	100-300	150-400	100-400	200	200	150-250	150-250	30-150	50-350
Quay bearing capacity	t/m²	6-40	15-20		10-20	10-40	20	20-40	8-10	8-10	8-25	8-25	5-10	5-40
External laydown area	ha	3,5-12	1-3	1-3	5-16	15-20	10	15	1-2,5	1-2,5	1-6	1-6	0,2-1	1-3
Heavy load out bearing capacity	t/m²	6-20	20	15-20	15-20	20-40	15-20	20-40	8-15	8-15	8-12	8-12	5-12	8-40
General laydown area bearing capacity	t/m²	5-20	8	15-20	5-20	5-20	8-20	8-20	5-8	5-8	8-12	8-12	5-10	8-20
Distance between integration port and project site	km	740												
Capacity of floating foundations possible	units	10												

Port requirements for evaluation

MINIMUM requirements

Criteria	Unit	WTG storage	WTG mating	WTG (Pre)commissioning	Concrete: Floating foundation fabrication	Concrete: Floating foundation assembly	Floating foundation fabrication	Floating foundation assembly	Mooring	Anchor	Inter-array cable storage	Export cable storage	O&M – Scheduled	O&M - MCE
Tidal range	m	2,5				2,5-6								1
Horizontal water access	m	25-75	350	75-350	50-75	50-75	75	75	50	50	75	75		25-350
Water depth quay side	m	10-12	10		10	10-20	10	10-20	9-10	9-10	10-12	10-12	8-10	10-20
Water depth channel (approach)	m	10-15	10		10-15	12-25	12-15	12-15	9-10	9-10	10-15	10-15	10-15	8-25
Quay length	m	150-300	150-400	100	150-300	100-300	150-400	100-400	200	200	150-250	150-250	30-150	50-350
Quay bearing capacity	t/m²	6-40	15-20		10-20	10-40	20	20-40	8-10	8-10	8-25	8-25	5-10	5-40
External laydown area	ha	3,5-12	1-3	1-3	5-16	15-20	10	15	1-2,5	1-2,5	1-6	1-6	0,2-1	1-3
Heavy load out bearing capacity	t/m²	6-20	20	15-20	15-20	20-40	15-20	20-40	8-15	8-15	8-12	8-12	5-12	8-40
General laydown area bearing capacity	t/m²	5-20	8	15-20	5-20	5-20	8-20	8-20	5-8	5-8	8-12	8-12	5-10	8-20
Distance between integration port and project site	km	740												
Capacity of floating foundations possible - wet storage	Units	10												

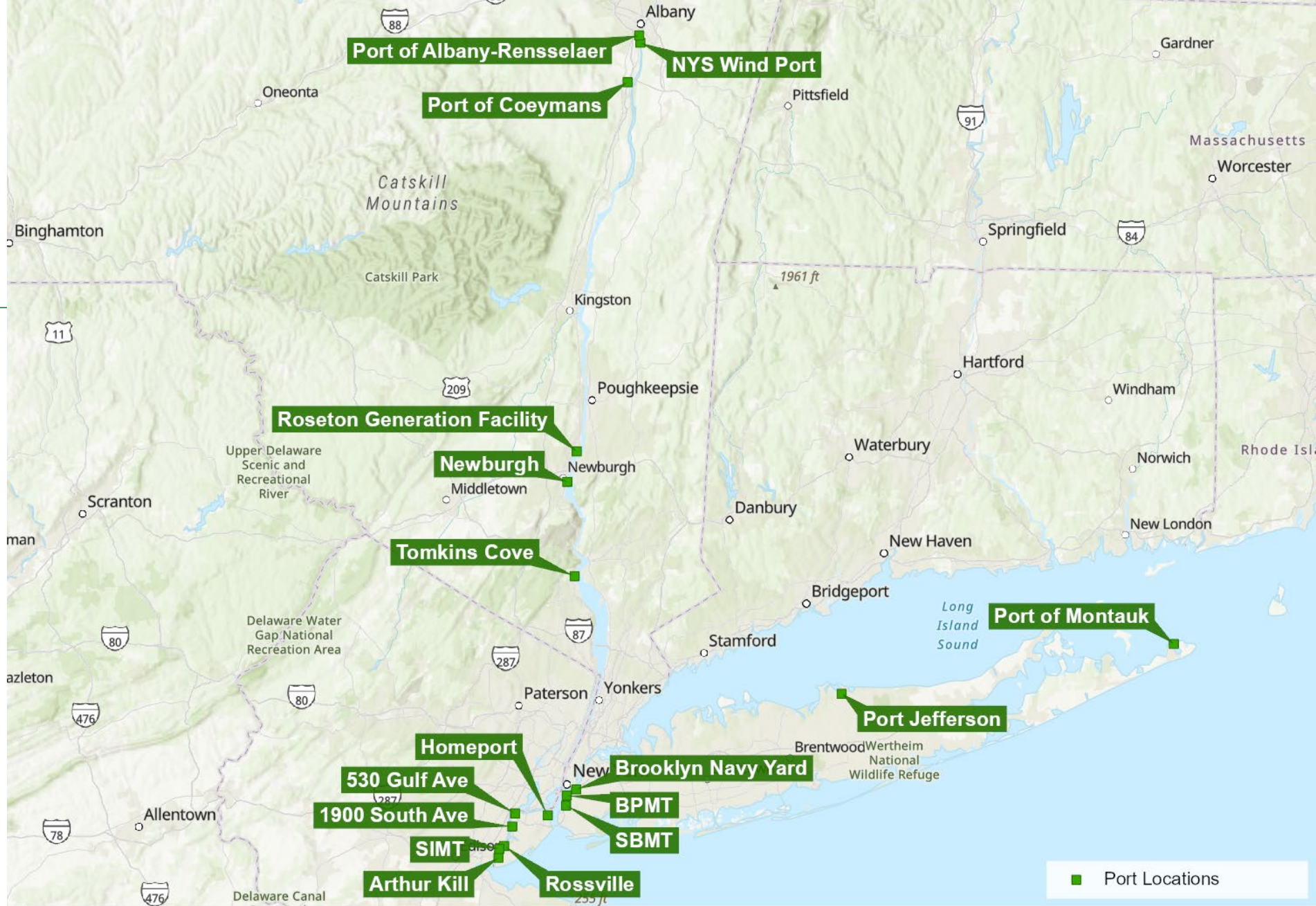
Source: Photo of the WindFloat Atlantic project courtesy of Principle Power/Ocean Winds (floaters designed for 8.3MW wind turbines – foundation of ~3.000 metric tons)



Source: Photo courtesy of Equinor

PORTS MAPPING

NYS Ports:
Existing & Planned



PORTS MAPPING

NYS Ports Data Collection

South Brooklyn Marine Terminal

General port data

	Project Data	Unit	Comment:
Tidal Range:	6	MHW-MLW (ft.)	34.6 MLLW will be the dredged berth at the Primary Wharf 39W. Overdredge to 37/38 MLW then remedial sand cap placed on top.
Water depth approach channel:	40	ft.	Bay Ridge Federal Navigation Channel.
Approach channel width:	1,200	ft.	Bay Ridge Federal Navigation Channel.
Limiting air draft restrictions:	215	ft.	Verrzano @ 215'
External laydown area:	75	acres	full acreage of terminal assuming no buildings. With O&M facility (10 acres) Staging reduced to approx. 65 acres
External laydown area bearing capacity:	3,000	PSF	3,000 psf planned throughout terminal
Heavy load out bearing capacity:	6,000	PSF	6,000 psf planned with Marmen Welcon
Skidding area available:	Yes	[Yes/No]	
Skidding area bearing capacity:	3,000	PSF	
Available area for water storage:	8	acres	2,300' shoreline x 150' to Navigation Channel
Can port accommodate jack up operations?	No	[Yes/No]	

Existing Quays/Wharf

Name/number	Quay length [LF]	Quay depth [	Quay bearing capacity [PSF]	Available for use? [Y/N]
39W (Primary Crane Pad @ 300'x150')/Berth 3	705	34.6	6,000	Y
39SW (Secondary Crane Pad @ 250'x150')/Berth	600	32.2	6,000	Y
39NW (Barge Storage)	530	22.2	450	Y
35N (SOV Platform)	100	26.5	1,000	Y

Long list and evaluation of additional Norwegian ports can be found in separate Excel document.

SCOPE

Offshore Wind Port & Supply Chain Study

Study Results

7 Investment Recommendations in OSW Infrastructure

- Updated view on critical bottlenecks for State's 2035 target, focusing on the most critical local supply chain elements
- High-level supply-demand considerations building on State Supply Chain Investment Plans (SCIPs).
- Longer term considerations on regional market development (US East Coast) and related supply chain bottlenecks

8 Evaluation of State's ability to Maximize Local Content for Deepwater OSW

- Recommendations on key focus areas for maximizing local content at acceptable cost and risk.
- Focus on the NYS supply chain elements that would be able to tap into the floating OSW supply chain.
- Quantification of the related job creation for the selected focus areas
- Longer term considerations on regional market development (US East Coast) and related supply chain bottlenecks.

Vessel Analysis for Deep Water Wind Development and Operation

Jesse Broehl, Principal Consultant, ERM

Oliver Thompson, Transport & Installation Analyst, Clarksons

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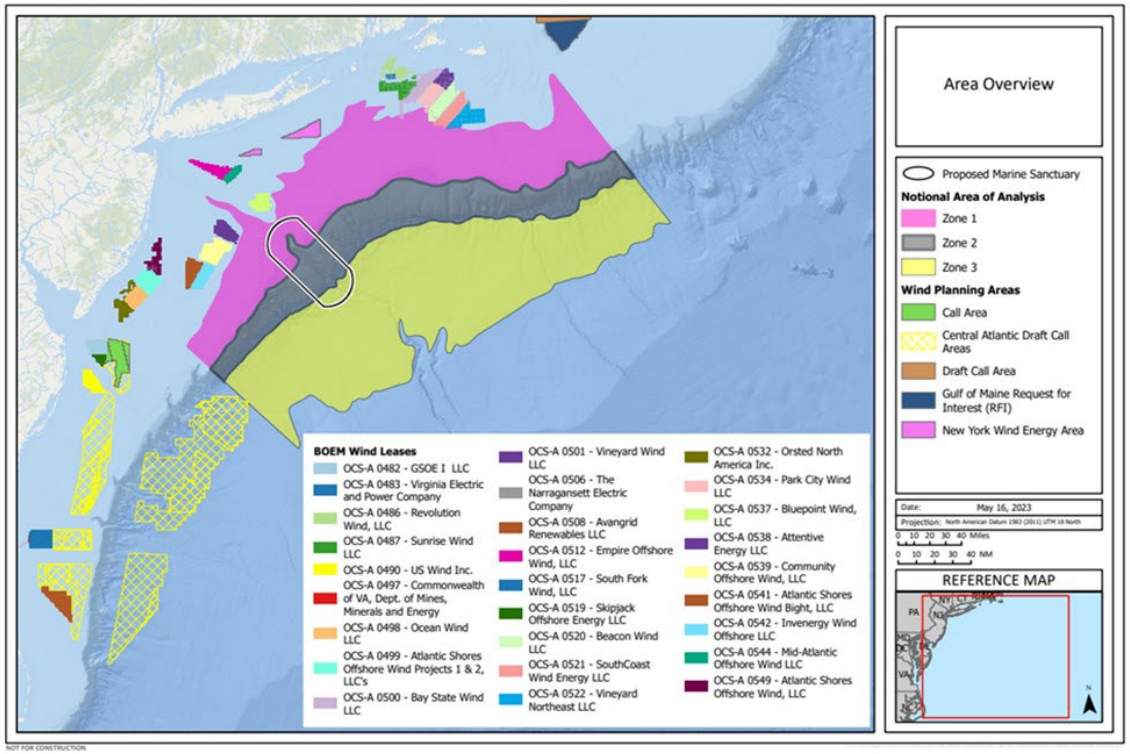
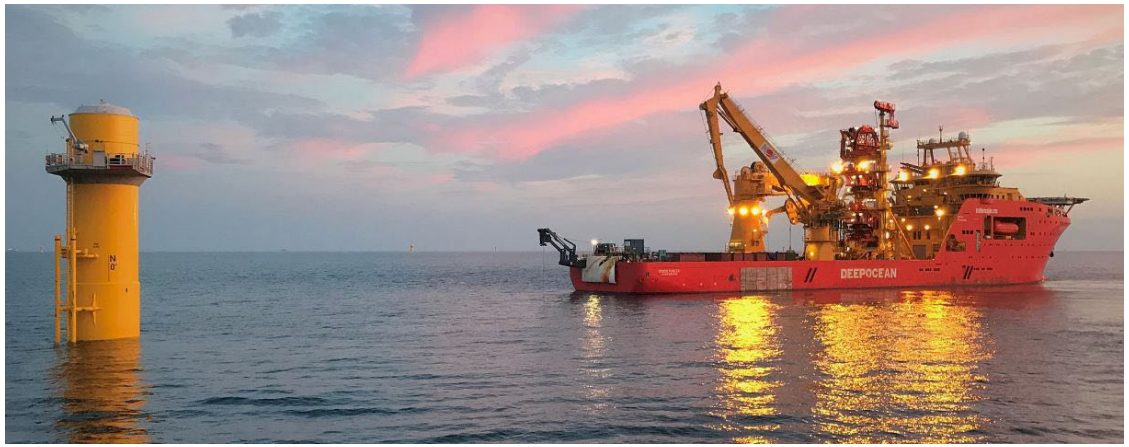
Objectives of the Study

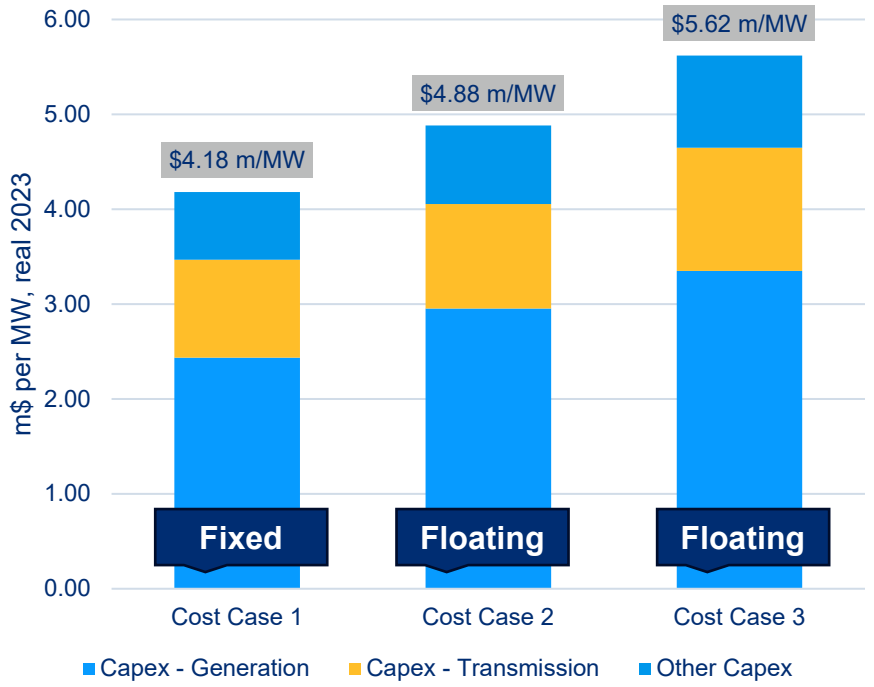
- Understand the methodologies and types of vessels required to support deep water offshore wind in the three zones in the Area of Analysis (AoA) off New York State.
- To provide insight on the size and type of vessels that will be required to build, install, operate, maintain, and decommission projects that could be built in the AoA.
- The research focus is on floating offshore wind base case, while also exploring deep water jackets, and the vessel needs for both scenarios.
- Provide insights into the supply and demand environment for the key vessels needed.
- A review of shipyard capabilities within the U.S. that could potentially be used for building newly required vessels.





Methodology

- Building upon ERM's experience providing developers, investors, supply chain companies with advice on market entry, technical due diligence and other consulting projects.
- ERM's global offshore wind database tracking all project details, including vessel contracts.
- Building on ERM's Track 1 Technology Study: ERM will reference the ***Technology Assessment and Cost Considerations Study***, performed by ERM earlier this year.
- Clarksons has utilized its in-house expertise in each relevant vessel segment to analyze the outlined vessel requirements for the installation of offshore wind turbines in each identified scenario.
- The analysis provides insights into the supply and demand environment, as well as a review of shipyard capabilities within the United States that could potentially be utilized for building newly required vessel assets.



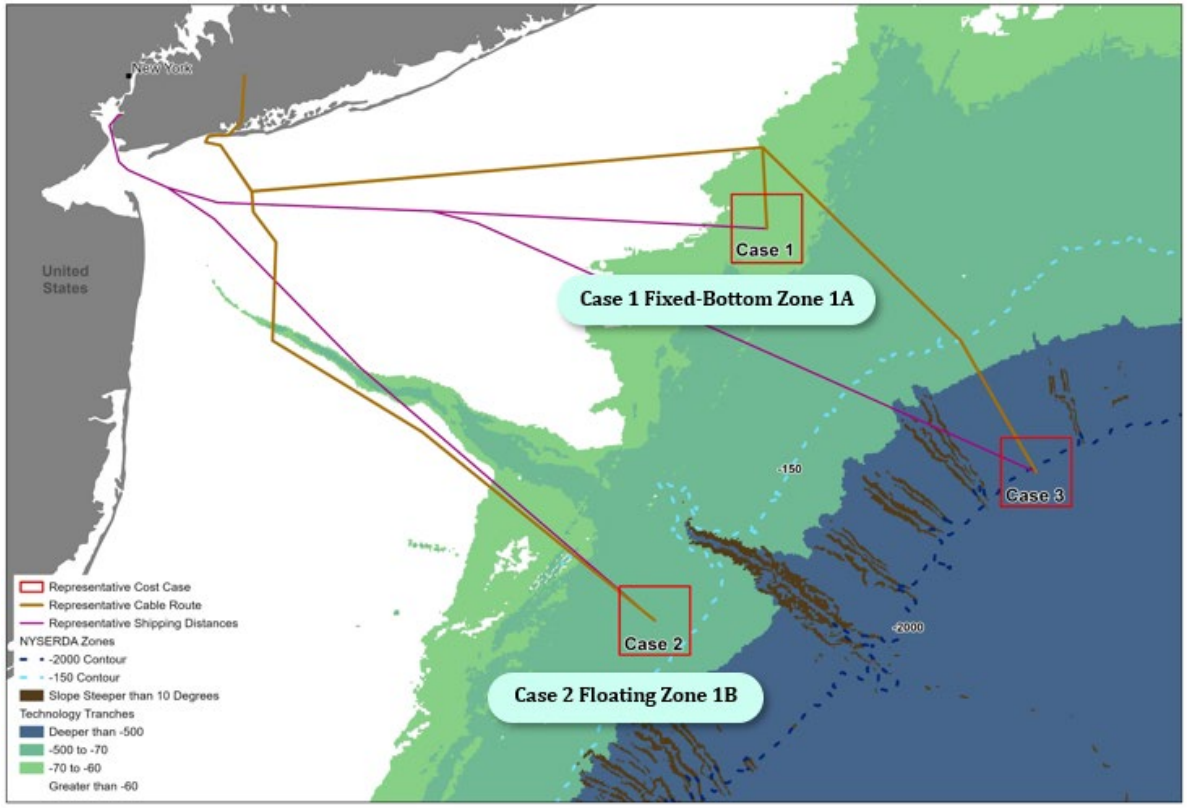
	Cost Case 1:	Cost Case 2:	Cost Case 3:
Turbine Size	20 MW, 275 m rotor diameter		
Project Size	68 WTGs, 1,360 MW total		
Marshalling Port Distance (nm)	100	110	150
Depth Range(m)	60—70	100—200	~2000
Foundation Concept	Steel jackets with pin-piles	Steel floating semi-sub	Steel floating semi-sub
Array Cables	Traditional static	Partially dynamic	Fully dynamic
Mooring Spread	NA	6x Catenary	6x Semi-taut
Anchor concept	NA	Drag-Embeded	Suction buckets

Project Case Studies and Vessel Implications

Two project scenarios:

Fixed bottom steel jackets in 60-80 meters

Floating steel semi-submersible in 80-150 meters



Project Assumptions

Project Assumptions	Project Case 1, Zone 1A Upper Limits of Fixed Bottom	Project Case 2, Zone 1B Floating Project
Turbine Size	20 MW, 275 m rotor diameter	
Project Size	68 WTGs, 1,360 MW total	
COD Year	COD 2040-2050	
Depth Range(m)	60 – 80 meters	80 - 150 meters
Marshalling Port Distance (nm)	100	110
Foundation Concept	Steel Jackets with pin-piles	Steel floating semi-submersible
Array Cables	Conventional static	Partially dynamic
Mooring Spread	NA	6x Catenary
Anchor concept	NA	Drag-Embedded
Substation Foundation	Steel Jackets with pin-piles	
Export Cable Route Offshore/Onshore (miles and km)	115 miles / 15 miles 185 km, 24 km	125 miles / 15 miles 200 km, 24 km

Vessels for Fixed Bottom Case, Zone 1A

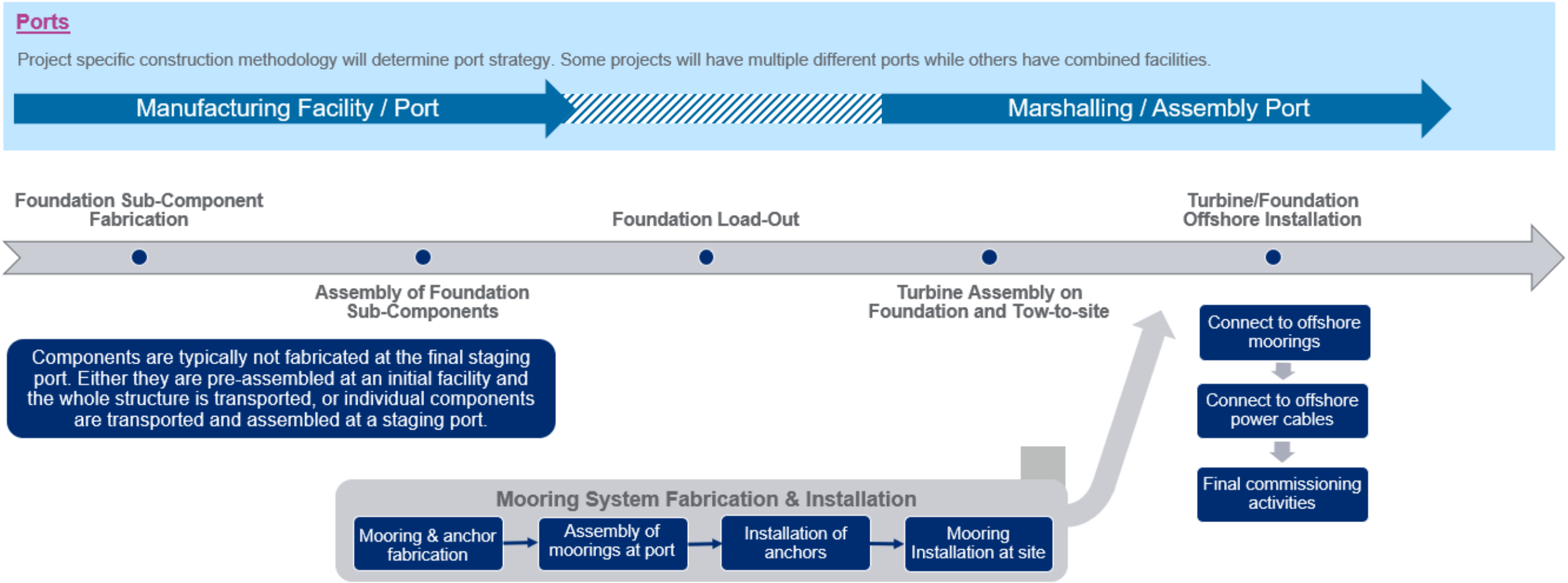
Example Project Case Location	Zone 1A
Depth Range	60 - 80 meters
Foundation Transportation	Heavy Transport Vessels (HTVs) for the transportation of foundation units between fabrication yards and marshalling facilities. Option: ocean going tugs / barges between U.S. ports if no HTVs available.
Prior Installation of pin piles on seafloor	Floating Crane Vessel or Jack up Crane Vessel with piling spread. Option: Construction Support Vessels (CLV) but most are too small for the very largest pin piles needed for deep water jackets
Fixed-jacket loadout	Ocean going tugs / barges to feed installation vessel with jacket foundation units
Jacket installation	Floating Crane Vessel / Jackup Installation Vessel to lift jacket foundations from feeder barge and lift into place.
WTG loadout and installation	Ocean going tugs / barges to feed installation vessel with WTG components. And/or Jones Act compliant U.S. Jackup Installation Vessel to collect WTG components from port for installation at project site
Inter-array cable (IAC) installation	A primary Cable Lay Vessel to install inter array cables (often +1 support vessel). Can load from U.S. mfg. ports to foreign CLV.
Export cable installation	A primary Cable Lay Vessel to install export cables (often +1 support vessel). Can load from U.S. mfg. ports to foreign CLV.
Substation installation (foundation & topside module)	Floating Crane Vessel / Jackup Installation Vessel to pre-install pin piles and lift jacket foundation and topside module from feeder barge and lift into place

Source: Boskalis

Source: Cadeler

Primary Focus on Floating Wind Vessel Needs

- **Understand the methodologies and types of vessels required to support deepwater offshore wind technologies on the East Coast of the U.S.**



Vessels for Floating Case, Zone 1A

Example Project Case Location	Zone 1A
Depth Range	80 – 150 meters
Port to Port Foundation Transportation	Heavy Transport Vessels for the transportation of foundation units between fabrication yards and marshalling facilities. Option: ocean going tugs / barges between U.S. ports if no HTVs available.
WTG Integration	Ocean-going tugs (50t BP) for floater transportation to marshalling yard
Floater assembly & load out	Harbor tugs to hold sub-structure in position following loadout of completed unit. Semi-submersible barges for loadout of foundation structures from quayside
Mooring pre-installation	Anchor Handling Vessel (200-250t BP) for pre-installing anchors and mooring system
Assembled Floater and WTG towing and hookup, return to port (heavy maintenance) & decommissioning	Ocean-going tugs (60t BP) for towing and station-keeping activities. Minimum 200 BP required for the main towing vessel.
Inter-array cable (IAC) installation	A primary Cable Lay Vessel to install inter array cables and often +1 support vessel. Can load from U.S. mfg. ports to foreign CLV.
Export cable installation	A primary Cable Lay Vessel to install export cables and often +1 support vessel. Can load from U.S. mfg. ports to foreign CLV.
Substation installation (foundation & topside module)	Floating Crane Vessel / Jackup Installation Vessel to pre-install pin piles and lift jacket foundation and topside module from feeder barge and lift into place

Anchor Handling Vessel loading drag embedment anchors. Source: Delmar Systems, Lundin Energy Norway.

Boskalis AHV towing floating turbine to site: Source: Boskalis.

Fixed versus floating project and vessel implications

Fixed jackets, pros, cons

Pros:

Jackets are overall a lower cost offshore wind project than floating.

7 – 12+ GW of existing potential in Zone 1 at depths of 60-80 meters.

Jackets use well established vessels and construction methods with lower cost uncertainty and cost escalation risk than floating.

Cons:

Vessels are possibly more challenging than floating due to Jones Act limits on foreign vessels. For jackets there are no U.S. floating crane vessels so there is full reliance on the international fleet and use of feeder barges. There is precedent to use the international fleet for O&G, but very limited options and very high demand.

Similar situation with WTIVs of only one U.S. vessel on the way and otherwise full reliance on foreign fleet in high demand. Depths at 60-80 meters are extremely challenging even if full global WTIV fleet is available.

Floating foundations, pros, cons

Pros:

Potentially less challenging from a vessel perspective than fixed jackets since there is no need for floating crane vessels, which there are none in the U.S. Likewise, no need for large jack-up WTIVs, of which only 1 U.S. vessel is on the way.

Floating primarily uses vessels that exist in limited numbers in the U.S. fleet: Anchor handlers, offshore construction vessels, ocean going tugs. The fleet is very limited for larger vessels of these types.

Purely from a vessel perspective, the U.S. is potentially a market that justifies leap-frogging over deep jackets and going earlier to floaters. However, as we noted it is still higher cost.

Cons:

Higher cost offshore wind project than fixed jackets and higher uncertainty of the costs, risk of cost escalation.

Less established vessel and construction methods, plus all less established supply packages (floater design, dynamic cables, etc.).

Vessel Pipeline and Market Dynamics

Impact of Jones Act on key required vessel types

Vessel Type	Jones Act Requirement	U.S. Availability
Heavy Transport Vessel	No (international transport)	Yes (international fleet)
Harbor Tug	Yes	Yes
Semi-Submersible Barge	Yes	No – Possibility of Newbuild
Ocean Going Tugs	Yes	Yes
Ocean Going Barges	Yes	Yes
Anchor Handling Vessel	Yes	Severely Limited
Construction Support Vessel	Yes	Yes, limited
Floating Crane Vessel	No – precedent of CBP determination allowing international tonnage	No current U.S. tonnage of required specification
Jackup Installation Vessel	Yes (however, workaround with European tonnage and U.S. feeder vessel possible)	Severely Limited – 1 Jones Act compliant vessel currently under construction
Cable Lay Vessel	No – precedent of CBP determination allowing international tonnage. Can load from U.S. ports to foreign CLV.	No – Possibility of Conversion / Newbuild
Crew Transfer Vessel	Yes – Personnel transfer constitutes “passenger” transportation as a turbine considered a U.S. coastwise point	Limited – newbuilds currently under construction
Service Operation Vessel	Yes – Personnel transfer constitutes “passenger” transportation as a turbine considered a U.S. coastwise point	Limited – newbuilds currently under construction

Key installation vessels

Deep water fixed jackets (60-80-meters)

Floating Crane Vessels

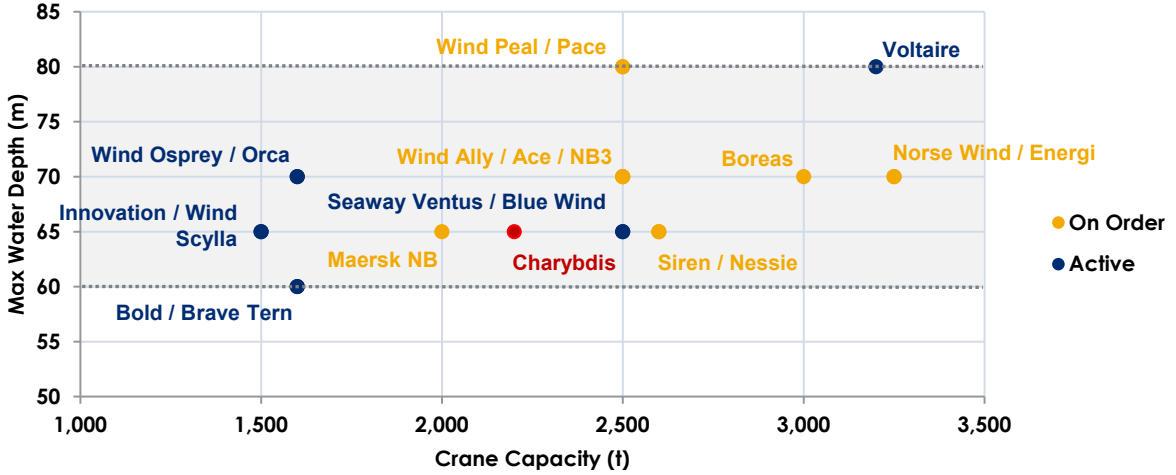
BOKALIFT 2 – Boskalis

SAIPEM 7000 – Saipem

Key Takeaways

- Precedent allowing the use of international tonnage
- Currently no US tonnage of the required specification
- Significant portion of the fleet operating across and experiencing high levels demand from multiple sectors (offshore oil & gas, decommissioning etc.)
- Currently no new tonnage on order, likely down to high capital expenditure required and limited availability of long-term contracts to support the financial case for new assets
- Clarksons see limited appetite across US shipyards to build new tonnage, meaning that the US offshore sector likely to remain dependent on the international fleet for the foreseeable future

Jackup Crane Vessels (60-80 meters) ex. China



Key Takeaways

- Jones Act requirement (however, workaround with compliant feeder solution)
- Currently 1 US Jones Act compliant jackup installation vessel under construction (Dominion Energy's Charybdis)
- Severely limited vessel availability, with majority of European newbuild assets going straight onto long-term agreements
- Older tonnage potentially limited by crane capacity
- Keppel AMFELS in Brownsville currently construction Charybdis making them most likely candidate to support any additional newbuilds

Jackup Crane Vessels

Newbuild United States

Shipowner / Investor Perspective

- To unlock a newbuild in US, owners/investors requirement a strong ‘pipeline’ and firmer economics to pull it off – although the market looks big, this does not current exist
- Consideration is given to further risk in the timeline (infrastructure / permitting / marine logistics delays) will make the JUV “idle” in-between projects
- Lower annual utilisation will have a detrimental impact on the project economics even though there is a reasonably high T/C day-rate (will end up on a lower average for a year)
- Shipowners will invite the charterer to look at the business case on a more “global” scale, not only award the T&I contractor work for the US but offer a portfolio deal and offer OWF scopes in other geographical areas **– *this is however difficult for JV companies***

  This way the shipowner and the financiers get the “overall” acceptable economics out of it, not necessary based on only the US project(s)

General UK Market Perspective

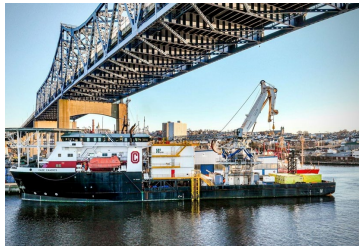
- US Offshore Wind is shaping up …but have some distance to go!
- Believing in Yard’s estimated timetable is a risky business
- What is the offshore wind developers expected % bracket for ROCE and how does that translate into a profitable business case for a shipowner?
- When will there be a fully developed market?
- There are considerable risks to this timeline (permitting, infrastructure, logistics)
- There is a flood of false starts and what we call “Fake News” associated to the US maritime industry…if one would believe the string of announcement there would already be a fleet of capable WTIVs to support, we would like to remind you of the following and offer a word of caution that this is still very much an ongoing problem:
  - **Zentech:** https://www.zentech-usa.com/renewables/
  - **Aeolus:** https://aeolusenergygroup.com/offshore
  - **AK Suda:** https://www.tradewindsnews.com/offshore/designer-ak-suda-looks-to-consortium-to-tap-us-wind-farm-riches/2-1-873658
  - **EXMAR:** https://nationaloffshorewind.org/projects/feasibility-of-a-jones-act-compliant-wtiv-conversion/
  - **Bleutech:** https://gcaptain.com/bleutec-industries-jones-act-compliant-wind-turbine-installation-concept-wins-abs-approval/

….and the list just goes on

Vessels for Floating Wind

Anchor Installation and Towing

Construction Support Vessels



MPSVs Crane Size (mt)	Count	# with A-frames	# with gangway	% Stacked	% Shipyard/Idle/Warm Stacked
10 - 30	7	1	0	14%	71%
31 - 60	10	4	0	0%	40%
61 - 165	14	1	3	0%	14%
166 - 249	n/a	n/a	n/a	n/a	n/a
250+	6	0	1	0%	17%

Key Takeaways

- Jones Act requirement
- The US CSV fleet currently consists of 37 vessel (10t crane or larger)
- Several crane vessels are conversion from the AHTS or PSV fleet, with further conversions expected
- Hornbeck are in the process of building 2 new MPSVs with 250t cranes
- As of Q1 2023, 6 MPSVs were working for offshore wind projects within the United States (many converted for use as W2W vessels).

Anchor Handling Vessels

U.S. AHTS	Built / Rebuilt	DP	DWT (mt)	LOA (ft)	Beam (ft)	Depth (ft)	Bollard Pull (mt)	BHP
26	1977-2012	N/A, DP1, DP2	762 - 5713	181' - 361'	40' - 80'	15' - 34'	49t - 276t	5750 - 31862

Key Takeaways

- Jones Act requirement
- Fleet currently consists of 26 assets (13 cold stacked, 2 under reactivation, 11 active)
- 19 of the 26 are DP2 AHTS vessels (118-276t BP), 9 of these are cold stacked, 2 are on long-term charters, 1 is on the East Coast working SPOT opportunities in offshore wind, leaving around 7 assets.
- The largest units (>200t BP) include Laney Chouest, Dove Chouest & Aiviq
- There are yards that can build this sort of tonnage, mainly based in the Gulf of Mexico

Member Updates

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M-TWG

2024/2025 Research Agenda

List of Research Agenda Topics:

Topic
1. Acceptable level of risk determination
2. Set-back distance
3. Navigation emergencies
4. Impacts to navigation radar and radio communication systems
5. Submarine cable routing
6. Considerations for cable burial depth
7. Anchorage areas updates
8. Anchor strike liability
9. Vessel traffic modeling and simulations
10. Jones Act-Compliant Vessel Availability
11. Regional Shipyard Capacity
12. Construction and Operational Safety Zones
13. Seabed Infrastructure Security

WSP Recommendation

- Opportunities for Additional Study
- Master Plan 2.0 Track 2
- Recommend Closing Out

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M-TWG Meeting Survey: Topics to Close-Out

Topic to Close Out	
1. Acceptable level of risk determination	
2. Set-back distance	
3. Navigation emergencies	
4. Impacts to navigation radar and radio communication systems	
5. Submarine cable routing	
6. Considerations for cable burial depth	
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10. Jones Act-Compliant Vessel Availability	
11. Regional Shipyard Capacity	
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13. Seabed Infrastructure Security	

WSP recommendation

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M-TWG Meeting Survey: Topics to Close-Out

Topic to Close Out	
1. Acceptable level of risk determination	
2. Set-back distance	I
3. Navigation emergencies	III
4. Impacts to navigation radar and radio communication systems	
5. Submarine cable routing	
6. Considerations for cable burial depth	
7. Anchorage areas updates	I
8. Anchor strike liability	
9. Vessel traffic modeling and simulations	I
10. Jones Act-Compliant Vessel Availability	
11. Regional Shipyard Capacity	I
12. Construction and Operational Safety Zones	
13. Seabed Infrastructure Security	

WSP recommendation

Post-survey M-TWG additions

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M-TWG Meeting Survey: Topics of Highest Interest

Topic to Close Out	
1. Acceptable level of risk determination	
2. Set-back distance	
3. Navigation emergencies	
4. Impacts to navigation radar and radio communication systems	
5. Submarine cable routing	
6. Considerations for cable burial depth	
7. Anchorage areas updates	
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9. Vessel traffic modeling and simulations	
10. Jones Act-Compliant Vessel Availability	
11. Regional Shipyard Capacity	
12. Construction and Operational Safety Zones	
13. Seabed Infrastructure Security	

Topic identified at M-TWG meeting

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M-TWG Meeting Survey: Topics of Highest Interest

Topic to Close Out	
1. Acceptable level of risk determination	II
2. Set-back distance	III
3. Navigation emergencies	II
4. Impacts to navigation radar and radio communication systems	III
5. Submarine cable routing	IIIIII
6. Considerations for cable burial depth	IIIIII
7. Anchorage areas updates	I
8. Anchor strike liability	II
9. Vessel traffic modeling and simulations	
10. Jones Act-Compliant Vessel Availability	II
11. Regional Shipyard Capacity	
12. Construction and Operational Safety Zones	I
13. Seabed Infrastructure Security	I
14. Workforce and Training`	**NEW**

Post-survey M-TWG recommendations

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M-TWG Meeting Survey: Topics of Highest Interest

Topic to Close Out	
1. Acceptable level of risk determination	II
2. Set-back distance	III
3. Navigation emergencies	II
4. Impacts to navigation radar and radio communication systems	III
5. Submarine cable routing	IIIIII
6. Considerations for cable burial depth	IIIIII
7. Anchorage areas updates	I
8. Anchor strike liability	II
9. Vessel traffic modeling and simulations	
10. Jones Act-Compliant Vessel Availability	II
11. Regional Shipyard Capacity	
12. Construction and Operational Safety Zones	I
13. Seabed Infrastructure Security	I

M-TWG recommendations

Set-back distance identified on both close-out and high interest lists

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Discussion Questions:

1. Do the results seem to represent your organization’s interests?

2. Are you comfortable relying on these responses for determining next steps for the research agenda?

3. If you didn't have an opportunity to respond to the survey, would you be willing to respond by April 26?

Next Steps

NYSERDA

Thank you!