AMERICAN MADE WIND PRIZE

U.S. DEPARTMENT OF ENERGY

FLOWIN PRIZE

Voucher Digest and Capabilities Menu: Phase I

December 2022

Winners of Phase 1 of the U.S. Department of Energy's American-Made FLoating Offshore Wind ReadINess (FLOWIN) Prize will be awarded a $75,000 voucher to be redeemed during Phase 2 at one of the U.S. Department of Energy's national laboratories in the American-Made Network. These vouchers can be used to access expertise, testing, validation, manufacturing, and other resources to advance your innovation.

Further details about vouchers can be found in the Voucher Guidelines.

The intention of this document is to introduce you to the steps your team will need to take to create a voucher slide for Phase 1 submission and, if your team is a winner of Phase 1 of the FLOWIN Prize, the steps to redeem your voucher and introduce you to the capabilities at the national labs that could be accessed for your voucher work.

If you have any general questions or would like to contact us, please reach out to the FLOWIN Prize administrative team at FLOWINprize@nrel.gov.

Please read on to learn about the voucher process for the FLOWIN Prize and review the capabilities for five national laboratories.

Contents

1 Voucher Benefits

The voucher benefits include:

- $75,000 to be redeemed at national labs in the American-Made Network
- Access to national-lab expertise, testing, validation, manufacturing, and other resources to advance your innovation
- Sustained partnerships and resources beyond the prize competition.

2 Voucher Process

What's the process to redeem my voucher? What are the first steps?

Your team is responsible for identifying your technical needs and coordinating those needs with the American-Made Network to redeem your voucher, should you win one by becoming a winner. You can utilize the National Renewable Energy Laboratory (NREL) Prize Administrator to help facilitate connections to people and resources. Please review the Voucher Guidelines, which provide voucher use policies and the process for payments.

Step 1: Review the Voucher Capabilities Menu (found in Appendix 1:).

Step 2: Identify up to two national labs that can help you with your technical needs. Teams can connect with the point of contact (POC) at each national laboratory, which is provided in the Voucher Capabilities Menu (Appendix 1:), for support in creating their voucher slide.

Step 3: Create a voucher slide (see Section 3). By **the Phase 1 deadline on Jan. 13, 2023**, you will need to submit a voucher slide with your Phase 1 submission package.

Step 4: Should you win a Phase 1 voucher, the Prize Administrator will share with you the contact information of a principial investigator (PI) at the lab you provided on your voucher slide.

Step 5: Connect with your assigned PI to create your work agreement. This may be a Statement of Work (SOW) or Joint Statement of Work (JSW). The National Renewable Energy Laboratory uses JSWs for work agreements, whereas all other labs use SOWs for work agreements.

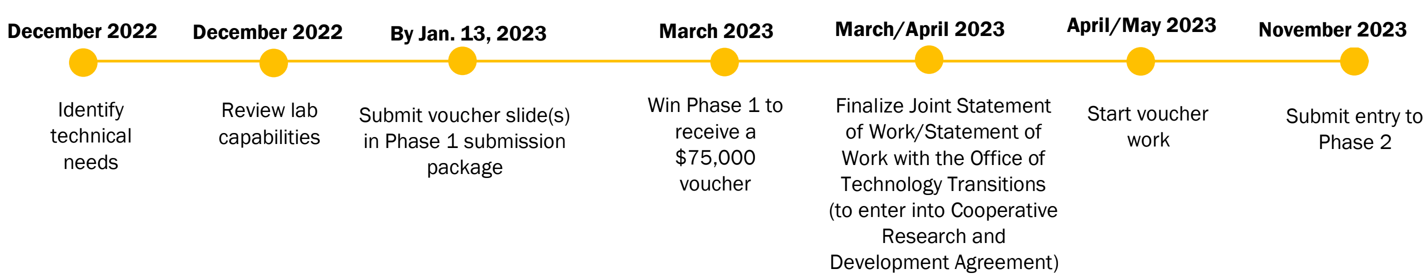

Figure 1. Timeline of the voucher process for Phase 1 winners of the 2022 FLOWIN Prize

3 Voucher Work Slide

Submit a completed voucher slide by Jan. 13, 2023. This slide must include an overview of your objective for your $75,000 voucher.

The slide format is shown below. It should contain your objective, your team name, your team's POC, the name and POC (name and email) of the lab(s) at which you choose to redeem your voucher, and the tasks and deliverables the lab(s) will complete for you using your voucher.

See an example slide in Appendix 2:.

4 How to Work With a National Lab

For voucher work with NREL, you have 20 business days from the day the winners announcement is posted to finalize your JSW, if you are a winner of Phase 1. Please submit your finalized JSW to the Prize Administrator, Lisa Trope, at FLOWINprize@nrel.gov by Feb. 10, 2023. Your JSW will be forwarded to the NREL Technology Transfer Office. From there, you will enter a Cooperative Research and Development Agreement so that work can commence.

For voucher work with other national labs, you have 20 business days from the day the winners announcement is posted to finalize your SOW, if you are a winner of Phase 1. Send your SOW to the lab's PI. They will work directly with you to get an agreement in place to conduct voucher work.

Appendix 1: Voucher Capabilities Menu

Select National Lab Capabilities for Offshore Wind Power

A1.1 Pacific Northwest National Laboratory

Voucher Representative: Alicia Mahon (Alicia.Mahon@pnnl.gov)

Pacific Northwest National Laboratory (PNNL) leverages multidisciplinary teams with diverse backgrounds to tackle the most complex challenges facing offshore wind energy development in the United States. PNNL's expertise in wind resource characterization, community benefits, and environmental and co-use considerations are helping to improve siting and design and streamline permitting.

In addition, the PNNL-Sequim Campus in Sequim, Washington, houses the only marine research facilities in the U.S. Department of Energy complex. The campus is uniquely positioned for marine-based research, which provides researchers with unique capabilities and expertise in planning, designing, installing, monitoring, and maintaining energy infrastructure and technology in harsh, extreme, and remote marine environments.

Platform Design Status and Feasibility

PNNL leverages extensive atmospheric sciences expertise from the laboratory's global change research program to support the identification of design site characteristics for offshore wind energy development.

Specifically, PNNL collects and analyzes meteorological and oceanographic data in areas that are targeted for offshore wind energy development to improve wind resource characterization and forecasting. PNNL's researchers use observational data to monitor behavior of wind profiles, validate wind resource models, and identify parameters in atmospheric models that cause uncertainties in wind forecasting simulations. PNNL's integrated expertise in atmospheric processes, air-sea interactions, and ocean engineering provides the technical underpinnings to understand the impacts of local meteorological and oceanographic phenomena on design considerations, such as turbine and foundation loads.

Researchers at PNNL have expertise related to integrating environmental, meteorological, and oceanographic monitoring sensors with offshore components. PNNL's expertise around sensor integration includes technology development, communication protocols, power distribution, minimizing measurement interference, data standardization, and data sharing.

U.S. Location Considerations

PNNL conducts research that provides a better understanding of the communities that may be affected by offshore wind energy, relationships between coastal communities and offshore wind energy, and co-use considerations. PNNL has expertise in exploring trade-offs and synergies among social, economic, and environmental outcomes of offshore wind energy and understanding its distributional effects. PNNL effectively engages and collaborates with local populations and stakeholders to achieve positive social, ecological, and economic outcomes and ensure offshore wind energy benefits communities. Specifically, PNNL's researchers work to identify and understand the communities that may benefit from or be negatively impacted by offshore wind energy based on demographics, values, livelihoods, jurisdiction, and relationships with coastal and marine ecosystems. PNNL also assesses the potential benefits and impacts of offshore wind energy on communities using quantitative social-ecological modeling and multicriteria analysis that reveal variation in socioeconomic outcomes for different communities.

In addition, PNNL has extensive expertise regarding the environmental and co-use considerations for offshore wind energy development. PNNL has engaged domestic and international experts to explore prior topics related to the environmental effects of offshore wind energy development, synthesized the current state of knowledge about environmental effects, and disseminated information through educational research briefs, webinars, and workshops. PNNL also develops technology to help monitor the environmental impacts of offshore wind energy, which helps streamline siting and permitting.

Team Management

PNNL has extensive experience managing multidisciplinary, diverse, and inclusive teams. PNNL leads or co-leads several offshore wind energy research and development efforts that are highly collaborative and complex in nature, requiring comprehensive project and risk management plans to assure work is completed safely, equitably, on time, and within budget.

PNNL supports a culture of understanding, inclusion, and collaboration, and seeks to include all voices in the pursuit of scientific discovery. Throughout the project lifecycle, PNNL encourages project teams to:

- Consider how different forms of diversity (e.g., gender, ethnicity, racial, religious, sexual orientation, career stage, physical abilities, veteran status, etc.) will strengthen the project team
- Articulate SMART (specific, measurable, achievable, relevant, time-bound) diversity, equity, and inclusion (DEI) goals
- Learn about issues that will help the team incorporate DEI into the project (e.g., implicit bias training, which is available through PNNL)
- Identify opportunities to involve first-generation students, interns, grad students, or early-career scientists from underserved communities and/or organizations as collaborators
- Consult PNNL's workforce development and internship programs to help recruit a diverse team
- Solicit anonymous feedback from team members throughout the life of the project
- Evaluate progress toward DEI goals at all phases of the project (proposal, development, implementation, and delivery)
- Consider the outcomes of the project and how they may affect underserved communities.

A1.2 Idaho National Laboratory

Voucher Representative: Jake Gentle (Jake.Gentle@inl.gov)

Intersection of Mechanical and Electrical Wind Turbine Systems

Idaho National Laboratory's (INL's) Power and Energy Systems Department has extended experience with modeling and simulation of power systems, electromechanical systems, and wind turbine structure for load assessment. In addition, one of the department's members has expertise in wind turbine reliability and data analytics, particularly regarding drivetrains, as well as digital twin development. To further de-risk any demonstration and/or deployment of wind turbine technology for power system integration, the department offers high-fidelity-model-enabled, digital, real-time simulation capabilities with power system protection and energy storage hardware-in-the-loop settings.

Supply Chain Vulnerability and Deployment Impacts

INL's dedicated System Dynamics and Modeling Group has the capability to conduct qualitative and quantitative supply chain analyses for over a decade. They authored the U.S. Department of Energy deep-dive assessment on electric grid supply chain review for large power transformers and high-voltage direct-current systems. Applying the same methodology, INL can reveal the offshore wind energy supply chain's bottlenecks/vulnerabilities to achieve the Wind Vision. They can also conduct analysis on how the deployment of floating offshore wind energy can impact port or manufacturing communities. The retooling of oil and gas supply chains to cater to the offshore wind supply chain is another area that INL can investigate. Depending on the specific questions, INL can use agent-based modeling, system-dynamics modeling, or operations research programming to support decision making.

Resilience (Design, Evaluation)

INL's Critical Infrastructure Security and Resilience programs have extensive experience in applying best practices and evaluating systems for secure and resilient architectures. Work in this area includes the development and application of resilience metrics, a resilience framework to evaluate how different assets or configurations can add to system resilience, and quantitative evaluation of how advanced controls and communications support resilience. INL's capabilities are reflected in bench-scale, lab-scale, and full-scale systems, models, and industry platforms across the 890-square-mile campus and more than 100,000 square feet of labs and collaborative space in which industry and academia can engage.

Cybersecurity for Wind (Subject-Matter-Expert Input, Design, Evaluation, Tools)

INL has a decades-long history of protecting critical infrastructure from cyber threats. This research has led to the development of the National Cyber Informed Engineering strategy. INL also has the capability to conduct red-team analysis of a design and consult on applicable standards and best practices.

Projects specifically addressing cybersecurity for wind energy include:

- Microgrids, Infrastructure Resilience, and Advanced Controls Launchpad, which evaluated needs and challenges for cybersecurity of distributed wind energy and provided best practices for various stakeholders
- Wind Security through Hardware Integration, Education, and Layered Defense, which provides a platform (the Cyber Security Evaluation Tool) to evaluate a wind energy system's architecture against relevant standards and best practices
- Wind Cyber Hardening, which develops layered defense tools to protect wind energy systems against advanced cyberattacks based on generic wind power plant architectures developed for this project.

Probabilistic Risk Assessment for Wind Energy

No formal process exists in the power industry, let alone for the wind energy industry, to quantify the likelihood of system weakness, bringing to bear an unacceptable state. INL has developed a method for combining probabilistic risk assessment with power flow analysis, which can be applied to wind energy systems.

The advantages of this approach include quantifying the:

- Overall likelihood the system will experience an unacceptable violation
- Most likely scenarios (combination of component failures) that will result in an unacceptable violation
- Most likely component to fail and contribute to an unacceptable violation.

Coupled with consequence-driven metrics, the overall risk of a design or system may be quantified. This type of analysis can help determine the appropriate times for maintenance without dramatically increasing the risk of the system (i.e., from taking planned outages), as well as the most cost-effective system upgrades to benefit system reliability.

Grid Interconnection Analysis and Systems Integration for Renewable Power Generation, Energy Storage Systems, Microgrids, Distribution, and Controls

As a multiprogram laboratory oriented toward energy systems engineering research, INL has worked extensively on electric-utility-grid-level and facility/base-level power systems developments and improvements by applying science-based engineering research and development. With a foundation of more than 25 years of applications experience in assisting with research, development, advancement, and integration of over 1,000 megawatts of wind, solar and hybrid power systems for the U.S. Department of Energy and others, this experience has been integrated into long-term renewable energy assessments, power systems, microgrid planning, controls development, and research and development projects in the field.

Additional INL Expertise

Additional INL expertise includes:

- Human factors and integration of new systems
- Advanced modeling and simulation
- Hardware-in-the-loop testing
- Data collection and aggregation
- Data visualization for rapid decision making
- Operational cybersecurity responses.

A1.3 National Renewable Energy Laboratory

Voucher Representative: Brian Smith (Brian.Smith@nrel.gov)

The National Renewable Energy Laboratory (NREL) is the premier national laboratory focused on advancing the foundational science, engineering, and applied research to advance renewable energy technology. NREL has pioneered many of the components and systems that have taken wind energy technologies to new heights, providing global leadership in fundamental wind energy science research, development, and validation activities.

For more than 9 years, NREL has worked with the U.S. Department of Energy to become an international leader in offshore wind energy research, and the lab's core capabilities align with the evaluation criteria categories as shown in the following table.

NREL's Core Capabilities and Evaluation Criteria Categories

	Modeling and Validation	Technology Innovation	Resource Assessment and Characterization	Research Laboratories and Capabilities	Advanced Manufacturing and Materials	Economic Analysis and Data Analytics	Environmental Science and Siting	Stakeholder Engagement and Social Science	Workforce Development	Grid Integration
Platform Design Status and Feasibility	X	X	X	X			X			
U.S. Manufacturing &					X	X				

Commercialization										
U.S. Location Considerations						X	X	X	X	X

Platform Design Status and Feasibility

Modeling and Validation

Advancing wind power plant technology development by creating open-source, multi-fidelity modeling tools and high-performance computing codes that simulate the behavior of wind power technologies in complex environments and create a deeper understanding of complex flow physics and turbine dynamics, NREL:

- Led the International Energy Agency Wind Technology Collaboration Programme's Offshore Code Comparison Collaboration projects (OC3–OC6), guiding the development and validation of engineering-level offshore wind energy modeling tools
- Developed OpenFAST, a tool used to research and design advanced fixed and floating offshore wind energy systems and calculate their ultimate and fatigue loading
- Developed multi-fidelity tools, including FAST.Farm, ExaWind, and SOWFA, used to explore farm-level behavior of offshore wind systems.

Technology Innovation

NREL developed its own optimization framework that integrates wind power plant engineering performance, loads, and cost software modeling to enable full-system analysis used to identify and define innovative and cost-effective offshore wind energy designs through multidisciplinary design analysis and optimization.

In terms of next-generation wind turbines and floating offshore wind energy systems, this includes:

- Aerodynamics, aeroelasticity, structural dynamics, marine architecture, and mooring systems
- Computational fluid dynamics
- Systems engineering and optimization
- Analysis and design of innovating substructures and moorings.

In terms of operations and maintenance, this includes:

- Digital twins of offshore assets
- Innovative control systems and actuation at turbine and plant levels to optimize wind farm operations for performance, reliability, and life extension.

Resource Assessment and Characterization

NREL leads efforts in numerical weather prediction and has expertise in measurement and remote-sensing technologies that determine atmospheric quantities important for wind energy design.

Research Laboratories and Facilities

NREL's Flatirons Campus features state-of-the-art, accredited equipment and facilities that help researchers and industry partners pursue wind energy innovations, including:

- The Advanced Research on Integrated Energy Systems research platform
- Structural research facilities
- Field and technology research validation facilities

- Dynamometer research facilities
- Composites manufacturing
- A high-performance computing system.

U.S. Manufacturing and Commercialization

Advanced Manufacturing and Materials

NREL is exploring the use of innovative materials and manufacturing processes to develop lighter, stronger, more cost-effective wind turbine blades and components that are easier to recycle, including:

- Materials and research applications
- Manufacturing and process at scale
- Manufacturing optimization and on-site and modular manufacturing
- Recycling and reuse for a circular economy.

Economic Analysis and Data Analytics

NREL develops its own bottom-up techno-economic modeling and analysis tools, incorporating anonymized data from the offshore wind energy industry to estimate the cost of offshore wind energy systems on a geospatial and temporal framework that mirrors actual project development practices for weather delays, vessel selection, and installation methodologies.

In terms of techno-economic analysis, this includes:

- Historical market and technology trends
- Wind energy technology (turbine, plant, balance of systems) innovation and system design, optimization, and cost analyses
- Technology trade-off studies and alternatives analysis
- State and regional cost and policy evaluations
- Plant innovation impacts at regional and continental scales.

In terms of port and vessel assessment, this includes:

- Port networks definitions that can efficiently, cheaply, and reliably support installation and operations and maintenance activities along the West Coast.

In terms of supply chain assessment, this includes:

- A comprehensive assessment of how to strategically develop a supply chain that benefits the entire industry and country.

U.S. Location Considerations

Environmental Science and Siting

NREL’s work in conducting wind energy–wildlife interaction research and developing innovative tools and technologies to advance understanding and solutions to protect marine wildlife and make informed decisions about offshore wind energy siting and operation includes:

- Environmental process and impact assessments of innovation technologies and approaches
- Leading the Technology Development and Innovation and Working Together to Resolve Environmental Effects of Wind Energy programs
- Species-specific scientific investigations
- Cost-effective mitigation

- Regulatory support to the Bureau of Ocean Energy Management and Bureau of Safety and Environmental Enforcement.

Stakeholder Engagement and Social Science

NREL disseminates wind energy information, develops wind energy tools and resources, researches community impact and equity issues, and conducts outreach to increase public understanding and acceptance of wind energy deployment and build connections with wind energy stakeholders.

Workforce Development

NREL's workforce development program analyzes workforce needs of the offshore wind energy industry and works with stakeholders through the Offshore Wind Workforce Network to address priority challenges and develop programs and initiatives to ensure a skilled and diverse workforce is available to meet industry needs.

Grid Systems Integration

NREL works with power system stakeholders to enable seamless integration of large amounts of wind power into the nation's power grid, including:

- Grid integration studies
- Probabilistic planning
- Solutions for operational challenges of weak grids
- Optimal infrastructure utilization.

A1.4 Sandia National Laboratories

Voucher Representative: [Grace McNealy (GKMcNea@sandia.gov)](mailto:GKMcNea@sandia.gov)

Platform and Turbine Design and Analysis for Certification

Since its formation in 1974, the wind energy technologies program at Sandia National Laboratories (Sandia) has been an international leader in the development of novel wind energy systems, taking concepts from design to manufacturing to testing. There are numerous examples where Sandia has developed scaled system designs to test advanced concepts that are now common in the industry, including carbon spar caps and flatback airfoils.

Sandia has experience with the certification of both horizontal- and vertical-axis wind energy systems, including coupled floating offshore wind turbines. This has been accomplished using industry tools and through the development of the Offshore Wind Energy Simulator. Sandia has experience partnering with platform designers and classification agencies to perform floating body design and optimization and coupled analysis for design certification following the governing standards.

Techno-Economic Analysis and Life Cycle Assessments

Sandia developed tools and models to conduct system-level analyses of costs and environmental impacts associated with design, manufacturing, operation and maintenance, and recycling of wind and other renewable energy systems. Sandia has broad experience using life cycle inventory and economic data to quantify system efficiency, reduce costs, and mitigate harmful environmental emissions. This experience can be combined with other advanced computational tools to perform rigorous optimization and uncertainty analysis. Sandia has access to open-source and proprietary life cycle inventory databases, such as the United States Life Cycle Inventory and Ecoinvent, which can be used to determine types and quantities of raw input materials required for various components and enable supply chain analysis.

Materials and Manufacturing

Sandia has a long history of characterizing advanced materials for use in wind energy systems. Sandia and its partners have been testing composite materials since the 1980s, and the Composite Materials Database is one of the first and most complete repositories for mechanical test data, which has enabled designers to utilize new materials in future wind energy system designs. Sandia has experience characterizing manufacturing processes with industry partners to develop manufacturing flow models, which have been used in the optimization of integrated design and manufacturing. Leadership in materials research for wind energy systems has poised Sandia to support modeling of supply chains and manufacturing processes.

Optimization and Uncertainty Quantification

Sandia is a leader in developing optimization and uncertainty-quantification algorithms and methods (e.g., Rapid Optimization Library, Dakota), which are applied to some of the world's most challenging numerical problems using high-performance computing clusters. These capabilities and staff expertise contribute to Sandia's ability to support high-fidelity modeling, model validation, and certification work. Sandia's Dakota software, along with experience developing and using Nalu-Wind and AMR-Wind, resulted in capabilities to support multi-fidelity uncertainty quantification and optimization under uncertainty.

A1.5 Oak Ridge National Laboratory

Voucher Representative: [Madhu Chinthavali](ChinthavaliM@ornl.gov) (ChinthavaliM@ornl.gov)

Manufacturing

Carbon Fiber Processing Line at CFTF

Oak Ridge National Laboratory's (ORNL's) Manufacturing Demonstration Facility (MDF) and Carbon Fiber Technology Facility are designated user facilities focused on performing early-stage research and development to improve the energy and material efficiency, productivity, and competitiveness of U.S. manufacturers. The MDF contains more than 200 manufacturing systems and over 100 additive manufacturing systems, with over 50% placed at MDF as no-cost loans with industry. Capabilities include large-scale additive (metal, ceramic, and composite), multimaterial printing for soft, critical, permanent rare earth magnets; tooling generation; powder bed manufacturing; robotic disassembly of multimaterial components; digital manufacturing; metrology/characterization; carbon fiber production; preparation of feedstock; end-use manufacturing; and hybrid manufacturing. The MDF is a 110,000-square-foot facility driving the development of new materials, software, and systems for advanced manufacturing. The Carbon Fiber Technology Facility is a 42,000-square-foot facility, developing high-potential, low-cost, sustainable materials with a 390-foot-long carbon fiber production line capable of custom configuration and a capacity of up to 25 tons per year.

Recycling, Sustainable Manufacturing, and Life Cycle Analysis

MDF shredding equipment.
Photo from ORNL

ORNL's offshore wind energy recycling capabilities include direct repurposing of wind turbine blades, pilot-scale mechanical recycling capable of processing 4,000 pounds of composites per hour, thermochemical recycling (pyrolysis) at industrial scale, chemical and enzymatic recycling, mixed composites waste separation technologies, as well as characterization and recycling of futuristic/novel recyclable resin and thermoplastic systems. ORNL also houses a one-of-its-kind Hub and Spoke program with the University of Maine, in which the team is capable of state-of-the-art wind characterization for offshore wind, manufacturing lidar buoys for sensing technologies, fabricating low-carbon molds for offshore wind energy, multiscale modeling, and life cycle analysis. ORNL's life cycle/techno-economic analysis capabilities are complementary to the manufacturing development being done across the lab.

Grid Integration

The Grid Research Integration & Development Center (GRID-C) research facility houses state-of-the-art technologies, equipment, instrumentation, and computational resources to advance technologies in support of modernizing our electric delivery system. Major research thrusts include grid-systems integration (i.e., residential- and transmission-scale test beds), advanced controls and transactive controls (i.e., microgrid controls), electrification research (i.e., electric vehicle drivetrain, charging, and energy storage), grid modeling (large-scale AC, AC-DC, and analytics), grid operations (large-scale AC, AC-DC, and analytics), and material to systems research (physical/electrical sensing, protection sensing, and cybersecurity sensing).

GRID-C facility. *Photo from ORNL*

These five major research thrusts span across GRID-C's 52,000-square-foot facility with multiple dedicated lab spaces engineered to accomplish ORNL's vision. GRID-C provides a full ecosystem to enable end-to-end materials and devices components and subsystems to full-grid-connected systems research and development with large-scale grid analytics, planning, and real-time hardware.

Environmental Impacts and Siting

ORNL has capabilities in advanced biological monitoring, ecological and statistical modeling, and multi-objective decision support. Acoustic monitoring tracks flocking species, monitoring impacts of wind energy on biota, and aquatic monitoring using drones. ORNL can anticipate animal population response to energy facilities and operations using a range of modeling techniques, including Bayesian state-space models to models of responses to energy facilities using endpoints such as survival, reproduction, and population status. These tools provide a foundation for decision support tools. ORNL's decision tools can be used to design offshore wind farms to maximize multiple objectives, including economic benefits to producers, reductions in emissions from offsetting fossil fuels,

Environmental toxicity testing. Photo from ORNL equitable distribution of benefits (social justice), and benefits to aquatic species of concern. Optimization can be performed at the project scale or grid scale.

High-Performance Computing

ORNL has developed high-fidelity computational models in concert with experimental research programs in application-driven settings. ORNL has simulation capabilities through the Exascale Computing Project targeting free-surface liquid flows and computational mechanics. These high-fidelity tools may be used in advanced manufacturing or to measure floating offshore platform dynamics with wave-resolved flows. More recently, ORNL has developed new high-fidelity capabilities for computational fluid dynamics more suitable for air flow as well as capabilities in electromagnetics. Research and development in modeling and simulation at ORNL strongly emphasizes spanning from desktop-scale simulations to using the world's largest computers, including the Summit and Frontier supercomputers located at ORNL.

ORNL Facilities' Capabilities

Capability	Manufacturing Demonstration Facility (MDF)	Carbon Fiber Technology Facility	Grid Research Integration & Development Center (GRID-C)	Aquatic Ecology Laboratory	Leadership Computing Facility
Large-Scale Additive Manufacturing	✓	✓			
Metal Powder Bed Systems	✓				
Multimaterial Magnet Production and Recycling	✓				
Preparation of Composites Feedstock	✓				
End-Use Manufacturing & Characterization	✓	✓			
Hybrid and Subtractive Manufacturing	✓				
Bio-Derived Material Development	✓				
Advanced Recycling Technologies	✓				
Design for Sustainability	✓				
Life Cycle Analysis	✓	✓	✓		

Carbon Fiber Production	✓			
Grid Operations and Analytics		✓		
Grid Systems Integration and Modeling		✓		
Transmission Grid Testing		✓		
Microgrid Testing		✓		
Advanced Biological Monitoring			✓	
Ecological & Statistical Modeling			✓	
Multi-Objective Decision Support			✓	
Smooth Particle Dynamics				✓
Fluid-Structure Interaction Modeling				✓
Environmental Modeling				✓

Appendix 2: Sample Voucher Slide

An example (mocked-up version) of a completed voucher slide.

American-Made FLOWIN Prize Phase 1

Prepared for {{Team Name}}, team POC: {{Name}}

{{National Lab}}, {{POC}}, {{POC email}}

Objective: Determine existing port facilities and potential expansion opportunities

Anticipated Scope of Work:

Tasks: {{National Lab}} will perform the following tasks for {{team name}}:
- Review facilities at different ports on the east and west coasts
- Document current operations and limitations to further expansion
- Identify potential ports that could be expanded/developed for offshore wind platform assembly and deployment
-

Deliverables: {{National Lab}} will provide {{team name}} with the following:
- Report detailing port facilities, operations, and limitations for offshore wind
- Short list of feasible ports for given platform assembly and deployment
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