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WHITE PAPER / **SUPPORTING OFFSHORE WIND DEVELOPMENT**

SUPPLY CHAIN CHALLENGES FACING U.S. OFFSHORE WIND PROJECTS

BY Tony Appleton

Tapping into the wind resources off the U.S. coastline has the potential to provide clean energy resources and bring economic prosperity through direct and indirect job creation. However, developers must address highly specialized supply considerations to meet schedule, budget and long-term operational needs.

The electric energy production potential of the U.S. offshore wind market is well documented. Tapping into this new market has unique challenges that, at a high-level, can be segmented into onshore and offshore components. Onshore considerations deal primarily with connecting offshore generation to the onshore electric grid. However, offshore components rely heavily on supply chain considerations for wind farm development, operations and maintenance.

SITING OFFSHORE ASSETS

Permitting an offshore wind project is complex. Depending on the location, permitting efforts may involve multiple federal agencies and multiple state governments. In addition, environmental considerations above water, on the water surface and below the water level must be considered.

Routes used by the fishing industry and migratory animals limit where turbines and the offshore platform can be placed. Specialized equipment, such as remotely operated vehicles (ROVs), must examine the seabed and take core samples to determine the types of foundations to be used and how transmission cables are to be placed (trenched vs. covered in rock). ROVs are common in the U.S. and obtaining access is merely a line item cost. These ROVs also help route the underwater cable and identify other obstacles. In the United Kingdom, for example, unexploded ordnance found within an area of construction must be removed prior to construction. In the U.S., obstacles that must be avoided include shipwreck remains, telecommunications cables, pipelines and sensitive flora or fauna.

To help streamline siting efforts, the U.S. Department of Interior, through the Bureau of Ocean Energy Management (BOEM), has identified offshore wind zones in federal waters along the outer continental shelf and has facilitated a competitive bidding process for developers to obtain leases to those areas.

If each of the first 12 commercial leases executed by BOEM under its renewable energy program for offshore wind development in the U.S. is built to its greatest potential, such developments would support approximately 15 gigawatts of offshore wind capacity.

ACCESS TO SPECIALIZED VESSELS

Construction, operations and maintenance of an offshore facility requires the use of purpose-built, highly specialized vessels that are scarce or nonexistent within the U.S. The Jones Act — enacted in 1920 to regulate maritime commerce in the U.S. — prohibits the use of foreign built, owned and/or manned vessels to transport goods between U.S. domestic ports. Compliance with the Jones Act means that developers cannot simply rent vessels from their European counterparts. Specialized vessels include:

- Jacket vessels, which serve as an offshore crane, lifting the turbines into place. No such vessels have been built in the U.S.
- Crew Transfer Vessels (CTV's) vs. Sea Transfer Vessels, which act as a type of ferry or water taxi to bring crews to and from a specific turbine. Only one such type of vessel currently exists that meets Jones Act requirements.
- Service offshore vessels (SOVs), which are dispatched for weeks at a time and include passenger and crew accommodations as well as room for specialized maintenance activities. Only one such type of vessel currently exists that meets Jones Act requirements.

Each offshore developer is actively working to develop a means for accessing and using such vessels without violating the Jones Act. During construction of the Block Island Wind Farm — currently the only operational offshore wind farm in the U.S. — developers transported the turbines on the jacket vessels from overseas directly to the project site. This project involved the installation of only five, 6-MW turbines, making the transportation and installation method feasible. For larger developments, an alternative solution is required.

PORTS

Ports are a critical component to developing and sustaining an offshore wind industry. For the wind industry, there are four types of ports:

- Manufacturing — Ports with manufacturing facilities on-site.
- Construction — Ports where construction of an offshore wind farm is managed.
- Assembly — Ports with facilities for assembling various components that come in from various parts of the country or world.
- Operations & Maintenance (O&M) — The location of SOVs and STVs, and where all O&M activities are managed.

Key considerations for port use include size, location, depth and the ability to handle the weight of equipment. For construction ports, the seabed is also an important consideration. For example, jacket vessels lift when docked and require the appropirate type of seabed to do so. Accessibility is another consideration. Many ports on the East Coast have bridges that are too low for many offshore wind vessels to pass under.

To address the unique needs of the offshore industry, Connecticut recently announced plans to redevelop State Pier in New London. Redevelopment work involves upgrades to the port's infrastructure and heavy lift capability. State officials say that the upgrades will allow State Pier to meet facility requirements of the offshore wind industry. The redevelopment is anticipated to benefit the port's long-term growth by increasing its capability to accommodate heavy lift cargo for years to come.

SUSTAINABLE LABOR FORCE

A skilled labor force is essential for cost-effective offshore wind construction and O&M. Specialist jobs include pilots for the various vessels, helicopters and ROVs. Technicians are also needed to read the scans from the ROVs. Marine coordinators, who are similar to air traffic controllers, are needed to maintain safety and control vessel traffic throughout the area. Traditional skilled labor, such as carpenters and welders, must have considerable health and safety training prior to working at an offshore and at-height project site. The potential economic boom through high-paying job creation has several states maneuvering to capitalize to the greatest extent possible. However, it is unlikely that any single U.S. state can support all aspects of the offshore wind market's supply chain requirements. Cross-state collaboration is essential to not only create jobs but sustain those jobs and avoid potential boom-and-bust cycles.

Select community colleges in Massachusetts are now offering specialist training for a variety of offshore wind market jobs. The Rhode Island Commerce Corp. is working with British consultants to develop an offshore wind supply chain and supply chain directory. New York has numerous ports that can support manufacturing. The benefits of the burgeoning offshore market will directly and indirectly support growth throughout the region. The U.S. has the opportunity to expedite its supply chain development through cross-state collaboration.

NEXT STEPS

The frequency of solicitations for offshore wind generation is increasing as states move to achieve clean energy objectives. Developers must work to obtain BOEM leases and position themselves to compete for state solicitations that include considerations for local supply chain utilization. Few, if any, U.S. companies have the existing experience or knowledge to perform design and construction of offshore components. However, a robust, local supply chain does exist for the onshore components.

U.S. companies seeking to expand their capabilities to offshore components have the opportunity to subcontract or partner with European firms during the initial project developments. Many developers today are following a pyramid approach for engaging the local supply chain for initial offshore wind developments. This approach involves selecting a small number of larger companies, such as engineering-procurement-construction (EPC) firms who then subcontract to the next tier of providers, such as geotechnical design, who in turn subcontract to the next tier of specialized firms.

To build local capability, supply chain members should seek to partner with European firms to gain knowledge and experience. This approach provides a win-win opportunity for all stakeholders. European companies gain local supply chain partners to support current pursuits while U.S. companies gain critical knowledge and experience to position themselves for larger roles in future projects.

U.S. does not need to go through the incremental steps endured by the European market in the development of a mature offshore wind industry. Knowledge transfer enables the U.S. supply chain to apply lessons learned from the European market and identify key differences between the European and U.S. markets to create a sustainable offshore wind model within a few short years.

BIOGRAPHY

TONY APPLETON, is director of offshore wind for Burns & McDonnell. He is a Chartered Engineer registered with the Institution of Mechanical Engineers and earned a bachelor's degree in mechanical engineering (with honors) from Newcastle University upon Tyne, England. He specializes in the offshore renewables and interconnection global markets and has led organizations and teams with work ranging from front-end feasibility studies to commissioning and operation and maintenance.

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11057-OFF-0820