BUSINESS NETWORK for OFFSHORE WIND

Supply Chain Roadmap: Where Are We on This Road?
Leadership 100
November 18, 2021

The current development of the offshore wind industry in the United States is, in part, limited by the lack of a robust domestic supply chain. In 2019, L100 attendees identified the supply chain as a top industry challenge to address. Using the Network's supply chain database—Supply Chain Connect—as a starting point, the L100 leaders conceived the idea of development of an industry roadmap. The roadmap is an industry formulated approach, which could be used for several purposes including, but not limited to, identifying the U.S. supply chain capacity, pinpointing potential domestic manufacturing gaps, providing information to support a regional port strategy, and initiating cooperation among states on workforce issues. The following provides a summary of where the Supply Chain Roadmap stands and what the steps are moving forward.

Background

The project team is comprised of the Business Network for Offshore Wind (Network), DNV and the National Renewable Energy Laboratory (NREL). The work is being funded under a grant administered by the National Offshore Wind Research and Development Consortium (NOWRDC) with funds received from the Department of Energy, Maryland Energy Administration, and the New York Research and Development Authority.

The project utilizes the Network's Supply Chain Connect registry, the premier offshore wind database where companies indicate their product and/or service capabilities for the industry, to collect and analyze the respective strengths of the supply chain. The study will determine the readiness level of the existing supply chain to support 30 GWs by 2030. Moreover, policymakers and developers will gain a better understanding of the collective benefits of a domestic supply chain through this study that will hopefully facilitate the acceleration of the offshore wind industry in the United States.

The Study includes 7 major tasks:

1. Expand the Supply Chain Connect supplier registry
2. Develop a Baseline Atlantic Offshore Wind Deployment Projection
3. Determine Resources Required to Support the Atlantic Deployment Pipeline
4. Establish the Anticipated Domestic Manufacturing and Workforce Requirements
5. Identify Readiness Levels and Gaps in Existing Supply Chain
6. Conduct Economic Case Study for a Fully Domestic Supply Chain
7. Stakeholder Engagement

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Project Timeline:

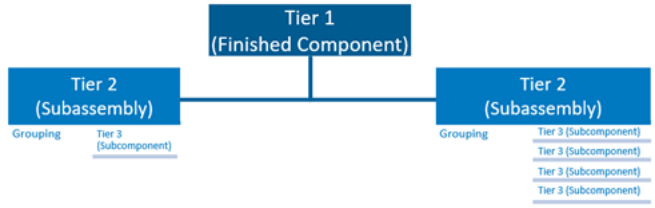
	2021									2022							
	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
1.1: Memo describing hierarchy maps	100%																
2.1: Gantt chart with development timeline	100%																
2.2: Report with constraints of European market	100%																
3.1: Draft gaps and economic impact report				100%													
4.1: Spreadsheet with supply chain requirements								5%									
5.1: Memo describing role in readiness level report											0%						
6.1: Draft supply chain impact report														0%			

Work Completed to Date

The team has completed the first three tasks and recently delivered a draft of the Phase I Report that includes a deployment pipeline, gaps analysis and initial findings about port capabilities, vessel needs, and workforce.

Hierarchy and updating Supply Chain Connect

To better understand the opportunities for existing domestic suppliers, under Task 1, the project team developed a hierarchical breakdown of all major fixed-bottom and floating wind Tier 1 components. For example, the wind turbine was separated into numerous parts and pieces that make up its intricate design. By identifying all the subassemblies and subcomponents that make up each Tier I's unique supply chain, eventually, the strengths and gaps of the existing domestic manufacturing landscape can be assessed.



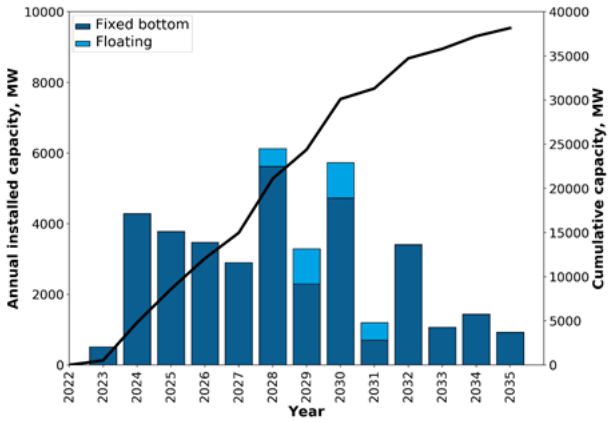
In parallel, the Network's existing Supply Chain Connect (SCC) company registry was expanded to include each subcomponent that makes up all of the Tier 1 components[1]. As part of the updated SCC, the Network added additional fields for data collection. The fields not only included new categories of products for companies to register under but also data fields seeking manufacturing throughput and questions about capabilities for critical components.

Key findings from hierarchy mapping:

- The wide range of Tier 2 and Tier 3 components (subassemblies and subcomponents) required for offshore wind projects represents an opportunity for existing businesses to leverage their capabilities to support the growing offshore wind market; however, these specialized components would likely require additional investment or certification to develop the capabilities to manufacture them domestically.
- Identify critical path items which represent a particular challenge to establishing a domestic supply chain. Some of these components include:
    - Permanent magnets
    - Yaw bearings and pitch bearings
    - Flanges
    - Blades
    - Array and export cables materials, such as specific lead alloys and plastics used for insulation, need to be imported as they are not currently produced in the United States.
    - Critical offshore substation sub-tier components, such as power transformers, switchgear, power compensation devices, gas-insulated switchgear, and shunt reactors.

Deployment Pipeline

Next to understand the supply chain that is necessary to build up the offshore wind industry along the Atlantic Coast, DNV GL developed a baseline deployment projection through 2035. This pipeline was based upon public data on planned lease and wind energy areas. The pipeline conveys the scheduling of how existing offshore wind lease areas can be developed. This pipeline considers evolving technologies over the course of the decade, such as increasing wind turbine ratings and the types of vessels required to install projects.



Annual and cumulative installed capacity for the Baseline pipeline scenario. With no supply chain constraints, 30.1 GW are installed by the end of 2030.

Key Findings

- The awarded and soon-to-be-awarded lease areas (including the California Call Areas and New York Bight Wind Energy Areas) have sufficient capacity to deploy 30.1 GW by the end of 2030.
- If all projects in the pipeline progress with a realistic development and permitting schedule and do not experience significant supply chain delays, deployment will peak in 2028 at just over 6 GW.

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U.S Port and Vessel Assessment

As part of work, the project team has also performed an analysis of ports capabilities and vessels. We present a high-level description of the ports that may contribute to the domestic offshore wind industry and a description of the type of vessels that will be used to install projects. The port analysis reports on the key characteristics that are relative to offshore wind deployments, such as berthage, laydown areas, manufacturing facilities, accessibility, and potential upgrade requirements.

In terms of vessels, construction of new vessels and modernization of the fleet needs to happen in both Europe and the U.S. to meet the expected demand through the end of the decade. The findings provide that there is a tremendous opportunity for vessel building as the project team is projecting a peak demand to 2030 for 5 Jones Act compliant WTIVs, 10 Feeder Barge/Vessels and at least 13 SOVs to meet the 2030 target.

Table 18 - Vessels that pose a high or moderate risk to achieving the National Offshore Wind Target.

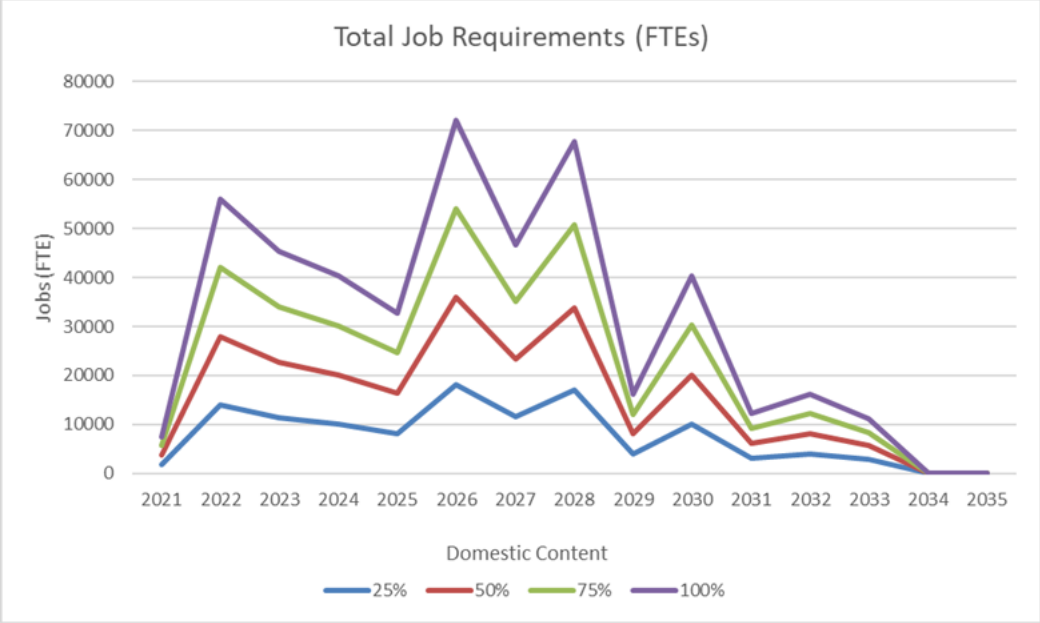
Vessel Type	Estimated Cost	Estimated construction time	# Existing	Estimated Peak Demand to 2030	Risk to 30GW target
Jones Act-compliant Wind Turbine Installation Vessel (WTIV)	$250M-$600M	3 years	0 / 1 under construction	5	
Cable Lay Vessel (CLV)	$200M	3 years	0	4	
Feeder Barge/Vessel	$150M-$200M new, $10-$20M retrofit	Depends on design	20 jack-ups, 44 barges	10	
Service Operation Vessel (SOV)	$50M-$100M new, $10M-$50M retrofit	2-3 years	0 / 2 under construction	13+	

Key findings related to ports and vessels:

- Few East or West Coast ports have sufficient capabilities to fully support offshore wind activities, although several ports are actively investing in infrastructure upgrades.
- Draft limitations in the navigation channels and at quayside may require projects to use a feeder barge strategy to install projects even if Jones Act-compliant wind turbine installation vessels are available.
- New vessels are required to alleviate risks of missing the National Offshore Wind Target, with wind turbine installation vessels posing the biggest risk followed by feeder barges, cable lay vessels, and service operation vessels. Although wind turbine installation vessels do not necessarily need to be Jones Act-compliant, if a feeder barge installation strategy is used, building these vessels domestically may make it more likely that they are dedicated to projects in the United States.

Workforce Assessment

The work performed to date also includes an initial workforce and economic assessment. The assessments were based on scenarios relating to the percentage of domestic content in a project. Depending on the level of domestic content, between 18,000 and 72,000 jobs would be needed to meet component demand.



Baseline East and West Coast - number of jobs (FTEs) for all component demand based on scaling domestic content for the entire supply chain

Key findings for workforce include:

- Nacelle production has the potential to create the highest demand for jobs, particularly through the fabrication and assembly of subcomponents such as generators, gearboxes, and power converters.
- The high demand for a trained workforce in the early 2020s suggests that there is an immediate need for training in the appropriate job categories.
- The ramp up in jobs between 2021 and 2022 demonstrates that if manufacturing facilities open in time and partner with suppliers to fabricate and assembly components for initial offshore wind projects, there is an immediate need, ensuring there are trained workers ready to hire.
- The effects of the expanded labor pool from a domestic supply chain could inject an average of $942 - $3,800 million per year into the United States economy. This amount of gross domestic product growth depends on the level of domestic content, with greater expansion of the supply chain leading to greater impacts on the economy.

Outreach

Stakeholder engagement and outreach is key to the success of this project. To increase the number of companies in SCC, the Network is engaging in an outreach and marketing campaign. The Network has spoken at events, attended trade shows, and hosted a webinar to highlight changes to supply chain connect. In addition, the Network has engaged in marketing through the weekly Offshore Wind Insider Newsletter and social media platforms. Since the start of the project, the Network Supply Chain Connect Registry has increased from 1483 in December 2020 to 2170 through end of October 2021.

Next Steps

From here the project team will shift our focus to getting feedback from industry on the work completed to date as well as diving further into the analysis of the capabilities and gaps of Tier 2 and 3 subassemblies and subcomponents. The team will be completing the following work:

- Reaching out to industry reviewers to provide feedback on draft Phase 1 report.
- Calculate the number of Tier 2 and 3 components required
- The information collected in SCC, will be analyzed and to capabilities of the companies will be compared to the deployment pipeline to understand the strengths and weaknesses of the existing supply chain as part of a follow-on report. Compare supply chain connect data to the Tier 2 and 3 requirements developed under Task 4
- Continued outreach targeted manufacturing firms and manufacturing associations and organizations
- The second report in this study is planned for publication in 2022, will compare the demand for components in all sectors of the supply chain with the capabilities of existing manufacturers to understand the readiness level of the current supply chain to support the anticipated deployment pipeline through 2030.