Floating Offshore Wind US Manufacturing and Commercialization

Cooperative Research and Development Final Report

CRADA Number: CRD-23-23782

NREL Technical Contact: Jeremy Stefek

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Technical Report
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Cooperative Research and Development Final Report

Report Date: June 11, 2025

In accordance with requirements set forth in the terms of the CRADA agreement, this document is the CRADA final report, including a list of subject inventions, to be forwarded to the DOE Office of Scientific and Technical Information as part of the commitment to the public to demonstrate results of federally funded research.

Parties to the Agreement: Ocergy Inc.

CRADA Number: CRD-23-23782

CRADA Title: Floating Offshore Wind US Manufacturing and Commercialization

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Sponsoring DOE Program Office(s):

Office of Energy Efficiency and Renewable Energy (EERE), Wind Energy Technologies Office

Joint Work Statement Funding Table showing DOE commitment:

Estimated Costs	NREL Shared Resources Government In-Kind
Year 1	$75,000.00
Year 2, Modification #1	$.00
Year 3, Modification #2	$.00
Year 4, Modification #3	$.00
TOTALS	$75,000.00

Executive Summary of CRADA Work:

The American-Made FLoating Offshore Wind ReadINess (FLOWIN) Prize provides the Participant with a voucher technical support provided by DOE national laboratories, such as the Contractor. The primary goals include providing insights for the OCG-Wind floater on 1) capabilities and efficiency from advanced manufacturing, 2) workforce needs to manufacture and fabricate the technology, 3) vessel requirements and opportunities for installation.

CRADA benefit to DOE, Participant, and US Taxpayer:

- Uses the laboratory's core competencies.
- Enhances U.S. competitiveness by utilizing DOE developed intellectual property and/or capabilities.

Summary of Research Results:

NREL assessed the supply chain and workforce considerations for the OCG-Wind floater technology, a floating semi-submersible offshore wind substructure, as well sharing vessel needs to inform their installation strategy. This technical assistance was in support of the FLoating Offshore Wind ReadINess (FLOWIN) Prize Phase 2 submission.

NREL provided an assessment of domestic supplier capabilities for the main components of their floating offshore wind platform design and analyzed US regional and national supply chain constraints and gaps. Thirteen interviews with companies including steel distributors, forges, foundries, ports, large component fabricators, subcomponent fabricators, and secondary suppliers provided key insights such as 1) assembly ports are the key infrastructure barrier standing in the way of unlocking the domestic assembly and component fabrication for steel-based FOW platforms, 2) domestic steel producers can supply the types and quantities of steel necessary for FOW platforms, and 3) coordination between stakeholders will be a vital part of successfully developing the supply chain and infrastructure needed to domestically produce FOW platforms.

In the workforce assessment, NREL documented a step-by-step approach to conduct a place-based assessment of the foundational workforce consideration for recruiting, upskilling, and retaining a workforce, such as supportive local and state policy, nearby education and training programs, and existing relevant industry. This approach was applied to Tacoma, Washington. Tacoma was indicated to have the potential be a successful location for fabrication and assembly of floating offshore wind energy in terms of workforce development.

To share data on vessel requirements to install the OCG-Wind floater, NREL compiled resources that help answer the questions related to anchor handling tug vessels, shared a database of cable laying vessels, and answered questions on complying with the Jones Act.

Task 1: Capabilities and efficiency from advanced manufacturing

The Contractor shall evaluate advanced manufacturing technologies for the OCG-Wind floater fabrication. The Contractor shall consider technologies, processes, location, and other strategies to increase the automation and efficiency during the fabrication of the technology. The Participant shall provide technology requirements and engineering designs to better understand the industrialization potential. This task supports developing a deeper understanding of the manufacturing capabilities and supply chain needs for the OCG-Wind floater technology. Work activities under this Task 1 include:

- Research the supply chain requirements and fabrication processes for the OCG-Wind floater.
- Assess technologies and processes to increase automation of OCG-Wind floater fabrication.
- Define what capabilities would be necessary to develop facilities or retrofit existing facilities with advanced manufacturing technologies.

NREL provided Ocergy an assessment of domestic supplier capabilities for the main components of their floating offshore wind platform design and analyzed US regional and national supply chain constraints and gaps. As part of this analysis, NREL conducted thirteen interviews with companies including steel distributors, forges, foundries, ports, large component fabricators, subcomponent fabricators, and secondary suppliers. The Ocergy is a tubular design that features flanged connections. This assessment was documented in a report to Ocergy, in which NREL engaged several questions. Key insights from this supply chain assessment include:

- Final assembly ports for steel-based floating offshore wind (FOW) platforms are the key infrastructure barrier standing in the way of unlocking the domestic assembly and component fabrication of these structures.
- This design utilizes flanged connections which could result in reduced assembly times when compared to designs featuring welded connections.
- Final assembly time dictates the number of concurrent builds that will ultimately be needed to deliver one platform per week.
- The total number of workers and type of workers needed to fully staff a final assembly facility can vary depending on component design and onsite activities (see above), but interviews indicated that facilities could need between 500 and 1,000+ workers.
- Tubular designs that are fabricated on the West Coast will likely require additional equipment investments since many West Coast fabricators have limited, if any, rolling capabilities.
- Multiple existing fabricators currently operate within the West Coast region. Though most of these yards are in the Columbia River Basin / Portland region, there are some California fabricators that are currently capable of producing and/or finishing subcomponents (braces, columns, and tanks).

- While forges in the United States can only produce flanges/rings that are up to 6.5 m diameter. Domestic manufacturers could invest in new equipment and/or facilities to expand their ring rolling capabilities to produce large diameter flanges/rings for FOW. However, several key hurdles must be overcome for domestic production of large diameter flanges/rings.
- Interviewees stated that domestic steel mills are essentially capable of producing any standard of steel necessary (including European standards or equivalent), although it may cost more if the platform design calls for a less common steel grade.
- Early and consistent engagement between potential ports, fabricators, and suppliers to optimize designs and processes, account for lead times and workforce training, and encourage capital investments is suggest to fabricate this technology.

Task 2: Workforce development for OCG-Wind floater fabrication

The Contractor shall assess the workforce training programs and initiatives to meet labor needs to fabricate the OCG-Wind floater. The Participant shall provide available information on workforce needs such as the possible number of workers or skillsets expected during fabrication. Special focus will be given to ensuring skilled trade labor can be hired from marginalized and historically underrepresented groups. The scope of the workforce development will be in a geographic location of interest near the final fabricator. The Contractor shall also develop a tool to guide the Participant in the assessment of **workforce developing that can be reproduced in** different regions or communities across the United States (US). Work activities under this Task 2 include:

- Assess existing education and training programs that could support OCG-Wind floater.
- Identify gaps and opportunities in workforce development programs within communities.
- Provide recommendations to increase the supply of workers, especially from marginalized communities.

NREL developed a seven-step workforce assessment process to better understand the workforce skills, training programs and initiatives to fabricate the OCG-Wind floater. The process is an effective framework for evaluating workforce development in projects across different regions to meet the occupational needs (e.g., qualifications and certifications) to fabricate a floating semi-submersible offshore wind substructure. The workforce assessment process, which also details the type of data collected in this Task is shown in Figure 1.

Figure 1. Seven step workforce assessment replicable methodology

This approach assessed existing education and training programs at a regional and statewide level, an identification of gaps and opportunities in workforce development initiatives, and a list of recommendations to increase the supply of workers, particularly from communities. This approach was documented for Ocergy to use as a tool in future workforce assessments for technology deployment in other communities across the United States.

This approach was applied to the Tacoma, Washington area to understand the foundation that a location has in place for recruiting, upskilling, and retaining a workforce, such as supportive local and state policy, nearby education and training programs, and existing relevant industry. The analysis around Tacoma has indicated that the city has the potential to be a successful location for fabrication and assembly of floating offshore wind energy in terms of workforce development. The high-level strengths, weakness, opportunities, and threats for workforce development of the OCG-Wind floating in Tacoma include:

- Strengths: a robust education system present in Tacoma, with a lot of attention and initiative on all levels of educational attainment.
- Weaknesses: no existing offshore wind-specific education and training programs.
- Opportunities: focus on growing a workforce that may not pursue a traditional four-year degree because skilled trades will be in high demand and there's potential to provide expand training opportunities.
- Threats: predictable project timelines are needed to ensure that the workforce is developed at the correct time; however, recent supply chain uncertainties have made it a larger risk to invest in program development.

Based on this workforce assessment, several future recommendations were provided to develop a workforce to support the potential fabrication of the OCG-Wind floater in a community, including:

- Convene decision-making stakeholders to discuss potential ways to develop the workforce. These stakeholders include existing industry, port authorities, education and training programs, CBOs, the local government, and labor unions.
- Start creating a curriculum for specific training needed in floating offshore wind.
- Communicate predicted workforce demand to training providers years before fabrication begins, so that they can start to upskill and recruit a workforce to meet the demand.

Task 3: Vessel requirements and opportunities for installation

The Contractor shall quantify the Jones Act fleet necessary to meet demand for installation and operation for a project off the United States coast. The Participant shall provide the technical requirements and advise on the installation and operational strategies for the OCG-Wind floater. The Contractor shall also support the identification of government funding for vessels to enable offshore transportation, towing, installation, and cable related activities. Work activities under this Task 3 include:

- Identify the installation vessel needs for the OCG-Wind floater.
- Assess the quantity of Jones Act-compliant vessels to meet US offshore wind demand.
- Identify government grants to support vessel needs.

NREL advised on the vessel requirements and opportunities for installation by sharing several resources. NREL completed a literature review for anchor handling tugs, discussing the availability of vessels, vessel day rates, and information on California vessel emission standards. NREL also provided a cable vessel database with the names, country, flag, and other details of seven vessels capable of supporting floating offshore wind energy. NREL also shared information on the Customs and Border Protection (CBP) decision that cable- laying vessels do not have to U.S.-built and foreign flagged vessels could install electric transmission cables.

Task 4: CRADA Final Report

This report serves to meet the requirement for the CRADA Final Report with preparation and submission in accordance with the agreement's Article X.

Task 5: Additional Tasks

Other work at the direction of the Participant, consistent with the scope and subject to the availability of funding.

No addition scope was added or modified. All funding was used for Tasks 1-4.

References: None

Subject Inventions Listing: None

ROI#: None