Emerging Technologies

Introduction to Offshore Wind Energy Careers

An important emerging sector of the U.S. maritime and transportation industry is offshore wind energy, particularly in the Mid-Atlantic region. By the end of 2015, the U.S. Bureau of Ocean Energy Management (BOEM) had awarded ten leases for commercial offshore wind project development in open ocean waters off Massachusetts, Rhode Island, New Jersey, Delaware, Maryland, and Virginia. These commercial leases cover a total underwater area of 1.15 million acres, and represent a market demand for nearly 4,300 offshore wind turbines, and their steel foundation substructures.

The skilled workforce needed for fabrication, delivery, on-shore assembly, port staging, ocean installation, and reliable operation of an offshore wind project over its 20- to 30-year service life includes all three of the core maritime industry sectors: (1) shipbuilding & ship repair; (2) ports & logistics; and (3) vessel operations.

This EMERGING TECHNOLOGIES section provides guidance and information on how existing credentials in each of the above three maritime sectors match the needs of the offshore wind industry and what additional specialized training is needed to “bridge the gap” between existing careers in any one of the three core sectors and a career in the emerging U.S. offshore wind industry.

The first part of this section is organized to lead off with a general description of the offshore wind supply chain element that primarily require skills from the shipbuilding & ship repair sector, which is Manufacturing. It then describes two elements that primarily require skills from the ports & logistics sector, which are Delivery and Port Staging. Finally, it describes two supply chain elements that primarily require skills from the vessel operations sector, which are Ocean Installation and Reliable Operation.

The second part of this section identifies the job skills that are needed to embark on a career in offshore wind. This follows the same organization as the first part, presenting information in the following order:

• Manufacturing
• Delivery and Port Staging
• Ocean Installation and Reliable Operation.

Bremerhaven’s EUROPORT container terminal includes an offshore wind base port, with 400 m of ocean-access quay, with alongside ground strength to support jack-up of turbine installation vessels, 200 m of short-sea quay for inland waterway access, and a 25-hectare area for staging of heavy components.
In order to understand the skills and trades needed to fabricate and assemble the various components of an offshore wind turbine, a diagram of the offshore wind turbine (OWT) fabrication and installation process is provided. The OWT fabricates and installs several critical components, including the foundation, which can be a concrete weight ballast or steel jacket; the tower, which can range in length from 230 to 260 feet (70 to 80 m), requiring three 89-foot flatbed rail cars to transport a single blade; and the rotor blades, which are typically half the size of the offshore foundations but still so large that they can be transported more economically by water than by land. Heavy-lift vessels are used to transport turbine blades or tower sections destined for land-based wind projects in the Midwest; these vessels typically have their own rotating cranes installed along one side of the ship, so that they don’t depend on vessel operators, but it also requires the skilled use of welding rod and cutting torch to make and break rigid steel “sea fastenings” that secure these large and heavy components to the deck. Likewise, transfer of a component from one mode of transport (say, from a ship to a truck) requires logistics planning skills on a global scale.

Note that waterborne transport on barges or ships not only requires port and harbor infrastructure, but it also requires the skilled use of welding rod and cutting torch to make and break rigid steel “sea fastenings” that secure these large and heavy components to the deck. Likewise, transfer of a component from one mode of transport (say, from a ship that is delivering blades or tower sections from an overseas manufacturer) to another mode of transport (say, to a truck or to a rail car) requires riggers and crane operators; stevedoring trades that are found at any major port. Managing these deliveries also requires logistics planning skills on a global scale.

In 2015, the Virginia Department of Mines, Minerals and Energy commissioned an evaluation of Virginia’s port readiness for offshore wind (www.dmme.virginia.gov/DE/OffshoreWindPortEvaluation.shtml), which included the assessment of Virginia’s ports for offshore wind turbine fabrication. This study shows that the Virginia Department of Mines, Minerals and Energy (DOEM) is able to satisfy the needs of a small and growing offshore wind market by the transfer of a component from one mode of transport (say, from a ship that is delivering blades or tower sections from an overseas manufacturer) to another mode of transport (say, to a truck or to a rail car) requires riggers and crane operators; stevedoring trades that are found at any major port. Managing these deliveries also requires logistics planning skills on a global scale.

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OVERVIEW OF JOB SKILLS NEEDED IN THE OFFSHORE WIND SUPPLY CHAIN

Manufacturing

Tower Fabrication: The skills and trades needed to fabricate tower sections are the most directly transferable from shipbuilding & ship repair. The specific certifications needed to qualify for hire at a tower fabrication facility will be listed and referenced to the appropriate job description in the shipbuilding & ship repair section of this SMART Career Guide.

Foundation Jacket Substructure Fabrication: Fabrication of foundation jacket substructures and offshore substation platforms requires some additional qualifications related to the fitting up of frames and welding together the main legs and braces. Secondary steel fabrication, such as ladders, railings, platform gratings, hatches, and doors uses exactly the same skill set as required for these same structures on ships. Specific certifications needed to qualify for hire at a foundation jacket substructure fabrication facility will be listed and referenced to the appropriate job description in the shipbuilding & ship repair section of this SMART Career Guide.

Wind Turbine Blade Fabrication: Manufacturing of wind turbine blades requires composite fabrication skills, some of which are transferable from the fiberglass boatbuilding and repair industry. Additional training is available from the American Composites Manufacturers Association. Specific certifications needed to qualify for apprenticeship and hire at a blade fabrication and repair facility may vary and will be determined by that facility.

Wind Turbine Nacelle Production: Manufacturing of wind turbine nacelles utilizes steel fabrication skills but also specialized assembly line training from the turbine manufacturer.

Delivery and Port Staging

Working in this part of the offshore wind supply chain is a matter of identifying companies that already are active in logistics for land-based wind projects, particularly if they have experience in the waterborne transport of tower sections, blades, and nacelles.

Ocean Installation and Reliable Operation

The personnel who captain and crew the vessels used to deploy components offshore and install them in the ocean must meet U.S. Coast Guard mariner certification requirements. Certain fabrication trades, such as welding and grouting, are also required for offshore installation, and these workers must have basic offshore safety and survival training, in addition to the certifications of their trade.

Wind turbine service technicians who already are certified to work up-tower on land-based wind turbines likewise must have basic offshore safety and survival training, in addition to their wind energy technician certifications. Some offshore wind turbines are accessible by helicopter and service technicians for these turbines also must have helicopter underwater egress training (HUET). The SMART Center is participating in an offshore wind health and safety working group that will define the specific offshore safety and survival training requirements, including HUET, which will be required for any land-based wind service technician that wants to work offshore.