

**Department of Energy (DOE)
Office of Energy Efficiency and Renewable Energy (EERE)**

**Fiscal Year (FY) 2019 Wind Energy Technologies Office
Funding Opportunity Announcement**

Funding Opportunity Announcement (FOA) Number: DE-FOA-0002071

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CFDA Number: 81.087

FOA Issue Date:	3/28/2019
Submission Deadline for Concept Papers:	4/29/2019 5:00pm ET
Submission Deadline for Full Applications:	7/1/2019 5:00pm ET
Expected Date for EERE Selection Notifications:	September 2019
Expected Timeframe for Award Negotiations:	September-December 2019

- Applicants must submit a Concept Paper by 5:00pm ET on the due date listed above to be eligible to submit a Full Application.
- To apply to this FOA, applicants must register with and submit application materials through EERE Exchange at <https://eere-Exchange.energy.gov>, EERE's online application portal.
- Applicants must designate primary and backup points-of-contact in EERE Exchange with whom EERE will communicate to conduct award negotiations. If an application is selected for award negotiations, it is not a commitment to issue an award. It is imperative that the applicant/selectee be responsive during award negotiations and meet negotiation deadlines. Failure to do so may result in cancelation of further award negotiations and rescission of the Selection.

Modifications

All modifications to the FOA are [HIGHLIGHTED] in the body of the FOA.

Mod. No.	Date	Description of Modification
0001	4/3/2019	To clarify the correct amount of maximum funding for Subtopic 2a of \$1M on page 10.
0002	5/17/2019	Extend FOA closing date and Expected Date for EERE Selection Notifications from 6/17/2019 to 7/1/2019 and August 2019 to September 2019, respectively.
0003	6/13/2019	<p>To revise the eligibility information for applications under Area of Interest 4 on page 21 to remove the requirement that the prime recipient must perform more than 50% of the project work, as measured by the Total Project Costs.</p> <p>AND</p> <p>To revise and clarify required LCOE analysis and include additional detail on assumptions in Appendix H – Guidelines for Tall Tower Estimates.</p>

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I. Funding Opportunity Description

A. Background and Context

i. Background and Purpose

Wind energy is one part of the U.S. Department of Energy's (DOE's) all-of-the-above energy portfolio, and is an integral part of the Office of Energy Efficiency and Renewable Energy (EERE) vision of a strong and prosperous America powered by clean, affordable, and secure energy. The Wind Energy Technologies Office's (WETO's) vision and mission are to advance wind energy technology and enhance the nation's strategic energy resources to enable wind energy to be a competitive, clean, unsubsidized electricity generation option in all regions of the United States and at all scales by 2030¹—contributing to a diverse, economic, clean, and reliable U.S. electricity grid. U.S. wind energy is already substantially contributing—and has tremendous future potential to provide additional contributions—to economic growth, energy security, and environmental value for all regions of the United States. For example, wind energy provided 6.3% of the nation's electrical power in 2017, and has the potential to provide 20% or more of the nation's electrical power by 2030. DOE's WETO has a unique leadership role in helping the nation realize these benefits by identifying, supporting, and accelerating wind energy innovation beyond what industry efforts alone may accomplish.

DOE maintains a leadership role in wind energy science and technology innovation. The mission is carried out through national laboratories, federal wind test centers, interagency collaboration, and competitive funding opportunities with the private sector and academia, and has enabled cost-effective development and validation of high-risk innovative wind technologies for over four decades. These efforts helped drive reductions in total costs² of land-based wind to a least-cost electricity generation option today in areas with excellent wind resources.³

This FOA consists of four areas of interest as summarized in the table below and will provide \$28.1 M in federal funding for innovative wind energy technologies research and development including land-based, distributed, and offshore applications.

¹ U.S. Department of Energy. (2018). Wind Vision Detailed Roadmap Actions: 2017 Update.
<https://www.energy.gov/eere/wind/downloads/updates-wind-vision-roadmap>

² "Total costs" means total net costs without subsidies and tax advantages, taking into account all grid and transmission costs and benefits of wind energy.

³ U.S. Department of Energy. (2015). Enabling Wind Power Nationwide.
<https://www.energy.gov/eere/wind/downloads/enabling-wind-power-nationwide>

Areas of Interest	Title
1	Wind Innovations for Rural Economic Development (WIRED)
Subtopic 1a	Fully integrated distributed wind research and development (R&D) innovations to enhance resilience and reliability
Subtopic 1b	Balance of system cost reduction through standardization
2	Utilizing and Upgrading National-Level Facilities for Offshore Wind R&D
Subtopic 2a	R&D utilizing existing national-level offshore wind testing facilities
Subtopic 2b	R&D requiring upgrades to existing national offshore wind testing facilities
3	Project Development for Offshore Wind Technology Demonstrations
4	Tall Towers for U.S. Wind Power

The objectives of the FOA are to:

- Expand the potential of distributed wind to support grid reliability and resilience for rural utilities and communities
- Advance offshore wind R&D by investing in research and facilities improvements at offshore wind test facilities in the United States
- Drive innovation in offshore wind through project development for innovative technology demonstrations, and
- Increase the potential for harnessing wind power on land through tall tower R&D and demonstration.

Additional background on the four areas of interest is summarized below.

Area of Interest 1: Wind Innovations for Rural Economic Development (WIRED)

Distributed wind refers to the use of wind power as a distributed energy resource (DER), where wind energy technologies (big and small) are connected directly to the electricity distribution grid, on the customer side of the meter, or at an off-grid location to support local loads or grid operations. Deployed by individuals, businesses, communities, and electric utilities, distributed wind refers to any size wind turbine or small array of turbines that generates power for local or on-site use. For example, distributed wind systems can range from a less than 1-kW off-grid wind turbine at a remote telecommunications tower or well head, to a 15-kW wind turbine at a home or small farm, to several multi-megawatt wind turbines at a university campus, at a manufacturing facility, or connected to the distribution system by a local utility.

WETO funds a multifaceted, distributed wind research and development portfolio to develop cost-competitive, high-performance technology for growing domestic and global distributed energy markets. DERs—including wind, photovoltaics, storage,

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advanced controls, flexible loads, and microgrid technology—can support the development of a more secure, affordable, resilient, and reliable electricity system.

In the United States, distributed wind is an emerging market with just over 1 GW of cumulative installed capacity, relative to nearly 20 GW of distributed solar.⁴ However, a 2016 National Renewable Energy Laboratory (NREL) analysis found that if distributed wind can (1) be more cost-competitive at a levelized cost of energy of \$0.05 - \$0.12 per kWh,⁵ (2) overcome technical challenges such as system integration limiting market access, and (3) increase consumer confidence and adoption, distributed wind could play a substantial role in the U.S. electricity sector.⁶ The potential for distributed wind capacity additions (>10 GW) is especially high on rural distribution grids, with the potential for hundreds of thousands of turbines installed at farms, small businesses, and residences in rural areas.

Enabling wind energy technology as a DER to be more valuable—in terms of generating reliable low-cost power, providing grid services, and resilience—for rural electric utilities and communities is a large opportunity. Rural electric cooperatives alone own \$183 billion in assets, invest \$12 billion annually in local economies, pay \$1.3 billion annually in state and local taxes, and power more than 50% of the U.S. landmass. The WIRED FOA area of interest aims to help unlock this opportunity by (1) developing wind technology solutions in combination with other DERs to enhance grid services for rural electric customers, rural distribution utilities, and rural generation and transmission utilities, and (2) by reducing balance of system costs—which can total more than 50% of the total cost of a distributed wind project—through mitigation of technical market barriers, system standardization, and technical assistance.

Areas of Interest 2 and 3: Utilizing and Upgrading National-Level Facilities for Offshore Wind R&D; and Project Development for Offshore Wind Technology Demonstrations

DOE funds research to enable the development and deployment of offshore wind technologies that capture and convert wind resources off the coasts of the United States into electricity. With almost 80% of United States electricity demand located in coastal states, and the offshore wind energy technical resource potential equal to about 2,000 GW, offshore wind has the potential to contribute significantly to a

⁴ D. Feldman, A. Ebers, R. Margolis. (2019). Q3/Q4 2018 Solar Industry Update. National Renewable Energy Laboratory. <https://www.nrel.gov/docs/fy19osti/73234.pdf>

⁵ Lazard. (2018). Lazard's Levelized Cost of Energy Analysis – Version 12.0. <https://www.lazard.com/media/450784/lazards-levelized-cost-of-energy-version-120-vfinal.pdf>

⁶ E. Lantz, B. Sigrin, M. Gleason, R. Preus, I. Baring-Gould. (2016). Assessing the Future of Distributed Wind: Opportunities for Behind the Meter Projects. National Renewable Energy Laboratory <https://www.nrel.gov/docs/fy17osti/67337.pdf>

clean, affordable, and secure national energy mix. Although there is a 20-year history of international offshore wind development, with over 16 gigawatts of capacity installed to date, deployment of offshore wind is relatively new to the United States, with the first project installed in 2016. However, the number of planned U.S. projects is growing rapidly, enabled by the leasing of wind energy areas by the Bureau of Ocean Energy Management and the strong support of a number of coastal states. The current U.S. pipeline of announced projects exceeds 25 gigawatts of total capacity.⁷

Offshore wind turbine technologies, and installation and maintenance approaches are maturing rapidly in Europe and Asia, leading to a strong decline in costs and risks, increased market competition, and a high pace of technical innovation. Analysis suggests that much of the cost-reduction progress seen in global markets can translate to the United States as developers leverage best-available technologies and adapt them to the United States. However, there are many physical conditions and commercial challenges unique to the United States that will require domestic research and development investments before offshore project developers and operators can fully realize similar cost and risk reductions and reliability improvements. Areas of Interest 2 and 3 of this FOA support additional U.S. offshore wind R&D through utilization and expansion of National-level facilities for offshore wind R&D and project development for demonstration of advanced offshore wind technologies.

Area of Interest 4: Tall Towers for U.S. Wind Power

WETO's Tall Wind Initiative has the potential to reduce today's Levelized Cost of Energy (LCOE) by almost 15% by developing innovative technologies that enable taller towers, lighter drivetrains, and longer blades. In the United States, sites with high wind speeds, and an overall high wind energy resource, have been developed first. However, historic estimates of wind speed and resource have assumed a turbine tower height of 80–90m. By increasing the turbine height, a higher quality wind resource can be accessed not only in the places where wind has already been developed, but in places where wind turbines have not historically been economical to deploy. The Tall Wind initiative enables access to higher wind speeds and continued economies of scale for land-based wind turbines that are currently limited by transportation constraints. A key element of Tall Wind involves increasing tower height from today's average of 86 meters to 140 meters or more. Tall towers have been installed in Europe; however, those technologies are too expensive to be cost-effective in the United States. While there are LCOE benefits possible with increases in turbine size and operating height, the size and design of these components have

⁷ U.S. Department of Energy. (2018). 2017 Offshore Wind Technologies Market Update.
<https://www.energy.gov/eere/wind/downloads/2017-offshore-wind-technologies-market-update>

been limited due to transportation and installation limitations that are currently limiting U.S. wind technology deployment.⁸ Larger turbine components, such as taller towers, require special transportation and support vehicles and can only be transported on certain U.S. highways. WETO plans to address this issue by funding the testing and validation of new tower concepts that have the ability to reduce the cost of tower technology and overcome transportation constraints. Validation of tall tower technology by meeting specific design, cost, and performance metrics that exceed current technology will provide investors and industry high confidence levels and will provide a clear pathway to commercialization.

ii. Technology Space and Strategic Goals

EERE is focused on three key opportunities for U.S. wind energy through 2030 and beyond:

1. Reduce the cost of wind energy technology—targeting near-zero costs with no-cost fuel—and increase wind value to the economy in all sectors: land-based, offshore, and distributed, contributing to lower, stable electricity rates, with increased domestic manufacturing, and increased domestic investment
2. Improve wind energy grid integration and increase grid resilience and reliability, with diverse locations providing value to address extreme weather events and cyber-attacks
3. Reduce market barriers and associated costs to increase options for responsible deployment in markets where wind is cost competitive, with improvements for local communities through lower pollution and minimized impacts to wildlife and the environment

B. Areas of Interest

This FOA consists of four areas of interest. Areas 1 and 2 include subtopic areas. Descriptions for all areas of interest and subtopics are provided below.

All work under EERE funding agreements must be performed in the United States. See Section IV.J.iii. and Appendix C.

Area of Interest 1: Wind Innovations for Rural Economic Development

The Wind Innovations for Rural Economic Development (WIRED) topic area of interest is focused on developing distributed wind technology solutions and easing their deployment, specifically for those communities served in rural electric utility territories. Hundreds of rural electric utilities have economically viable distributed wind potential that they could use as a tool to reduce costs and increase the

⁸ The 2015 DOE Enabling Wind Power Nationwide report estimates the technical potential for tall wind technology at hub height levels of 110 m and 140 m for a conceptual wind turbine with a specific power of approximately 150 W/m².

resilience and reliability of their systems, but adoption to date has been low because of perceived technical risks and a lack of familiarity with wind technology utilized as a distributed energy resource (DER) at multiple scales.

In October 2018, DOE convened the WIRED workshop with rural utilities, U.S. Department of Agriculture (USDA's) rural development programs, and members of the wind industry and the financial community, to understand the barriers to distributed wind adoption by rural utilities and understand how R&D might help overcome them. Workshop participants reported that distributed wind systems integrated with other DERs, and agricultural, commercial, and industrial applications represent potential high-value opportunities to support rural economic development. Further, developing standardized system designs, replicable project development templates and technical assistance resources could reduce the perceived technical risks and balance of system costs of developing distributed wind for rural utilities.⁹

DOE is seeking innovations to fully integrate and validate the benefits of distributed wind with DERs on rural electric grids, and to standardize and simplify distributed wind project development in the communities they serve.

Two subtopics in this Area of Interest address these issues:

Area of Interest Subtopic 1a: Fully integrated distributed wind research and development (R&D) innovations to enhance resilience and reliability

This subtopic seeks to increase the reliability, resilience, and security of rural electricity systems through the development of distributed wind solutions that are fully integrated with other technologies to support utility operations, such as distributed wind paired with solar, storage, or controllable loads. The goal of this subtopic is to develop distributed wind-focused technology solutions that support rural electric utility operations, enhance end user benefits and show a viable business case and broad applicability to the rural electric utility market.

Specific opportunities associated with fully integrated distributed wind plus DER solutions that applicants could address under this subtopic include, but are not limited to:

- Improved power quality, peak reduction, reduced reserve requirements, and lower interconnection costs to customers and utilities
- Improved performance and extended life of battery storage systems

⁹ U.S. Department of Energy. (2019). Workshop Report: Wind Innovations for Rural Economic Development (WIRED). <https://www.energy.gov/sites/prod/files/2019/01/f58/WIRED%20Workshop%20Report-010219-final.pdf>

- Large commercial or industrial loads seeking on-site generation, such as data centers or large agricultural operations
- Beneficial electrification, where fully integrated wind plus DER solutions are not eliminating existing utility load, but replacing the use of more expensive fossil fuels
- Load met or new load growth enabled in very low density areas where needed system upgrades would otherwise be cost-prohibitive; this could include off-grid systems provided by the utility within their service territory

Applications must address the following:

- Identify a specific technical opportunity or challenge facing rural utility operations and a specific DER solution, including distributed wind, to address it
- Make a compelling case that the proposed solution will address the opportunity or challenge
- Establish clear performance metrics to measure success
- Demonstrate that the solution will be replicable and broadly applicable to many rural utility markets
- Demonstrate that the solution will generate clear benefits for rural electric customers, rural distribution utilities, and rural generation and transmission utilities
- Provide a compelling plan on how the solution will be deployed.

WETO strongly encourages applicants to develop multidisciplinary teams capable of designing, developing, and ultimately deploying the proposed solution. Applicants should therefore strongly consider partnering with:

- Rural electric utilities including rural electric cooperatives, municipal utilities, tribal utilities, and community choice aggregation entities
- End users
- Appropriate members of the wind industry, such as turbine manufacturers, project developers, and consultants
- Other DER or technology providers, as appropriate
- Independent engineering firms
- Relevant authorities having jurisdiction
- Associations representing the above stakeholders such as the National Rural Electric Cooperative Association, American Public Power Association, National Association of Counties, American Planning Association, American Wind Energy Association, and/or Distributed Wind Energy Association, as appropriate for the proposed work.

Applicants should also consider engaging potential sources of financing, such as USDA's Renewable Energy for America Program and Rural Utilities Service, the Cooperative Finance Corporation, or private sources of project finance. No funds will

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be made available under this FOA for final procurement, construction, or deployment of proposed systems.

Total DOE funding for this subtopic is \$3.05M. Awards will range in size from \$1M-\$1.5M, and up to three awards will be made.

Area of Interest Subtopic 1b: Balance of system cost reduction through standardization

This subtopic aims to:

- reduce balance of system costs associated with the development of stand-alone distributed wind systems and distributed wind systems fully-integrated with DERs by rural utilities through standardized system designs and replicable project development templates and
- provide technical assistance to utilities to mitigate technical market barriers by developing and following consistent best practices when planning and financing stand-alone distributed wind systems and distributed wind systems fully integrated with DERs.

The goal of this subtopic is to reduce the technical risk and market barriers impacting the time and cost of stand-alone and fully integrated distributed wind deployment for rural electric utilities.

This subtopic addresses market barriers associated with rural electric utilities and rural communities having limited experience owning, deploying, and managing distributed wind assets or hybrid DER systems utilizing wind technology. While many rural utilities purchase wind from large-scale, remote wind farms through Power Purchase Agreements, distributed wind adoption in rural utilities has been low. This lack of experience, combined with the technical complexity of distributed wind technology, means that potential early adopters of distributed wind face relatively greater hurdles to deployment, perceived technical complexity, and system costs—particularly balance of system costs, which can comprise more than 50% of total installed costs. This subtopic seeks to buy down these costs through standardization and the development of best practices in areas such as balance of plant design, project assessment and planning, technical assistance to rural utilities and communities in using these tools to consider or develop distributed wind.

Specific opportunities to reduce balance of system costs that applicants could address through this subtopic include, but are not limited to:

- Developing replicable system designs aimed at reducing balance of system costs
- Developing technical resources and best practices such as standardized site assessment and equipment procurement procedures
- Applying existing technical and training resources related to DER deployment to develop resources tailored to distributed wind development

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Applications must address the following:

- Identify what opportunities or barriers they will address through standardization
- Make a compelling case for how they will be successful at addressing these opportunities or barriers
- Establish clear metrics to measure success
- Address multiple distributed wind system size classes (e.g. from 10kW to 100 kW-scale machines for onsite use, to multi-megawatt machines interconnected on the distribution network)
- Make a compelling case that proposed work will help rural electric utilities and communities accelerate distributed wind adoption, gain technical expertise, and build organizational capacity
- Make a compelling case that proposed work will show clear benefits for rural electric customers, rural distribution utilities, and rural generation and transmission utilities
- Make a compelling case that proposed work will result in a significant increase in the number of rural electric utilities incorporating distributed wind applications into their future planning, and adopting distributed wind on their systems

WETO strongly encourages applicants to develop multidisciplinary teams capable of comprehensively addressing the opportunities and barriers they plan to address in a way that will be applicable to a large number of rural utilities and communities across the nation. Applicants should therefore strongly consider partnering with:

- Rural electric utilities including rural electric cooperatives, municipal utilities, tribal utilities, and community choice aggregation entities
- End users
- Appropriate members of the wind industry, such as turbine manufacturers, project developers, and consultants
- Independent engineering firms
- Relevant authorities having jurisdiction
- Associations representing the above stakeholders such as the National Rural Electric Cooperative Association, American Public Power Association, National Association of Counties, American Planning Association, American Wind Energy Association, and/or Distributed Wind Energy Association, as appropriate for the proposed work.

Applicants should also consider engaging potential sources of financing, such as USDA's Renewable Energy for America Program and Rural Utilities Service, the Cooperative Finance Corporation, or private sources of project finance. No funds will be made available under this FOA for final procurement, construction or deployment of proposed systems.

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Total DOE funding for this subtopic is \$3.05M. Awards will range in size from \$1.5M to \$3.0M, and up to 2 awards will be made.

Area of Interest 2: Utilizing and Upgrading National-Level Facilities for Offshore Wind R&D

Costs of offshore wind energy, particularly in Europe, have dropped dramatically as the technology and the supply chain have become increasingly refined in response to the physical and commercial conditions of that market area. While many aspects of the European experience are applicable to the United States, there are physical factors such as hurricanes and geotechnical conditions, and supply chain factors including both limitations and potential assets, that are unique to large-scale deployment of offshore wind in the United States. Due to the very large scale of offshore turbines and support structures, and the difficulties of running tests in the offshore environment, testing at specialized facilities that can establish direct applicability to offshore wind technology development is very important.

The intent of this area of interest is to upgrade and utilize national test facilities in the United States to support innovative research and development related to offshore wind energy. The area of interest is comprised of two subtopics. Subtopic 2a focuses on testing to be conducted at existing facilities. Subtopic 2b will support upgrades to existing facilities that are needed to conduct key research at those facilities, followed by a test campaign utilizing those upgrades. **To qualify under either subtopic, facilities must be considered “national-level”. The term national-level as used herein is intended to describe any state-of-the-art, U.S.-based, technical testing facility where research directly applicable to the U.S. offshore wind industry can be carried out. In addition, the testing facility must be accessible to potential users outside of the facilities’ parent organization or institution for conducting research. Facilities that fall outside of that definition may qualify if the case can be made that they are uniquely capable of carrying out certain testing critical to advancing R&D for the U.S. offshore wind industry.**

Examples of the types of testing under Area of Interest 2 that may advance innovative offshore wind R&D to reduce risks and costs in the United States include, but are not limited to: aerodynamic, hydrodynamic or coupled aero-hydro dynamic testing of scaled models in simulated wind and/or wave conditions; geotechnical testing investigating soil-structure interaction; structural load and fatigue testing of turbine or substructure components; accelerated lifetime testing of materials and coatings; and testing of meteorological or oceanographic equipment. Research may also focus on establishing and/or furthering the accuracy and effectiveness of test facilities and test methodologies that are directly applicable to these types of tests.

In July, 2018 WETO issued a request for information (RFI) regarding U.S. test facilities supporting offshore wind energy research and development. A consolidated

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summary of the responses to the RFI is appended to this FOA for reference (Appendix G). The summary provides information listed in the following categories:

1. Testing needs for offshore wind research and development
2. U.S. offshore wind energy test facility inventory
3. Potential test facilities upgrades by type
4. Potential new facilities for offshore wind testing in the United States

The information in these summary lists is based solely on the responses to the RFI and should not be considered as being either comprehensive or limiting. The intent of including the information with this announcement is to create a general awareness of the types of tests and test facilities that could be considered by FOA applicants in preparing their applications. However, ***it should be noted that neither of the subtopics within this Area of Interest are intended to provide financial support for the construction of new facilities (Category 4 in the list above).***

Maximum total funding to be awarded under Area of Interest 2 is \$7M. Quantity, value and distribution of individual awards between subtopic 2a and 2b will be based on the number and quality of the applications received. For instance, WETO may elect not to fund any projects in one of the subtopics due to the greater merit of applications received in the other subtopic.

Subtopic 2a: R&D Utilizing Existing National-Level Offshore Wind Testing Facilities

WETO is soliciting applications to perform innovative offshore wind R&D at testing facilities that are currently established and operational within the United States. Applicants are encouraged, but not limited to, proposing a research project in the following areas:

- Scaled testing of floating offshore wind platform designs;
- Evaluation of key variables impacting floating platform configurations;
- Testing of next-generation bottom-fixed substructure designs and structural components;
- Testing of next-generation offshore wind turbine components; and
- Innovative methodologies for effective testing of next-generation substructures and turbine components.

The description of the proposed research project must explain how the results of the testing can be applied to furthering specific technical innovations; and must substantiate that those innovations have the potential to reduce commercial-scale LCOE and/or future commercial scale project risk.

Awards will range in size from \$500K to **\$1M**, and up to 14 awards will be selected. All federal funds awarded must be used for experimental test work at national-level

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facilities, including necessary data collection and reporting. Funds may be used to build or procure scale models or test articles required for a proposed test campaign.

Applicants should make a clear and substantiated case for the applicability and value of this research in furthering offshore wind technology and/or supply chain development in the United States.

Metrics for success will include increased utilization of offshore wind R&D test facilities in the United States, and an increase in the innovative offshore wind R&D performed in the United States with the potential to address unique U.S. offshore wind challenges while also supporting U.S supply chain development.

Subtopic 2b: R&D Requiring Upgrades to Existing National Offshore Wind Testing Facilities

WETO is soliciting applications to upgrade existing national-level test facilities in order to perform testing pertinent to offshore wind research that cannot currently be performed effectively in the United States, and to carry out such testing. Therefore, the applicant should propose a project with two primary outcomes: upgrades to a facility, and an R&D test program that utilizes those upgrades. Applicants are encouraged but not limited to proposing upgrades and R&D in the following areas:

- Scaled testing of floating offshore wind platform designs;
- Evaluation of key variables impacting floating platform configurations;
- Testing of next-generation bottom-fixed substructure designs and structural components;
- Testing of next-generation offshore wind turbine components; and
- Innovative methodologies for effective testing of next-generation substructures and turbine components.

The description of the proposed research project must explain how the results of the testing can be applied to furthering specific technical innovations; and must substantiate that those innovations have the potential to reduce commercial-scale LCOE and/or future commercial scale project risk.

Awards will range in size from \$1.5M to \$7M, and 1–2 awards will be selected. All federal funds awarded must be dedicated to upgrades of the facility, and experimental test work to be performed at the facility, including necessary data collection and reporting. Upgrades may include testing hardware, software, and instrumentation. Funds may be used to build or procure scale models or test articles required for a proposed test campaign, but may not be used to procure tools or other upgrades to shop facilities for fabricating models or test articles.

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Applicants should make a clear and substantiated case for the applicability and value of this research in furthering offshore wind technology and/or supply chain development in the United States.

Metrics for success will include the degree to which the facilities upgrades enhance the R&D opportunities for offshore wind in the United States, and increase the innovative offshore wind R&D that is performed in the United States with the potential to address unique U.S. offshore wind challenges and foster U.S. supply chain development.

Area of Interest 3: Project Development for Offshore Wind Technology Demonstrations

Although the offshore wind market in the United States is poised for growth, further cost reductions and barriers to deployment must be addressed through targeted innovation. Historically, demonstrations of new technologies and methodologies have proven to be effective in de-risking and accelerating their adoption by the wind industry. However, the high costs of offshore project development can limit the ability to demonstrate innovations at full scale in the offshore environment. This area of interest provides supplemental project development funds to enable demonstration of a novel technology and/or methodology that will advance the state-of-the-art of offshore wind energy in the United States.

The proposed work should enable the applicant to perform the necessary project planning to implement the new technology/methodology at an offshore wind plant that will be operational no later than 2025. Project funds are to be applied to costs incurred during the development stage of an offshore wind project that is currently in planning. For the purposes of this award, WETO defines project development as: the systematic use of resources, knowledge and practices to implement a novel technology or methodology to meet specific goals and objectives which, in this case, must relate to advancing the state-of-the-art of offshore wind energy technology. Funds for project development may be used to research the applicability and cost effectiveness of a new technology or methodology, and for site-specific engineering to utilize the technology, but may not be applied to procurement of the hardware for the proposed technology.

To be eligible for award, development of candidate projects where the proposed technology/methodology demonstration would take place must already be underway at the time of the application to this FOA—meaning specifically that a site has been secured, permitting and site assessments are underway or complete, and construction engineering and hardware selection are underway. The demonstration could be stand-alone or a portion of a larger commercial-scale offshore wind plant installation. In either case, the innovative technology/methodology must be one that has not been utilized commercially in the United States to date.

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Up to two awards will be made, totaling \$10M.

The proposed project must:

- Implement an innovative commercial-scale technology at full scale, and/or employ a novel methodology that has yet to be utilized commercially in the United States for offshore wind; and ,
- Have substantiated potential to reduce commercial-scale LCOE and/or future commercial scale project risk.

“Full-scale” is defined as being applicable to state-of-the-art wind turbines and supporting structures of a size and multi-megawatt generating capacity typically installed in utility-connected, multi-turbine arrays.

Proposed projects could include project development activities for demonstration of commercial-scale innovations such as:

- Next-generation turbines and components;
- Innovative foundation types;
- Turbine controls;
- Wind plant controls;
- Manufacturing and fabrication processes;
- Foundation and turbine installation techniques and/or technologies;
- Transmission cable installation methodologies; or
- Operations and maintenance (O&M) technology and procedures.

As a part of the technology transfer effort and a requirement of award, the applicant will commit to a suite of project instrumentation and data collection and to making that dataset available to DOE and its national laboratories for up to five years after the project end date for use in further research. If the demonstration is part of a larger offshore wind installation, the data delivered to DOE should include the baseline data and the demonstration data. For example:

- If project development funds are used to support a new installation technique , data delivered to DOE would include baseline and innovative techniques data, i.e. cycle times, noise emitted, cost savings, etc.
- If project development funds are used to support a new controls strategy , data delivered to DOE would include performance data for the baseline turbine(s) and the innovative turbines over the course of pertinent load conditions.
- If project development funds are used to support a new O&M strategy , data regarding baseline O&M and innovative O&M would be provided, i.e. availability, number of trips to the turbines, etc.

The strongest applicants will show that the proposed use of project development funds will clearly enable demonstration of innovations addressing common needs of

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the wider offshore wind industry. Successful applications should include substantive information supporting any assumptions that the proposed project will have significant impact on one or more of the offshore wind industry needs below:

- Reducing offshore wind energy costs;
- Reducing financing and permitting risks;
- Accelerating the rate of offshore wind deployment;
- Disseminating performance data;
- Decreasing environmental barriers to deployment or operation; and/or
- Validating innovative solutions beneficial to multiple commercial applications.

Metrics for success include a demonstrable cost reduction for offshore wind based on projected commercial-scale implementation of the innovative technology or methodology, and data collected from the follow-on successful demonstration of the innovation.

Area of Interest 4: Tall Towers for U.S. Wind Power

To support the development of technologies that mitigate U.S. transportation and logistics constraints affecting the deployment of taller utility-scale wind turbine systems, DOE seeks applications to design, build, test, and validate a 140 meter or taller wind turbine tower.

The cost of conventional wind turbine towers increases rapidly with increasing height, creating a trade-off between tower cost and the value of added energy production. Under current market conditions, technical innovations will be required for land-based tower heights beyond 120 meters to be economical, since the installed cost increases faster than the increased energy production for most sites. Rolled steel is the primary material used in wind turbine tower structures for utility-scale wind projects. Tubular steel tower sections are produced through automated manufacturing processes. Plate steel is rolled and machine-welded at the factory, then transported to and assembled at the project site. Conventional rolled steel towers can be transported with tower sections up to 4.6 m in diameter over roads and 4.0 m via railroad. Tower diameters exceeding 4.6 m are difficult to transport. These transport restrictions result in sub-optimal tower design and increased cost for tower heights exceeding 80 m. A structurally optimized tower would have a larger base diameter, with thinner walls and less total steel. Innovative manufacturing and design for tall towers will enable continued turbine up-scaling. Tall wind and other design advancements are expected to increase turbine performance and reduce the overall cost of energy by up to 50%.¹⁰

¹⁰ K. Dykes, M. Hand, T. Stehly, P. Veers, M. Robinson, E. Lantz, R. Tusing. (2017). Enabling the SMART Wind Power Plant of the Future Through Science-Based Innovation. National Renewable Energy Laboratory. <https://www.nrel.gov/docs/fy17osti/68123.pdf>

The objectives of this area of interest are to: (1) Reduce the levelized cost of energy (LCOE) of land-based wind power by enabling validation of taller tower technology and capturing stronger wind resources; and (2) Increase wind turbine deployment opportunities in lower wind speed regions across the country where wind energy has previously been more expensive to deploy (see Figure 1).

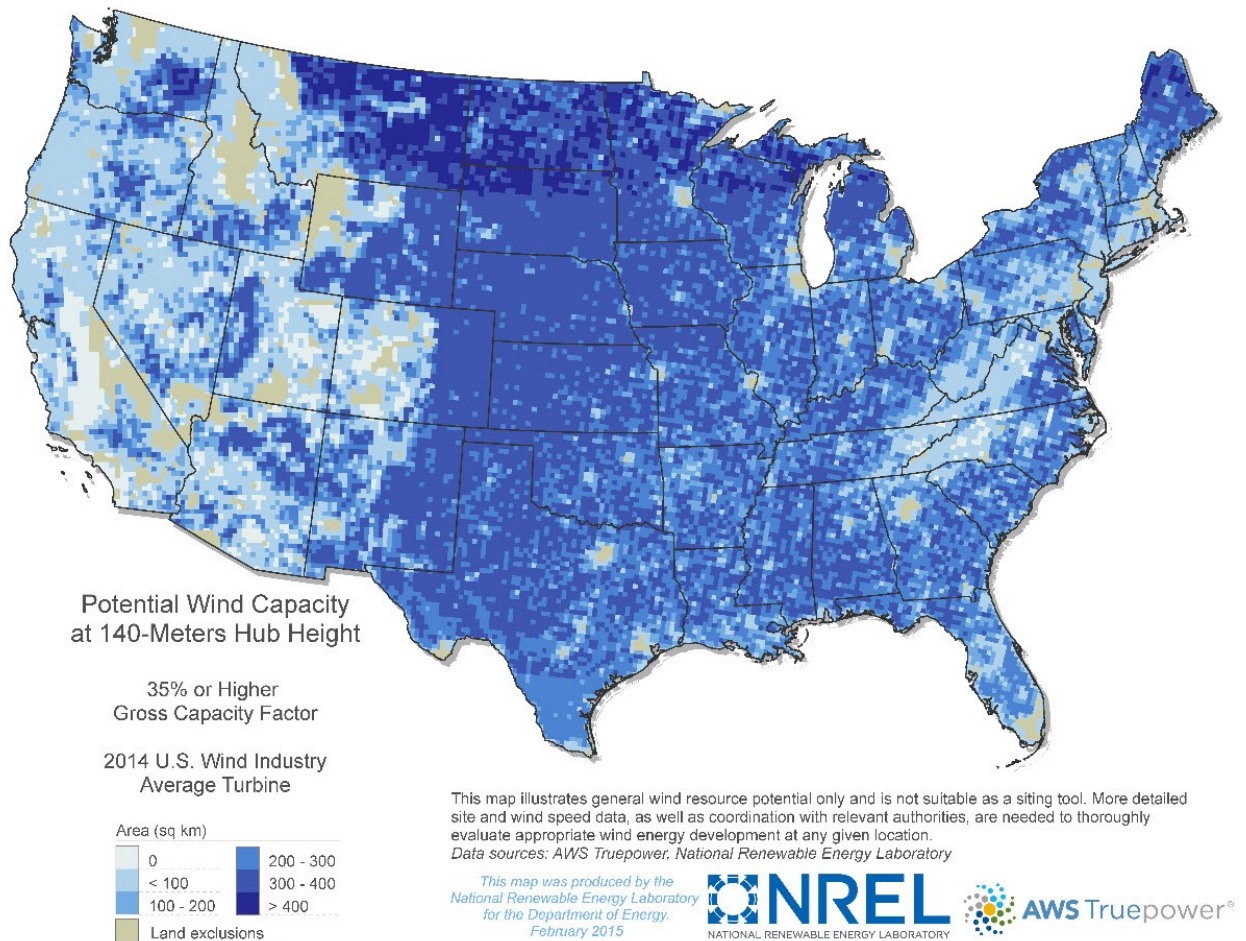


Figure 1: U.S. Potential Wind Capacity at 140-meter Hub Height¹¹

This area of interest is focused on innovative design and manufacturing for wind turbine towers for multi-megawatt turbines with hub heights of at least 140 meters that are cost competitive over their lifetime.

Desired outcomes include the following:

- The design of a new tower that is taller than 140m and can support multi-megawatt turbines, that is designed for:

¹¹ <https://windexchange.energy.gov/maps-data/326>

- Facilitating fabrication and erection;
 - Broad applicability to diverse installation locations;
 - Reducing transportation, assembly, and decommissioning challenges; and
 - Achieving cost competitive LCOE for a commercial scale wind plant.
- Design, fabricate, and install the tall tower, demonstrate its performance by installing a multi-megawatt nacelle on top, and perform validation testing for at least five years.
- Collect data that would facilitate future tower certification.
- Demonstration of cost-effective technology for developers/financiers enabling commercial adoption.
- Verify the new tower improvements to lifecycle costs through NREL-led analysis and reports comparing the baseline to the tall tower design. This will prove the feasibility of the tower to achieve cost targets.

Successful applications will include the following:

- Clear description of the proposed technology;
- A detailed description of the anticipated method for installation & assembly of the tower, nacelle, and rotor systems;
- Specify the turbine that will be used for the demonstration;
- Specify the geographic location for the project;
- Specific turbine data to be collected during testing & proposed data collection plan;
- Proposed commercialization plan & description of how this project facilitates that plan;
- Detailed description of transportation & delivery cost assumptions;
- Description of materials used, including material sourcing (domestic or foreign), and any limitations;
- Economic projections for full scale implementation utilizing assumptions provided by DOE in Appendix H.

Guidelines for cost estimates & key baseline turbine & plant assumptions can be found in Appendix H.

WETO has engaged the National Renewable Energy Laboratory (NREL) to provide support for cost analysis and LCOE modeling to each awardee for the duration of the awards. Potential applicants should not contact NREL for assistance in preparing an application and will collaborate with NREL at DOE's expense only (funded directly) if competitively selected and awarded.

WETO encourages industry engagement in this manufacturing competitiveness initiative through multi-organizational teams to invest in development of innovative

products for an integrated tower manufacturing, assembly and turbine erection concept. Teams can include, but are not prescribed or limited to, the following:

- A tower designer;
- An original equipment manufacturer (OEM) turbine designer;
- A tower fabricator;
- A wind farm developer; and/or
- An installation equipment or logistics firm.

Per Section G, "Eligible Applicants" below, Federally Funded Research and Development Centers (FFRDCs) are excluded from applying as either a prime or sub-recipient for this area of interest.

As a requirement of WETO support, the applicant will commit to a suite of instrumentation and data collection from the demonstration, and to making that dataset available to DOE and its national laboratories for up to five years after the project end date for use in further research.

C. Applications Specifically Not of Interest

The following types of applications will be deemed nonresponsive and will not be reviewed or considered (See Section III.D. of the FOA):

- For All Area(s) of Interest
 - Applications that fall outside the technical parameters specified in Section I.A and I.B of the FOA
 - Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics).
- For Area of Interest 1, applications that propose solutions that do not include a focus on distributed wind technology.
- For Area of Interest 2, applications for the construction of new offshore wind R&D test facilities are not of interest.
- For Area of Interest 2, Subtopic 2b, applications that propose using project funds to procure tools or other upgrades to shop facilities for fabricating models or test articles are not of interest.
- For Area of Interest 3,
 - Applications proposing projects that do not have a clearly identified commitment to demonstrate project results and validate the technology or methodology subsequent to the end of the project.
 - Applications that have not identified a demonstration location are not of interest.
 - Applications proposing a scope of work that is currently funded by EERE are not of interest.
- For Area of Interest 4,

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- Applications proposing projects that do not include the installation of a nacelle on top of the tower are not of interest.

D. Authorizing Statutes

The programmatic authorizing statute is the Energy Policy Act of 2005.

Awards made under this announcement will fall under the purview of 2 Code of Federal Regulation (CFR) Part 200 as amended by 2 CFR Part 910.

II. Award Information

A. Award Overview

i. Estimated Funding

EERE expects to make a total of approximately \$28.1M of federal funding available for new awards under this FOA, subject to the availability of appropriated funds. EERE anticipates making approximately 8 to 24 awards under this FOA. EERE may issue one, multiple, or no awards. Individual awards may vary between \$500K and \$10M.

Areas of Interest	Title	Minimum Award Size	Maximum Award Size	Total DOE Funding	Estimated # awards
Subtopic 1a	Wind Innovations for Rural Economic Development (WIRED)—Fully integrated distributed wind research and development (R&D) innovations to enhance resilience and reliability	\$1M	\$1.55M	\$3.05M	Up to 3
Subtopic 1b	Wind Innovations for Rural Economic Development (WIRED)— Balance of system cost reduction through standardization	\$1.5M	\$3.05M	\$3.05M	Up to 2
Subtopic 2a	R&D utilizing Existing national-level offshore wind testing facilities	\$500K	\$1M	Up to \$7M between 2a and 2b	Up to 14

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Subtopic 2b	R&D requiring upgrades to existing national offshore wind testing facilities	\$1.5M	\$7M	Up to \$7M between 2a and 2b	Up to 2
3	Project Development for Offshore Wind Technology Demonstrations	\$5M	\$10M	\$10M	Up to 2
4	Tall Towers for U.S. Wind Power	\$5M	\$5M	\$5M	1

EERE may establish more than one budget period for each award and fund only the initial budget period(s). Funding for all budget periods, including the initial budget period, is not guaranteed.

ii. Period of Performance

EERE anticipates making awards that will run up to 48 months in length, comprised of one or more budget periods. Project continuation will be contingent upon satisfactory performance and Go/No-Go decision review. At the Go/No-Go decision points, EERE will evaluate project performance, project schedule adherence, meeting milestone objectives, compliance with reporting requirements, and overall contribution to the program goals and objectives. As a result of this evaluation, EERE will make a determination to continue to fund the project, recommend re-direction of work under the project, place a hold on federal funding for the project, or discontinue funding the project.

Areas of Interest	Title	Est. Period of Performance (months)	Budget Period Guidance
Subtopic 1a	Wind Innovations for Rural Economic Development (WIRED)– Fully integrated distributed wind research and development (R&D) innovations to enhance resilience and reliability	Up to 24	Go/No-Go decision reviews
Subtopic 1b	Wind Innovations for Rural Economic Development (WIRED)– Balance of system cost reduction through standardization	Up to 48	Go/No-Go decision reviews
Subtopic 2a	R&D utilizing existing national-level offshore wind testing facilities	Up to 24	Go/No-Go decision reviews
Subtopic 2b	R&D requiring upgrades to existing national offshore wind testing facilities	Up to 36	Go/No-Go decision reviews
3	Project Development for Offshore Wind Technology Demonstrations	36	Go/No-Go decision reviews

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4	Tall Towers for U.S. Wind Power	42	Budget Period 1: 18 mos. Go/No-Go decision review Budget Period 2: 24 mos.
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iii. New Applications Only

EERE will accept only new applications under this FOA. EERE will not consider applications for renewals of existing EERE-funded awards through this FOA.

B. EERE Funding Agreements

Through Cooperative Agreements and other similar agreements, EERE provides financial and other support to projects that have the potential to realize the FOA objectives. EERE does not use such agreements to acquire property or services for the direct benefit or use of the United States Government.

i. Cooperative Agreements

EERE generally uses Cooperative Agreements to provide financial and other support to prime recipients.

Through Cooperative Agreements, EERE provides financial or other support to accomplish a public purpose of support or stimulation authorized by federal statute. Under Cooperative Agreements, the Government and prime recipients share responsibility for the direction of projects.

EERE has substantial involvement in all projects funded via Cooperative Agreement. See Section VI.B.ix of the FOA for more information on what substantial involvement may involve.

ii. Funding Agreements with Federally Funded Research and Development Center (FFRDCs)

In most cases, FFRDCs are funded independently of the remainder of the Project Team. The FFRDC then executes an agreement with any non-FFRDC Project Team members to arrange work structure, project execution, and any other matters. Regardless of these arrangements, the entity that applied as the prime recipient for the project will remain the prime recipient for the project.

III. Eligibility Information

To be considered for substantive evaluation, an applicant's submission must meet the criteria set forth below. If the application does not meet these eligibility requirements, it will be considered ineligible and removed from further evaluation.

A. Eligible Applicants

i. Individuals

U.S. citizens and lawful permanent residents are eligible to apply for funding as a prime recipient or subrecipient.

ii. Domestic Entities

For areas of interest 1a, 1b, 2a, 2b and 3, for-profit entities, educational institutions, and nonprofits that are incorporated (or otherwise formed) under the laws of a particular State or territory of the United States and have a physical location for business operations in the United States are eligible to apply for funding as a prime recipient or subrecipient. Nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995, are not eligible to apply for funding.

For areas of interest 1, 2, and 3, State, local, and tribal government entities are eligible to apply for funding as a prime recipient or subrecipient. For area of interest 4, state, local, and tribal government entities are eligible to apply for funding as a subrecipient, but are not eligible to apply as a prime recipient

For areas of interest 1, 2, and 3, DOE/NNSA FFRDCs are eligible to apply for funding as a subrecipient, but are not eligible to apply as a prime recipient.

For areas of interest 1, 2, and 3, Non-DOE/NNSA FFRDCs are eligible to apply for funding as a subrecipient, but are not eligible to apply as a prime recipient.

For areas of interest 1, 2 and 3, and 4, Federal agencies and instrumentalities (other than DOE) are eligible to apply for funding as a subrecipient, but are not eligible to apply as a prime recipient.

For area of interest 4, Tall Towers for U.S. Wind Power, eligibility will be restricted to for-profit entities in order to ensure that industry takes the lead as the prime recipient. All DOE/NNSA FFRDCs are excluded from participating in this area of interest as either a prime recipient or subrecipient. The prime recipient must perform more than 50% of the project work, as measured by the Total Project Costs.

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For area of interest 4, all DOE/NNSA FFRDCs are not eligible to apply for funding in this area of interest as either a prime recipient or a subrecipient.

For area of interest 4, educational institutions, and nonprofits that are incorporated (or otherwise formed) under the laws of a particular State or territory of the United States and have a physical location for business operations in the United States are eligible to apply for funding only as a subrecipient, but are not eligible to apply as a prime recipient.

iii. Foreign Entities

Foreign entities, whether for-profit or otherwise, are eligible to apply for funding under this FOA. Other than as provided in the “Individuals” or “Domestic Entities” sections above, all prime recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a State or territory of the United States and have a physical location for business operations in the United States. If a foreign entity applies for funding as a prime recipient, it must designate in the Full Application a subsidiary or affiliate incorporated (or otherwise formed) under the laws of a State or territory of the United States to be the prime recipient. The Full Application must state the nature of the corporate relationship between the foreign entity and domestic subsidiary or affiliate.

Foreign entities may request a waiver of the requirement to designate a subsidiary in the United States as the prime recipient in the Full Application (i.e., a foreign entity may request that it remains the prime recipient on an award). To do so, the applicant must submit an explicit written waiver request in the Full Application. Appendix C lists the necessary information that must be included in a request to waive this requirement. The applicant does not have the right to appeal EERE’s decision concerning a waiver request.

In the waiver request, the applicant must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to have a foreign entity serve as the prime recipient. EERE may require additional information before considering the waiver request.

A foreign entity may receive funding as a subrecipient.

iv. Incorporated Consortia

Incorporated consortia, which may include domestic and/or foreign entities, are eligible to apply for funding as a prime recipient or subrecipient. For consortia incorporated (or otherwise formed) under the laws of a State or territory of the United States, please refer to “Domestic Entities” above. For consortia incorporated in foreign countries, please refer to the requirements in “Foreign Entities” above.

Each incorporated consortium must have an internal governance structure and a written set of internal rules. Upon request, the consortium must provide a written description of its internal governance structure and its internal rules to the EERE Contracting Officer.

v. Unincorporated Consortia

Unincorporated Consortia, which may include domestic and foreign entities, must designate one member of the consortium to serve as the prime recipient/consortium representative. The prime recipient/consortium representative must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. The eligibility of the consortium will be determined by the eligibility of the prime recipient/consortium representative under Section III.A. of the FOA.

Upon request, unincorporated consortia must provide the EERE Contracting Officer with a collaboration agreement, commonly referred to as the articles of collaboration, which sets out the rights and responsibilities of each consortium member. This agreement binds the individual consortium members together and should discuss, among other things, the consortium’s:

- Management structure;
- Method of making payments to consortium members;
- Means of ensuring and overseeing members’ efforts on the project;
- Provisions for members’ cost sharing contributions; and
- Provisions for ownership and rights in intellectual property developed previously or under the agreement.

IV. Cost Sharing

Cost share requirements vary by area of interest and subtopics as summarized below.

Topic	Title	Cost Share
Subtopic 1a	Wind Innovations for Rural Economic Development (WIRED)— Fully integrated distributed wind research and development	20%

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	(R&D) innovations to enhance resilience and reliability	
Subtopic 1b	Wind Innovations for Rural Economic Development (WIRED)– Balance of system cost reduction through standardization	20%
Subtopic 2a	R&D utilizing existing national-level offshore wind testing facilities	20%
Subtopic 2b	R&D requiring upgrades to existing national offshore wind testing facilities	20% for R&D, 50% for facility upgrades
3	Project Development for Offshore Wind Technology Demonstrations	20%
4	Tall Towers for U.S. Wind Power	50%

Areas of Interest 1, 2a, 2b (R&D) & 3:

The cost share must be at least 20% of the total allowable costs for research and development projects (i.e., the sum of the Government share, including FFRDC costs if applicable, and the recipient share of allowable costs equals the total allowable cost of the project) and must come from non-federal sources unless otherwise allowed by law. (See 2 CFR 200.306 and 2 CFR 910.130 for the applicable cost sharing requirements.)

Areas of Interest 2b (facility upgrades) & 4:

The cost share must be at least 50% of the total allowable costs (i.e., the sum of the Government share, including FFRDC costs if applicable, and the recipient share of allowable costs equals the total allowable cost of the project) for research and development projects and 50% of the total allowable costs for demonstration and commercial application projects and must come from non-federal sources unless otherwise allowed by law. (See 2 CFR 200.306 and 2 CFR 910.130 for the applicable cost sharing requirements.)

PLEASE NOTE: Section 108, “Short-Term Cost-Share Pilot Program” of the recently enacted Department of Energy Research and Innovation Act (RIA), Pub. L. 115-246 removes the minimum statutory cost share requirement for Institutions of Higher Education and Non-Profit Organizations for research and development for a two year pilot period. Nevertheless, RIA does not automatically change the cost share requirements as set forth in 2 CFR 910.130 of DOE’s financial assistance regulation without first amending the regulation. Therefore, until the regulation is updated and aligned with RIA or a cost share waiver is issued, DOE programs and Contracting Officers must adhere to the cost share requirements as set forth in 2 CFR 910.130 and the FOA.

To assist applicants in calculating proper cost share amounts, EERE has included a cost share information sheet and sample cost share calculation as Appendices A and B to this

FOA.

i. Legal Responsibility

Although the cost share requirement applies to the project as a whole, including work performed by members of the project team other than the prime recipient, the prime recipient is legally responsible for paying the entire cost share. If the funding agreement is terminated prior to the end of the project period, the prime recipient is required to contribute at least the cost share percentage of total expenditures incurred through the date of termination.

The prime recipient is solely responsible for managing cost share contributions by the project team and enforcing cost share obligation assumed by project team members in subawards or related agreements.

ii. Cost Share Allocation

Each project team is free to determine how best to allocate the cost share requirement among the team members. The amount contributed by individual project team members may vary, as long as the cost share requirement for the project as a whole is met.

iii. Cost Share Types and Allowability

Every cost share contribution must be allowable under the applicable federal cost principles, as described in Section IV.J.1 of the FOA. In addition, cost share must be verifiable upon submission of the Full Application.

Project teams may provide cost share in the form of cash or in-kind contributions. Cost share may be provided by the prime recipient, subrecipients, or third parties (entities that do not have a role in performing the scope of work). Vendors/contractors may not provide cost share. Any partial donation of goods or services is considered a discount and is not allowable.

Cash contributions include, but are not limited to: personnel costs, fringe costs, supply and equipment costs, indirect costs and other direct costs.

In-kind contributions are those where a value of the contribution can be readily determined, verified and justified but where no actual cash is transacted in securing the good or service comprising the contribution. Allowable in-kind contributions include, but are not limited to: the donation of volunteer time or the donation of space or use of equipment.

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Project teams may use funding or property received from state or local governments to meet the cost share requirement, so long as the funding was not provided to the state or local government by the federal government.

The prime recipient may not use the following sources to meet its cost share obligations including, but not limited to:

- Revenues or royalties from the prospective operation of an activity beyond the project period;
- Proceeds from the prospective sale of an asset of an activity;
- Federal funding or property (e.g., federal grants, equipment owned by the federal government); or
- Expenditures that were reimbursed under a separate federal program.

Project teams may not use the same cash or in-kind contributions to meet cost share requirements for more than one project or program.

Cost share contributions must be specified in the project budget, verifiable from the prime recipient's records, and necessary and reasonable for proper and efficient accomplishment of the project. As all sources of cost share are considered part of total project cost, the cost share dollars will be scrutinized under the same federal regulations as federal dollars to the project. Every cost share contribution must be reviewed and approved in advance by the Contracting Officer and incorporated into the project budget before the expenditures are incurred.

Applicants are encouraged to refer to 2 CFR 200.306 as amended by 2 CFR 910.130 for additional guidance on cost sharing.

iv. Cost Share Contributions by FFRDCs

Because FFRDCs are funded by the federal government, costs incurred by FFRDCs generally may not be used to meet the cost share requirement. FFRDCs may contribute cost share only if the contributions are paid directly from the contractor's Management Fee or another non-federal source.

v. Cost Share Verification

Applicants are required to provide written assurance of their proposed cost share contributions in their Full Applications.

Upon selection for award negotiations, applicants are required to provide additional information and documentation regarding their cost share contributions. Please refer to Appendix A of the FOA.

vi. Cost Share Payment

EERE requires prime recipients to contribute the cost share amount incrementally over the life of the award. Specifically, the prime recipient's cost share for each billing period must always reflect the overall cost share ratio negotiated by the parties (i.e., the total amount of cost sharing on each invoice when considered cumulatively with previous invoices must reflect, at a minimum, the cost sharing percentage negotiated). As FFRDC funding will be provided directly to the FFRDC(s) by DOE, prime recipients will be required to provide project cost share at a percentage commensurate with the FFRDC costs, on a budget period basis, resulting in a higher interim invoicing cost share ratio than the total award ratio.

In limited circumstances, and where it is in the government's interest, the EERE Contracting Officer may approve a request by the prime recipient to meet its cost share requirements on a less frequent basis, such as monthly or quarterly. Regardless of the interval requested, the prime recipient must be up-to-date on cost share at each interval. Such requests must be sent to the Contracting Officer during award negotiations and include the following information: (1) a detailed justification for the request; (2) a proposed schedule of payments, including amounts and dates; (3) a written commitment to meet that schedule; and (4) such evidence as necessary to demonstrate that the prime recipient has complied with its cost share obligations to date. The Contracting Officer must approve all such requests before they go into effect.

A. Compliance Criteria

Concept Papers and Full Applications must meet all compliance criteria listed below or they will be considered noncompliant. EERE will not review or consider noncompliant submissions, including Concept Papers and Full Applications that were: submitted through means other than EERE Exchange; submitted after the applicable deadline; and/or submitted incomplete. EERE will not extend the submission deadline for applicants that fail to submit required information due to server/connection congestion.

i. Compliance Criteria*Concept Papers*

Concept Papers are deemed compliant if:

- The Concept Paper complies with the content and form requirements in Section IV.C. of the FOA; and
- The applicant successfully uploaded all required documents and clicked the "Submit" button in EERE Exchange by the deadline stated in this FOA.

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Full Applications

Full Applications are deemed compliant if:

- The applicant submitted a compliant Concept Paper;
- The Full Application complies with the content and form requirements in Section IV.D. of the FOA; and
- The applicant successfully uploaded all required documents and clicked the “Submit” button in EERE Exchange by the deadline stated in the FOA.

B. Responsiveness Criteria

All “Applications Specifically Not of Interest,” as described in Section I.C. of the FOA, are deemed nonresponsive and are not reviewed or considered.

C. Other Eligibility Requirements

i. Requirements for DOE/NNSA and non-DOE/NNSA Federally Funded Research and Development Centers Included as a Subrecipient

DOE/NNSA and non-DOE/NNSA FFRDCs may be proposed as a subrecipient on another entity’s application subject to the following guidelines:

Authorization for non-DOE/NNSA FFRDCs

The federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with its authority under its award.

Authorization for DOE/NNSA FFRDCs

The cognizant Contracting Officer for the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The following wording is acceptable for this authorization:

Authorization is granted for the Laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complementary to the missions of the laboratory, and will not adversely impact execution of the DOE assigned programs at the laboratory.

Value/Funding

The value of and funding for the FFRDC portion of the work will not normally be included in the award to a successful applicant. Usually, DOE will fund a DOE/NNSA FFRDC contractor through the DOE field work proposal (WP) system and non-DOE/NNSA FFRDC through an interagency agreement with the sponsoring agency.

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Cost Share

Although the FFRDC portion of the work is usually excluded from the award to a successful applicant, the applicant's cost share requirement will be based on the total cost of the project, including the applicant's, the subrecipient's, and the FFRDC's portions of the project.

Responsibility

The prime recipient will be the responsible authority regarding the settlement and satisfaction of all contractual and administrative issues including, but not limited to disputes and claims arising out of any agreement between the prime recipient and the FFRDC contractor.

Limit on FFRDC Effort

The FFRDC effort, in aggregate, shall not exceed 50% of the total estimated cost of the project, including the applicant's and the FFRDC's portions of the effort.

D. Limitation on Number of Concept Papers and Full Applications Eligible for Review

Areas of Interest	Title	Limitation re: number of application submittals
Subtopic 1a	Wind Innovations for Rural Economic Development (WIRED)– Fully integrated distributed wind research and development (R&D) innovations to enhance resilience and reliability	An entity may submit more than one Concept Paper and Full Application to this subtopic, provided that each application describes a unique, scientifically distinct project and provided that an eligible Concept Paper was submitted for each Full Application.
Subtopic 1b	Wind Innovations for Rural Economic Development (WIRED)– Balance of system cost reduction through standardization	An entity may submit more than one Concept Paper and Full Application to this subtopic, provided that each application describes a unique, scientifically distinct project and provided that an eligible Concept Paper was submitted for each Full Application.

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Subtopic 2a	R&D utilizing existing national-level offshore wind testing facilities	An entity may submit more than one Concept Paper and Full Application to this subtopic, provided that each application describes a unique, scientifically distinct project and provided that an eligible Concept Paper was submitted for each Full Application. (limit is 3 applications per single entity)
Subtopic 2b	R&D requiring upgrades to existing national offshore wind testing facilities	One Full Application per single entity **
3	Project Development for Offshore Wind Technology Demonstrations	One Full Application per single entity **
4	Tall Towers for U.S. Wind Power	One Full Application per single entity **

** An entity may only submit one Concept Paper and one Full Application for each Area of Interest or subtopic of this FOA. If an entity submits more than one Concept Paper and one Full Application to the same Area of Interest or subtopic, EERE will request a determination from the applicant's authorizing representative as to which application should be reviewed. Any other submissions received listing the same entity as the applicant for the same Area of Interest or subtopic will not be eligible for further consideration. This limitation does not prohibit an applicant from collaborating on other applications (e.g., as a potential subrecipient or partner) so long as the entity is only listed as the applicant on one Concept Paper and one Full Application for each Area of Interest or subtopic area of this FOA."

E. Questions Regarding Eligibility

EERE will not make eligibility determinations for potential applicants prior to the date on which applications to this FOA must be submitted. The decision whether to submit an application in response to this FOA lies solely with the applicant.

V. Application and Submission Information

A. Application Process

The application process will include two phases: a Concept Paper phase and a Full Application phase. **Only applicants who have submitted an eligible Concept Paper will be eligible to submit a Full Application.** At each phase, EERE performs an initial

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eligibility review of the applicant submissions to determine whether they meet the eligibility requirements of Section III of the FOA. EERE will not review or consider submissions that do not meet the eligibility requirements of Section III. All submissions must conform to the following form and content requirements, including maximum page lengths (described below) and must be submitted via EERE Exchange at <https://eere-exchange.energy.gov/>, unless specifically stated otherwise. **EERE will not review or consider submissions submitted through means other than EERE Exchange, submissions submitted after the applicable deadline, or incomplete submissions.** EERE will not extend deadlines for applicants who fail to submit required information and documents due to server/connection congestion.

A **Control Number** will be issued when an applicant begins the EERE Exchange application process. This control number must be included with all application documents, as described below.

The Concept Paper and Full Application must conform to the following requirements:

- Each must be submitted in Adobe PDF format unless stated otherwise;
- Each must be written in English;
- All pages must be formatted to fit on 8.5 x 11 inch paper with margins not less than one inch on every side. Use Times New Roman typeface, a black font color, and a font size of 12 point or larger (except in figures or tables, which may be 10 point font). A symbol font may be used to insert Greek letters or special characters, but the font size requirement still applies. References must be included as footnotes or endnotes in a font size of 10 or larger. Footnotes and endnotes are counted toward the maximum page requirement;
- The Control Number must be prominently displayed on the upper right corner of the header of every page. Page numbers must be included in the footer of every page; and
- Each submission must not exceed the specified maximum page limit, including cover page, charts, graphs, maps, and photographs when printed using the formatting requirements set forth above and single spaced. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages.

Applicants are responsible for meeting each submission deadline. **Applicants are strongly encouraged to submit their Concept Papers and Full Applications at least 48 hours in advance of the submission deadline.** Under normal conditions (i.e., at least 48 hours in advance of the submission deadline), applicants should allow at least 1 hour to submit a Concept Paper or Full Application. Once the Concept Paper or Full Application is submitted in EERE Exchange, applicants may revise or update that submission until the expiration of the applicable deadline. If changes are made

to any of these documents, the applicant must resubmit the Concept Paper or Full Application before the applicable deadline.

EERE urges applicants to carefully review their Concept Papers and Full Applications and to allow sufficient time for the submission of required information and documents. All Full Applications that pass the initial eligibility review will undergo comprehensive technical merit review according to the criteria identified in Section V.A.ii. of the FOA.

i. Additional Information on EERE Exchange

EERE Exchange is designed to enforce the deadlines specified in this FOA. The “Apply” and “Submit” buttons will automatically disable at the defined submission deadlines. Should applicants experience problems with EERE Exchange, the following information may be helpful.

Applicants that experience issues with submission PRIOR to the FOA deadline: In the event that an applicant experiences technical difficulties with a submission, the applicant should contact the EERE Exchange helpdesk for assistance (EERE-ExchangeSupport@hq.doe.gov). The EERE Exchange helpdesk and/or the EERE Exchange system administrators will assist applicants in resolving issues.

Applicants that experience issues with submissions that result in late submissions: In the event that an applicant experiences technical difficulties so severe that they are unable to submit their application by the deadline, the applicant should contact the EERE Exchange helpdesk for assistance (EERE-ExchangeSupport@hq.doe.gov). The EERE Exchange helpdesk and/or the EERE Exchange system administrators will assist the applicant in resolving all issues (including finalizing submission on behalf of and with the applicant’s concurrence). Please note, network traffic is at its heaviest during the final hours and minutes prior to submittal deadline. Applicants who experience this during the final hours or minutes and are unsuccessful in uploading documents will not be able to use this process.

B. Application Forms

The application forms and instructions are available on EERE Exchange. To access these materials, go to <https://eere-Exchange.energy.gov> and select the appropriate funding opportunity number.

Note: The maximum file size that can be uploaded to the EERE Exchange website is 10MB. Files in excess of 10MB cannot be uploaded, and hence cannot be submitted for review. If a file exceeds 10MB but is still within the maximum page limit specified in the FOA, it must be broken into parts and denoted to that effect. For example:

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ControlNumber_LeadOrganization_Project_Part_1

ControlNumber_LeadOrganization_Project_Part_2

C. Content and Form of the Concept Paper

To be eligible to submit a Full Application, applicants must submit a Concept Paper by the specified due date and time.

i. Concept Paper Content Requirements

EERE will not review or consider ineligible Concept Papers (see Section III of the FOA).

Each Concept Paper must be limited to a single concept or technology. Unrelated concepts and technologies should not be consolidated into a single Concept Paper.

The Concept Paper must conform to the following content requirements:

Section	Page Limit	Description
Cover Page	1 page maximum	The cover page should include the project title, the specific FOA Area of Interest being addressed (and subtopic if applicable), both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Technical Description and Impacts	5 pages maximum	Applicants are required to describe succinctly: <ul style="list-style-type: none">• The proposed technology or technology testing project, including its basic operating principles and how it is unique and innovative;• The proposed technology's target level of performance (applicants should provide technical data or other support to show how the proposed target could be met);• The current state-of-the-art in the relevant field and application, including key shortcomings, limitations, and challenges;• How the proposed technology will overcome the shortcomings, limitations, and challenges in the relevant field and application;• The potential impact that the proposed project would have on the relevant field and application;• The key technical risks/issues associated with the proposed technology development plan; and• The impact that EERE funding would have on the proposed project.

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Addendum	3 pages maximum	<p>Applicants are required to describe succinctly the qualifications, experience, and capabilities of the proposed Project Team, including:</p> <ul style="list-style-type: none">• Whether the Principal Investigator (PI) and Project Team have the skill and expertise needed to successfully execute the project plan;• Whether the applicant has prior experience which demonstrates an ability to perform tasks of similar risk and complexity;• Whether the applicant has worked together with its teaming partners on prior projects or programs; and• Whether the applicant has adequate access to equipment and facilities necessary to accomplish the effort and/or clearly explain how it intends to obtain access to the necessary equipment and facilities. <p>Applicants may provide graphs, charts, or other data to supplement their Technology Description.</p>
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EERE makes an independent assessment of each Concept Paper based on the criteria in Section V.A.i. of the FOA. EERE will encourage a subset of applicants to submit Full Applications. Other applicants will be discouraged from submitting a Full Application. An applicant who receives a “discouraged” notification may still submit a Full Application. EERE will review all eligible Full Applications. However, by discouraging the submission of a Full Application, EERE intends to convey its lack of programmatic interest in the proposed project in an effort to save the applicant the time and expense of preparing an application that is unlikely to be selected for award negotiations.

EERE may include general comments provided from reviewers on an applicant’s Concept Paper in the encourage/discourage notification posted on EERE Exchange at the close of that phase.

D. Content and Form of the Full Application

Applicants must submit a Full Application by the specified due date and time to be considered for funding under this FOA. Applicants must complete the following application forms found on the EERE Exchange website at <https://eere-Exchange.energy.gov/>, in accordance with the instructions.

Applicants will have approximately 30 days from receipt of the Concept Paper Encourage/Discourage notification on EERE Exchange to prepare and submit a Full Application. Regardless of the date the applicant receives the Encourage/Discourage notification, the submission deadline for the Full Application remains the date and time stated on the FOA cover page.

Questions about this FOA? Email FY19WETOFOA@ee.doe.gov.

Problems with EERE Exchange? Email EERE-ExchangeSupport@hq.doe.gov Include FOA name & number in subject line.

All Full Application documents must be marked with the Control Number issued to the applicant. Applicants will receive a control number upon clicking the “Create Concept Paper” button in EERE Exchange, and should include that control number in the file name of their Full Application submission (i.e., *Control number_Applicant Name_Full Application*).

i. Full Application Content Requirements

EERE will not review or consider ineligible Full Applications (see Section III. of the FOA).

Each Full Application shall be limited to a single concept or technology. Unrelated concepts and technologies shall not be consolidated in a single Full Application. Full Applications must conform to the following requirements:

Submission	Components	File Name
Full Application (PDF, unless stated otherwise)	Technical Volume (PDF format. See Chart in Section IV.D.ii.)	ControlNumber_LeadOrganization_TechnicalVolume
	Statement of Project Objectives (SOPO) (Microsoft Word format. 10 page limit)	ControlNumber_LeadOrganization_SOPO
	SF-424 Application for Federal Assistance (PDF format)	ControlNumber_LeadOrganization_App424
	Budget Justification (Microsoft Excel format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_Budget_Justification
	Summary for Public Release (PDF format. 1 page limit)	ControlNumber_LeadOrganization_Summary
	Summary Slide (Microsoft PowerPoint format. 1 page limit)	ControlNumber_LeadOrganization_Slide
	Subrecipient Budget Justification, if applicable (Microsoft Excel format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_Subrecipient_Budget_Justification
	DOE WP for FFRDC, if applicable (PDF format. See DOE O 412.1A, Attachment 3)	ControlNumber_LeadOrganization_WP
	Authorization from cognizant Contracting Officer for FFRDC, if applicable (PDF format)	ControlNumber_LeadOrganization_FFRDCAuth
	SF-LLL Disclosure of Lobbying Activities (PDF format)	ControlNumber_LeadOrganization_SF-LLL
	Foreign Entity and Performance of Work in the United States waiver requests, if applicable (PDF format)	ControlNumber_LeadOrganization_Waiver
	U.S. Manufacturing Plan (PDF format)	ControlNumber_LeadOrganization_USMP

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	Data Management Plan (Microsoft Word format)	ControlNumber_LeadOrganization_DMP

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ControlNumber_LeadOrganization_TechnicalVolume_Part_1

ControlNumber_LeadOrganization_TechnicalVolume_Part_2

EERE will not accept late submissions that resulted from technical difficulties due to uploading files that exceed 10MB.

EERE provides detailed guidance on the content and form of each component below.

ii. **Technical Volume**

The Technical Volume must be submitted in Adobe PDF format. The Technical Volume must conform to the following content and form requirements, including maximum page lengths. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages. This volume must address the Merit Review Criteria as discussed in Section V.A.ii. of the FOA. Save the Technical Volume in a single PDF file using the following convention for the title: "ControlNumber_LeadOrganization_TechnicalVolume".

Applicants must provide sufficient citations and references to the primary research literature to justify the claims and approaches made in the Technical Volume. However, EERE and reviewers are under no obligation to review cited sources.

The Technical Volume to the Full Application may not be more than 25 pages, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all of the information in the table below. The applicant should consider the weighting of each of the evaluation criteria (see Section V.A.ii of the FOA) when preparing the Technical Volume.

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The Technical Volume should clearly describe and expand upon information provided in the Concept Paper. The Technical Volume must conform to the following content requirements:

SECTION/PAGE LIMIT	DESCRIPTION
Cover Page	The cover page should include the project title, the specific FOA Area of Interest being addressed (and subtopic if applicable), both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Project Overview (This section should constitute approximately 10% of the Technical Volume)	<p>The Project Overview should contain the following information:</p> <ul style="list-style-type: none"> • Background: The applicant should discuss the background of their organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Full Application. • Project Goal: The applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal. • DOE Impact: The applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.
Technical Description, Innovation, and Impact (This section should constitute approximately 30% of the Technical Volume)	<p>The Technical Description should contain the following information:</p> <ul style="list-style-type: none"> • Relevance and Outcomes: The applicant should provide a detailed description of the technology, including the scientific and other principles and objectives that will be pursued during the project. This section should describe the relevance of the proposed project to the goals and objectives of the FOA, including the potential to meet specific DOE technical targets or other relevant performance targets. The applicant should clearly specify the expected outcomes of the project. • Feasibility: The applicant should demonstrate the technical feasibility of the proposed technology and capability of achieving the anticipated performance targets, including a description of previous work done and prior results. • Innovation and Impacts: The applicant should describe the current state of the art in the applicable field, the specific innovation of the proposed technology, the advantages of proposed technology over current and emerging technologies, and the overall impact on advancing the state of the art/technical baseline if the project is successful.
Workplan and Market Transformation Plan (This section should	The Workplan should include a summary of the Project Objectives, Technical Scope, Work Breakdown Structure (WBS), Milestones, Go/No-Go

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<p>constitute approximately 40% of the Technical Volume)</p>	<p>Decision Points, and Project Schedule. A detailed SOPO is separately requested. The Workplan should contain the following information:</p> <ul style="list-style-type: none"> • Project Objectives: The applicant should provide a clear and concise (high-level) statement of the goals and objectives of the project as well as the expected outcomes. • Technical Scope Summary: The applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). The overall work scope is to be divided by performance periods that are separated by discrete, approximately annual decision points (see below for more information on Go/No-Go decision points). The applicant should describe the specific expected end result of each performance period. • WBS and Task Description Summary: The Workplan should describe the work to be accomplished and how the applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. The Workplan is to be structured with a hierarchy of performance period (approximately annual), task and subtasks, which is typical of a standard WBS for any project. The Workplan shall contain a concise description of the specific activities to be conducted over the life of the project. The description shall be a full explanation and disclosure of the project being proposed (i.e., a statement such as “we will then complete a proprietary process” is unacceptable). It is the applicant’s responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this FOA. The summary provided should be consistent with the SOPO. The SOPO will contain a more detailed description of the WBS and tasks. • Milestone Summary: The applicant should provide a summary of appropriate milestones throughout the project to demonstrate success. A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be Specific, Measurable, Achievable, Relevant, and Timely, and must demonstrate a technical achievement rather than simply completing a task. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one milestone per quarter for the duration of the project with at least one SMART technical milestone per year (depending on the project, more milestones may be necessary to comprehensively demonstrate progress). The applicant should also provide the means by which the milestone will be verified. The summary provided should be consistent with the Milestone Summary Table in the SOPO. • Go/No-Go Decision Points: The applicant should provide a summary of project-wide Go/No-Go decision points at appropriate points in the Workplan. A Go/No-Go decision point is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance,
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technical success is definitively achieved and potential for success in future phases or periods of performance is evaluated, prior to actually beginning the execution of future phases. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one project-wide Go/No-Go decision point for each budget period (12 to 18-month period) of the project. The applicant should also provide the specific technical criteria to be used to make the Go/No-Go decision. The summary provided should be consistent with the SOPO. Go/No-Go decision points are considered “SMART” and can fulfill the requirement for an annual SMART milestone.

- End of Project Goal: The applicant should provide a summary of the end of project goal(s). Unless otherwise specified in the FOA, the minimum requirement is that each project must have one SMART end of project goal. The summary provided should be consistent with the SOPO.
- Project Schedule (Gantt Chart or similar): The applicant should provide a schedule for the entire project, including task and subtask durations, milestones, and Go/No-Go decision points.
- Project Management: The applicant should discuss the team’s proposed management plan, including the following:
 - The overall approach to and organization for managing the work
 - The roles of each Project Team member
 - Any critical handoffs/interdependencies among Project Team members
 - The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices
 - The approach to project risk management
 - A description of how project changes will be handled
 - If applicable, the approach to Quality Assurance/Control
 - How communications will be maintained among Project Team members
- Market Transformation Plan: The applicant should provide a market transformation plan, including the following:
 - Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including a mitigation plan
 - Identification of a product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, data dissemination, U.S. manufacturing plan, and product distribution.

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<p>Technical Qualifications and Resources (Approximately 20% of the Technical Volume)</p>	<p>The Technical Qualifications and Resources should contain the following information:</p> <ul style="list-style-type: none"> • Describe the Project Team’s unique qualifications and expertise, including those of key subrecipients. • Describe the Project Team’s existing equipment and facilities that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project. • This section should also include relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives. • Describe the time commitment of the key team members to support the project. • Attach one-page resumes for key participating team members as an appendix. Resumes do not count towards the page limit. Multi-page resumes are not allowed. • Describe the technical services to be provided by DOE/NNSA FFRDCs, if applicable. • Attach letters of commitment from all subrecipient/third party cost share providers as an appendix. Letters of commitment do not count towards the page limit. • Attach any letters of commitment from partners/end users as an appendix (1 page maximum per letter). Letters of commitment do not count towards the page limit. • For multi-organizational or multi-investigator projects, describe succinctly: <ul style="list-style-type: none"> ○ The roles and the work to be performed by each PI and Key Participant; ○ Business agreements between the applicant and each PI and Key Participant; ○ How the various efforts will be integrated and managed; ○ Process for making decisions on scientific/technical direction; ○ Publication arrangements; ○ Intellectual Property issues; and ○ Communication plans
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iii. **Statement of Project Objectives (SOPO)**

Applicants are required to complete a SOPO. A SOPO template is available on EERE Exchange at <https://eere-Exchange.energy.gov/>. The SOPO, including the Milestone Table, must not exceed 10 pages when printed using standard 8.5 x 11 paper with 1” margins (top, bottom, left, and right) with font not smaller than 12 point. Save the SOPO in a single Microsoft Word file using the following convention for the title “ControlNumber_LeadOrganization_SOPO”.

Questions about this FOA? Email FY19WETOFOA@ee.doe.gov.

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iv. SF-424: Application for Federal Assistance

Complete all required fields in accordance with the instructions on the form. The list of certifications and assurances in Field 21 can be found at <http://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms>, under Certifications and Assurances. Note: The dates and dollar amounts on the SF-424 are for the complete project period and not just the first project year, first phase or other subset of the project period. Save the SF-424 in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_App424".

v. Budget Justification Workbook

- Applicants are required to complete the Budget Justification Workbook. This form is available on EERE Exchange at <https://eere-Exchange.energy.gov/>.
- Prime recipients must complete each tab of the Budget Justification Workbook for the project as a whole, including all work to be performed by the prime recipient and its subrecipients and contractors.
- Applicants should include costs associated with required annual audits and incurred cost proposals in their proposed budget documents. The "Instructions and Summary" included with the Budget Justification Workbook will auto-populate as the applicant enters information into the Workbook.
- Applicants must carefully read the "Instructions and Summary" tab provided within the Budget Justification Workbook.
- Save the Budget Justification Workbook in a single Microsoft Excel file using the following convention for the title "ControlNumber_LeadOrganization_Budget_Justification".

vi. Summary/Abstract for Public Release

Applicants are required to submit a one-page summary/abstract of their project. The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the project director/principal investigator(s), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (e.g., benefits, outcomes), and major participants (for collaborative projects). This document must not include any proprietary or sensitive business information as DOE may make it available to the public after selections are made. The project summary must not exceed 1 page when printed using standard 8.5 x 11 paper with 1" margins (top, bottom, left, and right) with font not smaller than 12 point. Save the Summary for Public Release in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Summary".

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vii. Summary Slide

Applicants are required to provide a single PowerPoint slide summarizing the proposed project. The slide must be submitted in Microsoft PowerPoint format. This slide is used during the evaluation process. Save the Summary Slide in a single file using the following convention for the title “ControlNumber_LeadOrganization_Slide”.

The Summary Slide template requires the following information:

- A technology summary;
- A description of the technology’s impact;
- Proposed project goals;
- Any key graphics (illustrations, charts and/or tables);
- The project’s key idea/takeaway;
- Project title, prime recipient, Principal Investigator, and Key Participant information; and
- Requested EERE funds and proposed applicant cost share.

viii. Subrecipient Budget Justification (if applicable)

Applicants must provide a separate budget justification for each subrecipient that is expected to perform work estimated to be more than \$250,000 or 25 percent of the total work effort (whichever is less). The budget justification must include the same justification information described in the “Budget Justification” section above. Save each subrecipient budget justification in a Microsoft Excel file using the following convention for the title “ControlNumber_LeadOrganization_Subrecipient_Budget_Justification”.

ix. Budget for DOE/NNSA FFRDC (if applicable)

If a DOE/NNSA FFRDC contractor is to perform a portion of the work, the applicant must provide a DOE WP in accordance with the requirements in DOE Order 412.1A, Work Authorization System, Attachment 3, available at: <https://www.directives.doe.gov/directives-documents/400-series/0412.1-BOrder-a/@@images/file>. Save the WP in a single PDF file using the following convention for the title “ControlNumber_LeadOrganization_WP”.

x. Authorization for non-DOE/NNSA or DOE/NNSA FFRDCs (if applicable)

The federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with the contractor’s authority under its award. Save the Authorization in a single PDF file

using the following convention for the title
"ControlNumber_LeadOrganization_FFRDCAuth".

xi. SF-LLL: Disclosure of Lobbying Activities (required)

Prime recipients and subrecipients may not use any federal funds to influence or attempt to influence, directly or indirectly, congressional action on any legislative or appropriation matters.

Prime recipients and subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities"

(<https://www.grants.gov/web/grants/forms/sf-424-individual-family.html>) to ensure that non-federal funds have not been paid and will not be paid to any person for influencing or attempting to influence any of the following in connection with the application:

- An officer or employee of any federal agency;
- A Member of Congress;
- An officer or employee of Congress; or
- An employee of a Member of Congress.

Save the SF-LLL in a single PDF file using the following convention for the title
"ControlNumber_LeadOrganization_SF-LLL".

xii. Waiver Requests: Foreign Entities and Performance of Work in the United States (if applicable)

Foreign Entity Participation:

As set forth in Section III.A.iii., all prime recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. To request a waiver of this requirement, the applicant must submit an explicit waiver request in the Full Application. Appendix C lists the necessary information that must be included in a request to waive this requirement.

Performance of Work in the United States

As set forth in Section IV.J.iii., all work under EERE funding agreements must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment, so a waiver is not required for foreign purchases of these items. However, the prime recipient should make every effort to purchase supplies and equipment within the United States. Appendix C lists the necessary information that must be included in a request to waive the Performance of Work in the United States requirement.

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Save the Waivers in a single PDF file using the following convention for the title “ControlNumber_LeadOrganization_Waiver”.

xiii. U.S. Manufacturing Commitments

Pursuant to the DOE Determination of Exceptional Circumstances (DEC) dated September 9, 2013, each applicant is required to submit a U.S. Manufacturing Plan as part of its application. The U.S. Manufacturing Plan represents the applicant's measurable commitment to support U.S. manufacturing as a result of its award.

Each U.S. Manufacturing Plan must include a commitment that any products embodying any subject invention or produced through the use of any subject invention will be manufactured substantially in the United States, unless the applicant can show to the satisfaction of DOE that it is not commercially feasible to do so (referred to hereinafter as “the U.S. Competitiveness Provision”). The applicant further agrees to make the U.S. Competitiveness Provision binding on any subawardee and any assignee or licensee or any entity otherwise acquiring rights to any subject invention, including subsequent assignees or licensees. A subject invention is any invention conceived of or first actually reduced to practice under an award.

Due to the lower technology readiness levels of this FOA, DOE does not expect the U.S. Manufacturing Plans to be tied to a specific product or technology. However, in lieu of the U.S. Competitiveness Provision, an applicant may propose a U.S. Manufacturing Plan with more specific commitments that would be beneficial to the U.S. economy and competitiveness. For example, an applicant may commit specific products to be manufactured in the U.S., commit to a specific investment in a new or existing U.S. manufacturing facility, keep certain activities based in the U.S. or support a certain number of jobs in the U.S. related to the technology. An applicant which is likely to license the technology to others, especially universities for which licensing may be the exclusive means of commercialization the technology, the U.S. Manufacturing Plan may indicate the applicant's plan and commitment to use a specific licensing strategy that would likely support U.S. manufacturing.

If DOE determines, at its sole discretion, that the more specific commitments would provide a sufficient benefit to the U.S. economy and industrial competitiveness, the specific commitments will be part of the terms and conditions of the award. For all other awards, the U.S. Competitiveness Provision shall be incorporated as part of the terms and conditions of the award as the U.S. Manufacturing Plan for that award.

The U.S. Competitiveness Provision is also a requirement for the Class Patent Waiver that applies to domestic large business under this FOA (see Section VIII.K. Title to Subject Inventions).

Save the U.S. Manufacturing Plan in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_USMP".

xiv. Data Management Plan (DMP)

Applicants whose full applications are selected for award negotiations will be required to submit a DMP during the award negotiation phase.

An applicant may select one of the template Data Management Plans (DMP) listed below. Alternatively, instead of selecting one of the template Data Management Plans below, an applicant may submit another DMP provided that the DMP, at a minimum, (1) describes how data sharing and preservation will enable validation of the results from the proposed work, how the results could be validated if data are not shared or preserved and (2) has a plan for making all research data displayed in publications resulting from the proposed work digitally accessible at the time of publications. DOE Public Access Plan dated July 24, 2014 provides additional guidance and information on Data Management Plans.

Option 1 (when protected data is allowed): For the deliverables under the award, the recipient does not plan on making the underlying research data supporting the findings in the deliverables publicly-available for up to 5 years after the data were first produced because such data will be considered protected under the award. The results from the DOE deliverables can be validated by DOE who will have access, upon request, to the research data. Other than providing deliverables as specified in the award, the recipient does not intend to publish the results from the project. However, in an instance where a publication includes results of the project, the underlying research data will be made available according to the policies of the publishing media. Where no such policy exists, the recipient must indicate on the publication a means for requesting and digitally obtaining the underlying research data. This includes the research data necessary to validate any results, conclusions, charts, figures, images in the publications.

Option 2: For any publication that includes results of the project, the underlying research data will be made available according to the policies of the publishing media. Where no such policy exists, the recipient must indicate on the publication a means for requesting and digitally obtaining the underlying

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research data. This includes the research data necessary to validate any results, conclusions, charts, figures, images in the publications.

Save the DMP in a single Microsoft Word file using the following convention for the title "ControlNumber_LeadOrganization_DMP".

E. Post Selection Information Requests

If selected for award, EERE reserves the right to request additional or clarifying information regarding the following (non-exhaustive list):

- Indirect cost information;
- Other budget information;
- Commitment Letters from Third Parties Contributing to Cost Share, if applicable;
- Name and phone number of the Designated Responsible Employee for complying with national policies prohibiting discrimination (See 10 CFR 1040.5);
- Representation of Limited Rights Data and Restricted Software, if applicable; and
- Environmental Questionnaire.

F. Dun and Bradstreet Universal Numbering System (DUNS) Number and System for Award Management (SAM)

Each applicant (unless the applicant is an individual or federal awarding agency that is excepted from those requirements under 2 CFR §25.110(b) or (c), or has an exception approved by the federal awarding agency under 2 CFR §25.110(d)) is required to: (1) Be registered in the SAM at <https://www.sam.gov> before submitting its application; (2) provide a valid DUNS number in its application; and (3) continue to maintain an active SAM registration with current information at all times during which it has an active federal award or an application or plan under consideration by a federal awarding agency. DOE may not make a federal award to an applicant until the applicant has complied with all applicable DUNS and SAM requirements and, if an applicant has not fully complied with the requirements by the time DOE is ready to make a federal award, the DOE will determine that the applicant is not qualified to receive a federal award and use that determination as a basis for making a federal award to another applicant.

G. Submission Dates and Times

Concept Papers and Full Applications must be submitted in EERE Exchange no later than 5 p.m. Eastern Time on the dates provided on the cover page of this FOA.

H. Intergovernmental Review

This FOA is not subject to Executive Order 12372 – Intergovernmental Review of Federal Programs.

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I. Funding Restrictions

i. Allowable Costs

All expenditures must be allowable, allocable, and reasonable in accordance with the applicable federal cost principles.

Refer to the following applicable federal cost principles for more information:

- Federal Acquisition Regulation (FAR) Part 31 for For-Profit entities; and
- 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

ii. Pre-Award Costs

Selectees must request prior written approval to charge pre-award costs. Pre-award costs are those incurred prior to the effective date of the federal award directly pursuant to the negotiation and in anticipation of the federal award where such costs are necessary for efficient and timely performance of the scope of work. Such costs are allowable only to the extent that they would have been allowable if incurred after the date of the federal award and **only** with the written approval of the federal awarding agency, through the Contracting Officer assigned to the award.

Pre-award costs cannot be incurred prior to the Selection Official signing the Selection Statement and Analysis. Pre-award costs can only be incurred if such costs would be reimbursable under the agreement if incurred after award.

Pre-award expenditures are made at the Selectee's risk. EERE is not obligated to reimburse costs: (1) in the absence of appropriations; (2) if an award is not made; or (3) if an award is made for a lesser amount than the Selectee anticipated.

Pre-Award Costs Related to National Environmental Policy Act (NEPA) Requirements

EERE's decision whether and how to distribute federal funds under this FOA is subject to NEPA. Applicants should carefully consider and should seek legal counsel or other expert advice before taking any action related to the proposed project that would have an adverse effect on the environment or limit the choice of reasonable alternatives prior to EERE completing the NEPA review process.

EERE does not guarantee or assume any obligation to reimburse costs where the prime recipient incurred the costs prior to receiving written authorization from the Contracting Officer. If the applicant elects to undertake activities that may have an adverse effect on the environment or limit the choice of reasonable alternatives prior to receiving such written authorization from the Contracting

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Officer, the applicant is doing so at risk of not receiving federal funding and such costs may not be recognized as allowable cost share. Likewise, if an application is selected for negotiation of award, and the prime recipient elects to undertake activities that are not authorized for federal funding by the Contracting Officer in advance of EERE completing a NEPA review, the prime recipient is doing so at risk of not receiving federal funding and such costs may not be recognized as allowable cost share. Nothing contained in the pre-award cost reimbursement regulations or any pre-award costs approval letter from the Contracting Officer override these NEPA requirements to obtain the written authorization from the Contracting Officer prior to taking any action that may have an adverse effect on the environment or limit the choice of reasonable alternatives.

iii. Performance of Work in the United States

1. Requirement

All work performed under EERE awards must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment; however, the prime recipient should make every effort to purchase supplies and equipment within the United States. The prime recipient must flow down this requirement to its subrecipients.

2. Failure to Comply

If the prime recipient fails to comply with the Performance of Work in the United States requirement, EERE may deny reimbursement for the work conducted outside the United States and such costs may not be recognized as allowable recipient cost share. The prime recipient is responsible should any work under this award be performed outside the United States, absent a waiver, regardless of if the work is performed by the prime recipient, subrecipients, contractors or other project partners.

3. Waiver

There may be limited circumstances where it is in the interest of the Project to perform a portion of the work outside the United States. To seek a waiver of the Performance of Work in the United States requirement, the applicant must submit a written waiver request to EERE. Appendix C lists the necessary information that must be included in a request to waive the Performance of Work in the United States requirement.

The applicant must demonstrate to the satisfaction of EERE that a waiver would further the purposes of the FOA and is in the economic interests of the United States. EERE may require additional information before considering a waiver request. Save the waiver request(s) in a single PDF file

titled "ControlNumber_LeadOrganization_Waiver". The applicant does not have the right to appeal EERE's decision concerning a waiver request.

iv. Construction

Recipients are required to obtain written authorization from the Contracting Officer before incurring any major construction costs.

v. Foreign Travel

If international travel is proposed for your project, please note that your organization must comply with the International Air Transportation Fair Competitive Practices Act of 1974 (49 USC 40118), commonly referred to as the "Fly America Act," and implementing regulations at 41 CFR 301-10.131 through 301-10.143. The law and regulations require air transport of people or property to, from, between, or within a country other than the United States, the cost of which is supported under this award, to be performed by or under a cost-sharing arrangement with a U.S. flag carrier, if service is available. Foreign travel costs are allowable only with the written prior approval of the Contracting Officer assigned to the award.

vi. Equipment and Supplies

To the greatest extent practicable, all equipment and products purchased with funds made available under this FOA should be American-made. This requirement does not apply to used or leased equipment.

Property disposition will be required at the end of a project if the current fair market value of property exceeds \$5,000. The rules for property disposition are set forth in 2 CFR 200.310 – 200.316 as amended by 2 CFR 910.360.

vii. Lobbying

Recipients and subrecipients may not use any federal funds to influence or attempt to influence, directly or indirectly, congressional action on any legislative or appropriation matters.

Recipients and subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities" (<https://www.grants.gov/web/grants/forms/sf-424-individual-family.html>) to ensure that non-federal funds have not been paid and will not be paid to any person for influencing or attempting to influence any of the following in connection with the application:

- An officer or employee of any federal agency;
- A Member of Congress;
- An officer or employee of Congress; or

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- An employee of a Member of Congress.

viii. Risk Assessment

Prior to making a federal award, the DOE is required by 31 U.S.C. 3321 and 41 U.S.C. 2313 to review information available through any Office of Management and Budget (OMB)-designated repositories of government-wide eligibility qualification or financial integrity information, such as SAM Exclusions and “Do Not Pay.”

In addition, DOE evaluates the risk(s) posed by applicants before they receive federal awards. This evaluation may consider: results of the evaluation of the applicant's eligibility; the quality of the application; financial stability; quality of management systems and ability to meet the management standards prescribed in this part; history of performance; reports and findings from audits; and the applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on non-federal entities.

In addition to this review, DOE must comply with the guidelines on government-wide suspension and debarment in 2 CFR 180, and must require non-federal entities to comply with these provisions. These provisions restrict federal awards, subawards and contracts with certain parties that are debarred, suspended or otherwise excluded from or ineligible for participation in federal programs or activities.

ix. Invoice Review and Approval

DOE employs a risk-based approach to determine the level of supporting documentation required for approving invoice payments. Recipients may be required to provide some or all of the following items with their requests for reimbursement:

- Summary of costs by cost categories;
- Timesheets or personnel hours report;
- Invoices/receipts for all travel, equipment, supplies, contractual, and other costs;
- UCC filing proof for equipment acquired with project funds by for-profit recipients and subrecipients;
- Explanation of cost share for invoicing period;
- Analogous information for some subrecipients; and
- Other items as required by DOE.

x. Additional Requirements (Optional)

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VI. Application Review Information

A. Technical Review Criteria

i. Concept Papers

Concept Papers are evaluated based on consideration of the following factors. All sub-criteria are of equal weight.

Concept Paper Criterion: Overall FOA Responsiveness and Viability of the Project (Weight: 100%)

This criterion involves consideration of the following factors:

- The applicant clearly describes the proposed technology or technology testing project, describes how it is unique and innovative, and how the technology or testing project will advance the current state-of-the-art;
- The applicant has identified risks and challenges, including possible mitigation strategies, and has shown the impact that EERE funding and the proposed project would have on the relevant field and application;
- The applicant has the qualifications, experience, capabilities and other resources necessary to complete the proposed project; and
- The proposed work, if successfully accomplished, would clearly meet the objectives as stated in the FOA.

ii. Full Applications

Applications will be evaluated against the merit review criteria as outlined below. Each Area of Interest has specifically tailored criteria. All sub-criteria are of equal weight.

a. Technical Review Criteria:

Area of Interest 1: Wind Innovations for Rural Economic Development (applicable to Subtopic 1a and 1b)

Criterion 1: Technical Merit, Innovation, and Impact (50%)

This criterion involves consideration of the following factors:

Technical Merit and Innovation

- Extent to which the proposed technology or process is innovative;
- Degree to which the current state of the technology and the proposed advancement are clearly described;

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- Extent to which the application specifically and convincingly demonstrates how the applicant will move the state-of-the-art to the proposed advancement; and
- Sufficiency of technical detail in the application to assess whether the proposed work is scientifically meritorious and revolutionary, including relevant data, calculations and discussion of prior work in the literature with analyses that support the viability of the proposed work.

Impact of Technology Advancement

- How the project supports the area of interest objectives and target specifications and metrics; and
- The potential impact of the project on advancing the state-of-the-art.

Criterion 2: Project Research and Market Transformation Plan (30%)

This criterion involves consideration of the following factors:

Research Approach, Workplan and SOPO

- Degree to which the approach and critical path have been clearly described and thoughtfully considered; and
- Degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Workplan and SOPO will succeed in meeting the project goals.

Identification of Technical Risks

- Discussion and demonstrated understanding of the key technical risk areas involved in the proposed work and the quality of the mitigation strategies to address them.

Baseline, Metrics, and Deliverables

- The level of clarity in the definition of the baseline, metrics, and milestones; and
- Relative to a clearly defined experimental baseline, the strength of the quantifiable metrics, milestones, and a mid-point deliverables defined in the application, such that meaningful interim progress will be made.

Market Transformation Plan

- Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including mitigation plan; and
- Comprehensiveness of market transformation plan including but not limited to product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations

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including intellectual property, infrastructure requirements, Data Management Plan, U.S. manufacturing plan, and product distribution.

Criterion 3: Team and Resources (20%)

This criterion involves consideration of the following factors:

- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team;
- The sufficiency of the facilities to support the work;
- The degree to which the proposed consortia/team demonstrates the ability to facilitate and expedite further development and commercial deployment of the proposed technologies;
- The level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan; and
- The reasonableness of the budget and spend plan for the proposed project and objectives.

Area of Interest 2: Utilizing and Upgrading National-Level Facilities for Offshore Wind R&D (applicable to Subtopic 2a and 2b)**Criterion 1: Technical Merit, Innovation, and Impact (50%)**

This criterion involves consideration of the following factors:

Technical Merit and Innovation

- Extent to which the proposed facility upgrade or testing project is innovative and unique;
- Degree to which the current state of U.S. testing capabilities, the results of relevant testing to date, and the proposed advancement(s) resulting from this project are clearly described;
- Extent to which the application specifically and convincingly demonstrates how the applicant will move the state-of-the-art to the proposed advancement(s); and
- Sufficiency of technical detail in the application to assess whether the proposed work is scientifically meritorious and revolutionary, including relevant data, calculations and discussion of prior work in the literature with analyses that support the viability of the proposed work.

Impact of Technical Advancement

- How the project supports the area of interest objectives and target specifications and metrics; and
- The potential impact of the project on advancing the state-of-the-art.

Criterion 2: Project Research and Market Impact (30%)

This criterion involves consideration of the following factors:

Research Approach, Workplan and SOPO

- Degree to which the approach and critical path have been clearly described and thoughtfully considered;
- Degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Workplan and SOPO will succeed in meeting the project goals; and
- Degree to which applicants to Subtopic 2a describe how they will allow access to the test facility in question, e.g. whether it has a user agreement in place.
- Degree to which the facility upgrades proposed under Subtopic 2b have been clearly described and delineated relative to the current status of the facility, including proposed timelines for implementation.

Identification of Technical Risks

- Discussion and demonstrated understanding of the key technical risk areas involved in the proposed work and the quality of the mitigation strategies to address them.

Baseline, Metrics, and Deliverables

- The level of clarity in the definition of the baseline, metrics, and milestones; and
- Relative to a clearly defined experimental baseline, the strength of the quantifiable metrics, milestones, and a mid-point deliverables defined in the application, such that meaningful interim progress will be made.

Market Impact Plan

- The degree to which the applicant has made a clear and substantiated case for the applicability and value of this research in furthering offshore wind technology and/or supply chain development in the U.S.
- Demonstrated understanding of: how the proposed research and upgraded facilities (Subtopic 2b only) can be utilized in furthering target applications; what similar or competing testing programs or test facilities exist; and what the known or perceived barriers to adoption are, including a mitigation plan; and

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- Comprehensiveness of market impact plan including but not limited to how the results of the research work and facility upgrades will be made available to the field of potential users, including a timeline, and legal/regulatory considerations including intellectual property.

Criterion 3: Team and Resources (20%)

This criterion involves consideration of the following factors:

- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team;
- The degree to which the applicant has made a clear and substantiated case that the facility is a National-level offshore wind testing facility
- The sufficiency of the facilities to support the work;
- The degree to which the proposed consortia/team demonstrates the ability to facilitate and expedite further development and commercial application of the proposed technologies;
- The level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan; and
- The reasonableness of the budget and spend plan for the proposed project and objectives.

Area of Interest 3: Project Development for Offshore Wind Technology Demonstrations**Criterion 1: Technical Merit, Innovation, and Impact: (30%)**

This criterion involves consideration of the following factors:

Technical Merit and Innovation

- Extent to which the proposed technology or process demonstrates full-scale, innovative offshore wind technology or methodology that can be used in future commercial offshore wind farm deployments.
- The degree to which documented progress has already been made in applicable siting, permitting, approval processes, environmental compliance, grid connection and public acceptance, including evidence that the responsible Federal, State, and local Authorities Having Jurisdiction (AHJs) are aware of the project and are in the process of evaluating any other necessary authorizations;
- Degree to which the current state of the technology is described and the degree of innovation for the proposed approach, and that the proposed concept offers advantages over other solutions or approaches from a cost of energy or overall risk reduction perspective.

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- The adequacy of the proposed testing, data collection and performance validation plan of the project innovation(s) being demonstrated.

Criterion 2: Project Research and Market Transformation Plan: (30%)

This criterion involves consideration of the following factors:

- Likelihood that proposed project will lead to a demonstration of the technology or methodology and eventual U.S. commercialization of the proposed innovative solutions;
- Extent to which a detailed cost of energy (LCOE) analysis, including all assumptions, calculations, and sources used to calculate the impact of the proposed design on LCOE, is presented for the proposed project with rigor, clarity, transparency and completeness.
- Likelihood that the proposed technology or method will improve the deployment or operation of wind plants, e.g. improve speed of installation, minimize stakeholder and or environmental impact, or improve overall plant performance.
- Discussion and demonstrated understanding of the key technical risk areas involved in the proposed work and the quality of the mitigation strategies to address them.
- Degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Work plan and SOPO will succeed in meeting the project goals.

Criterion 3: Team and Resources: (40%)

This criterion involves consideration of the following factors:

Project Team:

- The degree to which applicants show evidence of prior experience in offshore wind project development.
- The adequacy of the education, professional training, technical skills, and work experience of the Principal Investigator (PI) and other key personnel, including personnel from team member organizations;
- The level and reasonableness of the time commitment of the PI and other key personnel, including personnel from team member organizations.

Funding:

- Degree to which applicants show evidence of funding for the innovative demonstration and full project (if applicable). Evidence may include, but is not limited to: a final PPA, term sheet, financial letters of intent, negotiated financing terms from financial institutions, etc.

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Work Plan:

- The clarity and adequacy of project deliverables including:
 - The specific end result;
 - The proposed methods for publicly disseminating project-generated information, including but not limited to the final report, to the domestic offshore wind industry and to related stakeholder sectors;

Area of Interest 4: Tall Towers for U.S. Wind Power**Criterion 1: Technical Merit, Innovation, and Impact (50%)**

This criterion involves consideration of the following factors:

Technical Merit and Innovation

- Extent to which the proposed technology or process is innovative;
- Degree to which the current state of the technology and the proposed advancement are clearly described;
- Extent to which the application specifically and convincingly demonstrates how the applicant will move the state-of-the-art to the proposed advancement; and
- Sufficiency of technical detail in the application to assess whether the proposed work is scientifically meritorious and revolutionary, including relevant data, calculations and discussion of prior work in the literature with analyses that support the viability of the proposed work.

Impact of Technology Advancement

- How the project supports the area of interest objectives and target specifications and metrics; and
- The potential impact of the project on advancing the state-of-the-art.

Criterion 2: Project Research and Market Transformation Plan (30%)

This criterion involves consideration of the following factors:

Research Approach, Workplan and SOPO

- Degree to which the approach and critical path have been clearly described and thoughtfully considered; and
- Degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Workplan and SOPO will succeed in meeting the project goals.

Identification of Technical Risks

- Discussion and demonstrated understanding of the key technical risk areas involved in the proposed work and the quality of the mitigation strategies to address them.

Baseline, Metrics, and Deliverables

- The level of clarity in the definition of the baseline, metrics, and milestones; and
- Relative to a clearly defined experimental baseline, the strength of the quantifiable metrics, milestones, and a mid-point deliverables defined in the application, such that meaningful interim progress will be made.

Market Transformation Plan

- Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including mitigation plan; and
- Comprehensiveness of market transformation plan including but not limited to product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, Data Management Plan, U.S. manufacturing plan, and product distribution.

Criterion 3: Team and Resources (20%)

This criterion involves consideration of the following factors:

- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team;
- The sufficiency of the facilities to support the work;
- The degree to which the proposed consortia/team demonstrates the ability to facilitate and expedite further development and commercial deployment of the proposed technologies;
- The level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan; and
- The reasonableness of the budget and spend plan for the proposed project and objectives.

B. Standards for Application Evaluation

Applications that are determined to be eligible will be evaluated in accordance with this FOA, by the standards set forth in EERE's Notice of Objective Merit Review Procedure (76 Fed. Reg. 17846, March 31, 2011) and the guidance provided in the

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“DOE Merit Review Guide for Financial Assistance,” effective April 14, 2017, which is available at: <https://energy.gov/management/downloads/merit-review-guide-financial-assistance-and-unsolicited-proposals-current>.

C. Other Selection Factors

i. Program Policy Factors

In addition to the above criteria, the Selection Official may consider the following program policy factors in determining which Full Applications to select for award negotiations:

- The degree to which the proposed project exhibits technological diversity when compared to the existing DOE project portfolio and other projects selected from the subject FOA;
- The degree to which the proposed project, including proposed cost share, optimizes the use of available EERE funding to achieve programmatic objectives;
- The level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers;
- The degree to which the proposed project is likely to lead to increased employment and manufacturing in the United States;
- The degree to which the proposed project will accelerate transformational technological advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty; and
- The degree to which the proposed project, or group of projects, represent a desired geographic distribution (considering past awards and current applications).

D. Evaluation and Selection Process

i. Overview

The evaluation process consists of multiple phases; each includes an initial eligibility review and a thorough technical review. Rigorous technical reviews of eligible submissions are conducted by reviewers that are experts in the subject matter of the FOA. Ultimately, the Selection Official considers the recommendations of the reviewers, along with other considerations such as program policy factors, in determining which applications to select.

ii. Pre-Selection Interviews

As part of the evaluation and selection process, EERE may invite one or more applicants to participate in Pre-Selection Interviews. Pre-Selection Interviews are

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distinct from and more formal than pre-selection clarifications (See Section V.D.iii of the FOA). The invited applicant(s) will meet with EERE representatives to provide clarification on the contents of the Full Applications and to provide EERE an opportunity to ask questions regarding the proposed project. The information provided by applicants to EERE through Pre-Selection Interviews contributes to EERE's selection decisions.

EERE will arrange to meet with the invited applicants in person at EERE's offices or a mutually agreed upon location. EERE may also arrange site visits at certain applicants' facilities. In the alternative, EERE may invite certain applicants to participate in a one-on-one conference with EERE via webinar, videoconference, or conference call.

EERE will not reimburse applicants for travel and other expenses relating to the Pre-Selection Interviews, nor will these costs be eligible for reimbursement as pre-award costs.

EERE may obtain additional information through Pre-Selection Interviews that will be used to make a final selection determination. EERE may select applications for funding and make awards without Pre-Selection Interviews. Participation in Pre-Selection Interviews with EERE does not signify that applicants have been selected for award negotiations.

iii. Pre-Selection Clarification

EERE may determine that pre-selection clarifications are necessary from one or more applicants. Pre-selection clarifications are distinct from and less formal than pre-selection interviews. These pre-selection clarifications will solely be for the purposes of clarifying the application, and will be limited to information already provided in the application documentation. The pre-selection clarifications may occur before, during or after the merit review evaluation process. Information provided by an applicant that is not necessary to address the pre-selection clarification question will not be reviewed or considered. Typically, a pre-selection clarification will be carried out through either written responses to EERE's written clarification questions or video or conference calls with EERE representatives.

The information provided by applicants to EERE through pre-selection clarifications is incorporated in their applications and contributes to the merit review evaluation and EERE's selection decisions. If EERE contacts an applicant for pre-selection clarification purposes, it does not signify that the applicant has been selected for negotiation of award or that the applicant is among the top ranked applications.

EERE will not reimburse applicants for expenses relating to the pre-selection clarifications, nor will these costs be eligible for reimbursement as pre-award costs.

iv. Recipient Integrity and Performance Matters

DOE, prior to making a federal award with a total amount of federal share greater than the simplified acquisition threshold, is required to review and consider any information about the applicant that is in the designated integrity and performance system accessible through SAM (currently FAPIIS) (see 41 U.S.C. 2313).

The applicant, at its option, may review information in the designated integrity and performance systems accessible through SAM and comment on any information about itself that a federal awarding agency previously entered and is currently in the designated integrity and performance system accessible through SAM.

DOE will consider any written comments by the applicant, in addition to the other information in the designated integrity and performance system, in making a judgment about the applicant's integrity, business ethics, and record of performance under federal awards when completing the review of risk posed by applicants as described in 2 C.F.R. § 200.205.

v. Selection

The Selection Official may consider the technical merit, the Federal Consensus Board's recommendations, program policy factors, and the amount of funds available in arriving at selections for this FOA.

E. Anticipated Notice of Selection and Award Negotiation Dates

EERE anticipates notifying applicants selected for negotiation of award and negotiating awards by the dates provided on the cover page of this FOA.

VII. Award Administration Information

A. Award Notices

i. Ineligible Submissions

Ineligible Concept Papers and Full Applications will not be further reviewed or considered for award. The Contracting Officer will send a notification letter by email to the technical and administrative points of contact designated by the

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applicant in EERE Exchange. The notification letter will state the basis upon which the Concept Paper or the Full Application is ineligible and not considered for further review.

ii. Concept Paper Notifications

EERE will notify applicants of its determination to encourage or discourage the submission of a Full Application. EERE will post these notifications to EERE Exchange.

Applicants may submit a Full Application even if they receive a notification discouraging them from doing so. By discouraging the submission of a Full Application, EERE intends to convey its lack of programmatic interest in the proposed project. Such assessments do not necessarily reflect judgments on the merits of the proposed project. The purpose of the Concept Paper phase is to save applicants the considerable time and expense of preparing a Full Application that is unlikely to be selected for award negotiations.

A notification encouraging the submission of a Full Application does not authorize the applicant to commence performance of the project. Please refer to Section IV.J.ii. of the FOA for guidance on pre-award costs.

iii. Full Application Notifications

EERE will notify applicants of its determination via a notification letter by email to the technical and administrative points of contact designated by the applicant in EERE Exchange. The notification letter will inform the applicant whether or not its Full Application was selected for award negotiations. Alternatively, EERE may notify one or more applicants that a final selection determination on particular Full Applications will be made at a later date, subject to the availability of funds or other factors.

iv. Successful Applicants

Receipt of a notification letter selecting a Full Application for award negotiations does not authorize the applicant to commence performance of the project. If an application is selected for award negotiations, it is not a commitment by EERE to issue an award. Applicants do not receive an award until award negotiations are complete and the Contracting Officer executes the funding agreement, accessible by the prime recipient in FedConnect.

The award negotiation process will take approximately 60 days. Applicants must designate a primary and a backup point-of-contact in EERE Exchange with whom EERE will communicate to conduct award negotiations. The applicant must be responsive during award negotiations (i.e., provide requested documentation)

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and meet the negotiation deadlines. If the applicant fails to do so or if award negotiations are otherwise unsuccessful, EERE will cancel the award negotiations and rescind the Selection. EERE reserves the right to terminate award negotiations at any time for any reason.

Please refer to Section IV.J.ii. of the FOA for guidance on pre-award costs.

v. Alternate Selection Determinations

In some instances, an applicant may receive a notification that its application was not selected for award and EERE designated the application to be an alternate. As an alternate, EERE may consider the Full Application for federal funding in the future. A notification letter stating the Full Application is designated as an alternate does not authorize the applicant to commence performance of the project. EERE may ultimately determine to select or not select the Full Application for award negotiations.

vi. Unsuccessful Applicants

EERE shall promptly notify in writing each applicant whose application has not been selected for award or whose application cannot be funded because of the unavailability of appropriated funds.

B. Administrative and National Policy Requirements

i. Registration Requirements

There are several one-time actions before submitting an application in response to this FOA, and it is vital that applicants address these items as soon as possible. Some may take several weeks, and failure to complete them could interfere with an applicant's ability to apply to this FOA, or to meet the negotiation deadlines and receive an award if the application is selected. These requirements are as follows:

EERE Exchange

Register and create an account on EERE Exchange at <https://eere-Exchange.energy.gov>.

This account will then allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission. Applicants should also designate backup points of contact so they may be easily contacted if deemed necessary.

This step is required to apply to this FOA.

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The EERE Exchange registration does not have a delay; however, **the remaining registration requirements below could take several weeks to process and are necessary for a potential applicant to receive an award under this FOA.**

DUNS Number

Obtain a DUNS number (including the plus 4 extension, if applicable) at <http://fedgov.dnb.com/webform>.

System for Award Management

Register with the SAM at <https://www.sam.gov>. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an Marketing Partner ID Number (MPIN) are important steps in SAM registration. Please update your SAM registration annually.

FedConnect

Register in FedConnect at <https://www.fedconnect.net>. To create an organization account, your organization's SAM MPIN is required. For more information about the SAM MPIN or other registration requirements, review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf.

Grants.gov

Register in Grants.gov (<http://www.grants.gov>) to receive automatic updates when Amendments to this FOA are posted. However, please note that Concept Papers and Full Applications will not be accepted through Grants.gov.

Electronic Authorization of Applications and Award Documents

Submission of an application and supplemental information under this FOA through electronic systems used by the DOE, including EERE Exchange and FedConnect.net, constitutes the authorized representative's approval and electronic signature.

ii. Award Administrative Requirements

The administrative requirements for DOE grants and cooperative agreements are contained in 2 CFR Part 200 as amended by 2 CFR Part 910.

iii. Foreign National Access to DOE Sites

All applicants that ultimately enter into an award resulting from this FOA will be subject to the following requirement concerning foreign national involvement. Upon DOE's request, prime recipients must provide information to facilitate DOE's responsibilities associated with foreign national access to DOE sites,

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information, technologies, and equipment. A foreign national is defined as any person who was born outside the jurisdiction of the United States, is a citizen of a foreign government, and has not been naturalized under U.S. law. If the prime recipient or subrecipients, contractors or vendors under the award, anticipate utilizing a foreign national person in the performance of an award, the prime recipient is responsible for providing to the Contracting Officer specific information of the foreign national(s) to satisfy compliance with all of the requirements for access approval.

iv. Subaward and Executive Reporting

Additional administrative requirements necessary for DOE grants and cooperative agreements to comply with the Federal Funding and Transparency Act of 2006 (FFATA) are contained in 2 CFR Part 170. Prime recipients must register with the new FFATA Subaward Reporting System database and report the required data on their first tier subrecipients. Prime recipients must report the executive compensation for their own executives as part of their registration profile in SAM.

v. National Policy Requirements

The National Policy Assurances that are incorporated as a term and condition of award are located at: <http://www.nsf.gov/awards/managing/rtc.jsp>.

vi. Environmental Review in Accordance with National Environmental Policy Act (NEPA)

EERE's decision whether and how to distribute federal funds under this FOA is subject to NEPA (42 USC 4321, *et seq.*). NEPA requires federal agencies to integrate environmental values into their decision-making processes by considering the potential environmental impacts of their proposed actions. For additional background on NEPA, please see DOE's NEPA website, at <http://nepa.energy.gov/>.

While NEPA compliance is a federal agency responsibility and the ultimate decisions remain with the federal agency, all recipients selected for an award will be required to assist in the timely and effective completion of the NEPA process in the manner most pertinent to their proposed project. If DOE determines certain records must be prepared to complete the NEPA review process (e.g., biological evaluations or environmental assessments), the costs to prepare the necessary records may be included as part of the project costs.

vii. Applicant Representations and Certifications

1. Lobbying Restrictions

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By accepting funds under this award, the prime recipient agrees that none of the funds obligated on the award shall be expended, directly or indirectly, to influence Congressional action on any legislation or appropriation matters pending before Congress, other than to communicate to Members of Congress as described in 18 U.S.C. §1913. This restriction is in addition to those prescribed elsewhere in statute and regulation.

2. Corporate Felony Conviction and Federal Tax Liability Representations

In submitting an application in response to this FOA, the applicant represents that:

- a. It is **not** a corporation that has been convicted of a felony criminal violation under any federal law within the preceding 24 months, and
- b. It is **not** a corporation that has any unpaid federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

For purposes of these representations the following definitions apply:

A Corporation includes any entity that has filed articles of incorporation in any of the 50 states, the District of Columbia, or the various territories of the United States [but not foreign corporations]. It includes both for-profit and non-profit organizations.

3. Nondisclosure and Confidentiality Agreements Representations

In submitting an application in response to this FOA the applicant represents that:

- a. It **does not and will not** require its employees or contractors to sign internal nondisclosure or confidentiality agreements or statements prohibiting or otherwise restricting its employees or contractors from lawfully reporting waste, fraud, or abuse to a designated investigative or law enforcement representative of a federal department or agency authorized to receive such information.
- b. It **does not and will not** use any federal funds to implement or enforce any nondisclosure and/or confidentiality policy, form, or agreement it uses unless it contains the following provisions:

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- (1) *“These provisions are consistent with and do not supersede, conflict with, or otherwise alter the employee obligations, rights, or liabilities created by existing statute or Executive order relating to (1) classified information, (2) communications to Congress, (3) the reporting to an Inspector General of a violation of any law, rule, or regulation, or mismanagement, a gross waste of funds, an abuse of authority, or a substantial and specific danger to public health or safety, or (4) any other whistleblower protection. The definitions, requirements, obligations, rights, sanctions, and liabilities created by controlling Executive orders and statutory provisions are incorporated into this agreement and are controlling.”*
- (2) The limitation above shall not contravene requirements applicable to Standard Form 312 Classified Information Nondisclosure Agreement (<https://fas.org/sgp/othergov/sf312.pdf>), Form 4414 Sensitive Compartmented Information Disclosure Agreement (<https://fas.org/sgp/othergov/intel/sf4414.pdf>), or any other form issued by a federal department or agency governing the nondisclosure of classified information.
- (3) Notwithstanding the provision listed in paragraph (a), a nondisclosure or confidentiality policy form or agreement that is to be executed by a person connected with the conduct of an intelligence or intelligence-related activity, other than an employee or officer of the United States Government, may contain provisions appropriate to the particular activity for which such document is to be used. Such form or agreement shall, at a minimum, require that the person will not disclose any classified information received in the course of such activity unless specifically authorized to do so by the United States Government. Such nondisclosure or confidentiality forms shall also make it clear that they do not bar disclosures to Congress, or to an authorized official of an executive agency or the Department of Justice, that are essential to reporting a substantial violation of law.

viii. Statement of Federal Stewardship

EERE will exercise normal federal stewardship in overseeing the project activities performed under EERE awards. Stewardship Activities include, but are not limited to, conducting site visits; reviewing performance and financial reports; providing assistance and/or temporary intervention in unusual circumstances to correct deficiencies that develop during the project; assuring compliance with terms and conditions; and reviewing technical performance after project completion to ensure that the project objectives have been accomplished.

ix. Statement of Substantial Involvement

EERE has substantial involvement in work performed under awards made as a result of this FOA. EERE does not limit its involvement to the administrative requirements of the award. Instead, EERE has substantial involvement in the direction and redirection of the technical aspects of the project as a whole. Substantial involvement includes, but is not limited to, the following:

1. EERE shares responsibility with the recipient for the management, control, direction, and performance of the project.
2. EERE may intervene in the conduct or performance of work under this award for programmatic reasons. Intervention includes the interruption or modification of the conduct or performance of project activities.
3. EERE may redirect or discontinue funding the project based on the outcome of EERE's evaluation of the project at the Go/No-Go decision point(s).
4. EERE participates in major project decision-making processes.

x. Subject Invention Utilization Reporting

In order to ensure that prime recipients and subrecipients holding title to subject inventions are taking the appropriate steps to commercialize subject inventions, EERE may require that each prime recipient holding title to a subject invention submit annual reports for 10 years from the date the subject invention was disclosed to EERE on the utilization of the subject invention and efforts made by prime recipient or their licensees or assignees to stimulate such utilization. The reports must include information regarding the status of development, date of first commercial sale or use, gross royalties received by the prime recipient, and such other data and information as EERE may specify.

xi. Intellectual Property Provisions

The standard DOE financial assistance intellectual property provisions applicable to the various types of recipients are located at <http://energy.gov/gc/standard-intellectual-property-ip-provisions-financial-assistance-awards>.

xii. Reporting

Reporting requirements are identified on the Federal Assistance Reporting Checklist, attached to the award agreement. This helpful EERE checklist can be accessed at <https://www.energy.gov/eere/funding/eere-funding-application-and-management-forms>. See Attachment 2 Federal Assistance Reporting Checklist, after clicking on "Model Cooperative Agreement" under the Award Package section.

Questions about this FOA? Email FY19WETOFOA@ee.doe.gov.

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xiii. Go/No-Go Review

Each project selected under this FOA will be subject to a periodic project evaluation referred to as a Go/No-Go Review. At the Go/No-Go decision points, EERE will evaluate project performance, project schedule adherence, meeting milestone objectives, compliance with reporting requirements, and overall contribution to the EERE program goals and objectives. Federal funding beyond the Go/No-Go decision point (continuation funding) is contingent upon (1) availability of federal funds appropriated by Congress for the purpose of this program; (2) the availability of future-year budget authority; (3) recipient's technical progress compared to the Milestone Summary Table stated in Attachment 1 of the award; (4) recipient's submittal of required reports; (5) recipient's compliance with the terms and conditions of the award; (6) EERE's Go/No-Go decision; (7) the recipient's submission of a continuation application; and (8) written approval of the continuation application by the Contracting Officer.

As a result of the Go/No-Go Review, DOE may, at its discretion, authorize the following actions: (1) continue to fund the project, contingent upon the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) recommend redirection of work under the project; (3) place a hold on federal funding for the project, pending further supporting data or funding; or (4) discontinue funding the project because of insufficient progress, change in strategic direction, or lack of funding.

The Go/No-Go decision is distinct from a non-compliance determination. In the event a recipient fails to comply with the requirements of an award, EERE may take appropriate action, including but not limited to, redirecting, suspending or terminating the award.

xiv. Conference Spending

The recipient shall not expend any funds on a conference not directly and programmatically related to the purpose for which the grant or cooperative agreement was awarded that would defray the cost to the United States Government of a conference held by any Executive branch department, agency, board, commission, or office for which the cost to the United States Government would otherwise exceed \$20,000, thereby circumventing the required notification by the head of any such Executive Branch department, agency, board, commission, or office to the Inspector General (or senior ethics official for any entity without an Inspector General), of the date, location, and number of employees attending such conference.

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xv. Uniform Commercial Code (UCC) Financing Statements

Per 2 CFR 910.360 (Real Property and Equipment) when a piece of equipment is purchased by a for-profit recipient or subrecipient with federal funds, and when the federal share of the financial assistance agreement is more than \$1,000,000, the recipient or subrecipient must:

Properly record, and consent to the Department's ability to properly record if the recipient fails to do so, UCC financing statement(s) for all equipment in excess of \$5,000 purchased with project funds. These financing statement(s) must be approved in writing by the Contracting Officer prior to the recording, and they shall provide notice that the recipient's title to all equipment (not real property) purchased with federal funds under the financial assistance agreement is conditional pursuant to the terms of this section, and that the Government retains an undivided reversionary interest in the equipment. The UCC financing statement(s) must be filed before the Contracting Officer may reimburse the recipient for the federal share of the equipment unless otherwise provided for in the relevant financial assistance agreement. The recipient shall further make any amendments to the financing statements or additional recordings, including appropriate continuation statements, as necessary or as the Contracting Officer may direct.

VIII. Questions/Agency Contacts

Upon the issuance of a FOA, EERE personnel are prohibited from communicating (in writing or otherwise) with applicants regarding the FOA except through the established question and answer process as described below. Specifically, questions regarding the content of this FOA must be submitted to:

FY19WETOFOA@ee.doe.gov. Questions must be submitted not later than 3 business days prior to the application due date and time. Please note, feedback on individual concepts will not be provided through Q&A.

All questions and answers related to this FOA will be posted on EERE Exchange at: <https://eere-exchange.energy.gov>. **Please note that you must first select this specific FOA Number in order to view the questions and answers specific to this FOA.** EERE will attempt to respond to a question within 3 business days, unless a similar question and answer has already been posted on the website.

Questions related to the registration process and use of the EERE Exchange website should be submitted to: EERE-ExchangeSupport@hq.doe.gov.

Questions about this FOA? Email FY19WETOFOA@ee.doe.gov.

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IX. Other Information

A. FOA Modifications

Amendments to this FOA will be posted on the EERE Exchange website and the Grants.gov system. However, you will only receive an email when an amendment or a FOA is posted on these sites if you register for email notifications for this FOA in Grants.gov. EERE recommends that you register as soon after the release of the FOA as possible to ensure you receive timely notice of any amendments or other FOAs.

B. Government Right to Reject or Negotiate

EERE reserves the right, without qualification, to reject any or all applications received in response to this FOA and to select any application, in whole or in part, as a basis for negotiation and/or award.

C. Commitment of Public Funds

The Contracting Officer is the only individual who can make awards or commit the Government to the expenditure of public funds. A commitment by anyone other than the Contracting Officer, either express or implied, is invalid.

D. Treatment of Application Information

In general, EERE will only use data and other information contained in applications for evaluation purposes, unless such information is generally available to the public or is already the property of the Government.

Applicants should not include trade secrets or commercial or financial information that is privileged or confidential in their application unless such information is necessary to convey an understanding of the proposed project or to comply with a requirement in the FOA.

The use of protective markings such as “Do Not Publicly Release – Trade Secret” or “Do Not Publicly Release – Confidential Business Information” is encouraged. However, applicants should be aware that the use of protective markings is not dispositive as to whether information will be publicly released pursuant to the Freedom of Information Act, 5 U.S.C. §552, et. seq., as amended by the OPEN Government Act of 2007, Pub. L. No. 110-175. (See Section I of this document, “Notice of Potential Disclosure Under the Freedom of Information Act (FOIA)” for additional information regarding the public release of information under FOIA.

Applicants are encouraged to employ protective markings in the following manner:

Questions about this FOA? Email FY19WETOFOA@ee.doe.gov.

Problems with EERE Exchange? Email EERE-ExchangeSupport@hq.doe.gov Include FOA name & number in subject line.

The cover sheet of the application must be marked as follows and identify the specific pages containing trade secrets or commercial or financial information that is privileged or confidential:

Notice of Restriction on Disclosure and Use of Data:

Pages [list applicable pages] of this document may contain trade secrets or commercial or financial information that is privileged or confidential, and is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes or in accordance with a financial assistance or loan agreement between the submitter and the Government. The Government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source. [End of Notice]

The header and footer of every page that contains trade secrets or commercial or financial information that is privileged must be marked as follows: "May contain trade secrets or commercial or financial information that is privileged or confidential and exempt from public disclosure."

In addition, each line or paragraph containing trade secrets or commercial or financial information that is privileged or confidential must be enclosed in brackets.

E. Evaluation and Administration by Non-Federal Personnel

In conducting the merit review evaluation, the Go/No-Go Review and Peer Review, the Government may seek the advice of qualified non-federal personnel as reviewers. The Government may also use non-federal personnel to conduct routine, nondiscretionary administrative activities, including EERE contractors. The applicant, by submitting its application, consents to the use of non-federal reviewers/administrators. Non-federal reviewers must sign conflict of interest (COI) and non-disclosure acknowledgements (NDA) prior to reviewing an application. Non-federal personnel conducting administrative activities must sign an NDA.

F. Notice Regarding Eligible/Ineligible Activities

Eligible activities under this FOA include those which describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not those which encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.

G. Notice of Right to Conduct a Review of Financial Capability

EERE reserves the right to conduct an independent third party review of financial capability for applicants that are selected for negotiation of award (including personal credit information of principal(s) of a small business if there is insufficient information to determine financial capability of the organization).

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H. Notice of Potential Disclosure Under Freedom of Information Act (FOIA)

Under the FOIA, 5 U.S.C. §552, et. seq., as amended by the OPEN Government Act of 2007, Pub. L. No. 110-175, any information received from the applicant is considered to be an agency record, and as such, subject to public release under FOIA. The purpose of the FOIA is to afford the public the right to request and receive agency records unless those agency records are protected from disclosure under one or more of the nine FOIA exemptions. Decisions to disclose or withhold information received from the applicant are based upon the applicability of one or more of the nine FOIA exemptions, not on the existence or nonexistence of protective markings or designations. Only the agency's designated FOIA Officer may determine if information received from the applicant may be withheld pursuant to one of the nine FOIA exemptions. All FOIA requests received by DOE are processed in accordance with 10 C.F.R. Part 1004.

I. Requirement for Full and Complete Disclosure

Applicants are required to make a full and complete disclosure of all information requested. Any failure to make a full and complete disclosure of the requested information may result in:

- The termination of award negotiations;
- The modification, suspension, and/or termination of a funding agreement;
- The initiation of debarment proceedings, debarment, and/or a declaration of ineligibility for receipt of federal contracts, subcontracts, and financial assistance and benefits; and
- Civil and/or criminal penalties.

J. Retention of Submissions

EERE expects to retain copies of all Concept Papers, Full Applications and other submissions. No submissions will be returned. By applying to EERE for funding, applicants consent to EERE's retention of their submissions.

K. Title to Subject Inventions

Ownership of subject inventions is governed pursuant to the authorities listed below:

- Domestic Small Businesses, Educational Institutions, and Nonprofits: Under the Bayh-Dole Act (35 U.S.C. § 200 et seq.), domestic small businesses, educational institutions, and nonprofits may elect to retain title to their subject inventions;

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- All other parties: The federal Non-Nuclear Energy Act of 1974, 42. U.S.C. 5908, provides that the Government obtains title to new inventions unless a waiver is granted (see below);
- Class Patent Waiver:

DOE has issued a class waiver that applies to this FOA. Under this class waiver, domestic large businesses may elect title to their subject inventions similar to the right provided to the domestic small businesses, educational institutions, and nonprofits by law. In order to avail itself of the class waiver, a domestic large business must agree that any products embodying or produced through the use of a subject invention first created or reduced to practice under this program will be substantially manufactured in the United States, unless DOE agrees that the commitments proposed in the U.S. Manufacturing Plan are sufficient.

- Advance and Identified Waivers: Applicants may request a patent waiver that will cover subject inventions that may be invented under the award, in advance of or within 30 days after the effective date of the award. Even if an advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver for identified inventions, i.e., individual subject inventions that are disclosed to EERE within the timeframes set forth in the award's intellectual property terms and conditions. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784; and
- DEC: Each applicant is required to submit a U.S. Manufacturing Plan as part of its application. If selected, the U.S. Manufacturing Plan shall be incorporated into the award terms and conditions for domestic small businesses and nonprofit organizations. DOE has determined that exceptional circumstances exist that warrants the modification of the standard patent rights clause for small businesses and non-profit awardees under Bayh-Dole to the extent necessary to implement and enforce the U.S. Manufacturing Plan. Any Bayh-Dole entity (domestic small business or nonprofit organization) affected by this DEC has the right to appeal it.

L. Government Rights in Subject Inventions

Where prime recipients and subrecipients retain title to subject inventions, the U.S. Government retains certain rights.

1. Government Use License

The U.S. Government retains a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United

States any subject invention throughout the world. This license extends to contractors doing work on behalf of the Government.

2. March-In Rights

The U.S. Government retains march-in rights with respect to all subject inventions. Through “march-in rights,” the Government may require a prime recipient or subrecipient who has elected to retain title to a subject invention (or their assignees or exclusive licensees), to grant a license for use of the invention to a third party. In addition, the Government may grant licenses for use of the subject invention when a prime recipient, subrecipient, or their assignees and exclusive licensees refuse to do so.

DOE may exercise its march-in rights only if it determines that such action is necessary under any of the four following conditions:

- The owner or licensee has not taken or is not expected to take effective steps to achieve practical application of the invention within a reasonable time;
- The owner or licensee has not taken action to alleviate health or safety needs in a reasonably satisfied manner;
- The owner has not met public use requirements specified by federal statutes in a reasonably satisfied manner; or
- The U.S. Manufacturing requirement has not been met.

Any determination that march-in rights are warranted must follow a fact-finding process in which the recipient has certain rights to present evidence and witnesses, confront witnesses and appear with counsel and appeal any adverse decision. To date, DOE has never exercised its march-in rights to any subject inventions.

M. Rights in Technical Data

Data rights differ based on whether data is first produced under an award or instead was developed at private expense outside the award.

“Limited Rights Data”: The U.S. Government will not normally require delivery of confidential or trade secret-type technical data developed solely at private expense prior to issuance of an award, except as necessary to monitor technical progress and evaluate the potential of proposed technologies to reach specific technical and cost metrics.

Government Rights in Technical Data Produced Under Awards: The U.S. Government normally retains unlimited rights in technical data produced under Government financial assistance awards, including the right to distribute to the public. However,

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pursuant to special statutory authority, certain categories of data generated under EERE awards may be protected from public disclosure for up to five years after the data is generated (“Protected Data”). For awards permitting Protected Data, the protected data must be marked as set forth in the awards intellectual property terms and conditions and a listing of unlimited rights data (i.e., non-protected data) must be inserted into the data clause in the award. In addition, invention disclosures may be protected from public disclosure for a reasonable time in order to allow for filing a patent application.

N. Copyright

The prime recipient and subrecipients may assert copyright in copyrightable works, such as software, first produced under the award without EERE approval. When copyright is asserted, the Government retains a paid-up nonexclusive, irrevocable worldwide license to reproduce, prepare derivative works, distribute copies to the public, and to perform publicly and display publicly the copyrighted work. This license extends to contractors and others doing work on behalf of the Government.

O. Personally Identifiable Information (PII)

All information provided by the applicant must to the greatest extent possible exclude PII. The term “PII” refers to information which can be used to distinguish or trace an individual's identity, such as their name, social security number, biometric records, alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother's maiden name. (See OMB Memorandum M-07-16 dated May 22, 2007, found at:

<https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2007/m07-16.pdf>

By way of example, applicants must screen resumes to ensure that they do not contain PII such as personal addresses, personal landline/cell phone numbers, and personal emails. **Under no circumstances should Social Security Numbers (SSNs) be included in the application.** Federal Agencies are prohibited from the collecting, using, and displaying unnecessary SSNs. (See, the Federal Information Security Modernization Act of 2014 (Pub. L. No. 113-283, Dec 18, 2014; 44 U.S.C. §3551).

P. Annual Independent Audits

If a for-profit entity is a prime recipient and has expended \$750,000 or more of DOE awards during the entity's fiscal year, an annual compliance audit performed by an independent auditor is required. For additional information, please refer to 2 C.F.R. § 910.501 and Subpart F.

If an educational institution, non-profit organization, or state/local government is a prime recipient or subrecipient and has expended \$750,000 or more of federal awards during the non-federal entity's fiscal year, then a Single or Program-Specific Audit is required. For additional information, please refer to 2 C.F.R. § 200.501 and Subpart F.

Applicants and subrecipients (if applicable) should propose sufficient costs in the project budget to cover the costs associated with the audit. EERE will share in the cost of the audit at its applicable cost share ratio.

APPENDIX A – COST SHARE INFORMATION

Cost Sharing or Cost Matching

The terms “cost sharing” and “cost matching” are often used synonymously. Even the DOE Financial Assistance Regulations, 2 CFR 200.306, use both of the terms in the titles specific to regulations applicable to cost sharing. EERE almost always uses the term “cost sharing,” as it conveys the concept that non-federal share is calculated as a percentage of the Total Project Cost. An exception is the State Energy Program Regulation, 10 CFR 420.12, State Matching Contribution. Here “cost matching” for the non-federal share is calculated as a percentage of the federal funds only, rather than the Total Project Cost.

How Cost Sharing Is Calculated

As stated above, cost sharing is calculated as a percentage of the Total Project Cost. FFRDC costs must be included in Total Project Costs. The following is an example of how to calculate cost sharing amounts for a project with \$1,000,000 in federal funds with a minimum 20% non-federal cost sharing requirement:

- Formula: Federal share (\$) divided by federal share (%) = Total Project Cost
Example: \$1,000,000 divided by 80% = \$1,250,000
- Formula: Total Project Cost (\$) minus federal share (\$) = Non-federal share (\$)
Example: \$1,250,000 minus \$1,000,000 = \$250,000
- Formula: Non-federal share (\$) divided by Total Project Cost (\$) = Non-federal share (%)
Example: \$250,000 divided by \$1,250,000 = 20%

What Qualifies For Cost Sharing

While it is not possible to explain what specifically qualifies for cost sharing in one or even a couple of sentences, in general, if a cost is allowable under the cost principles applicable to the organization incurring the cost and is eligible for reimbursement under an EERE grant or cooperative agreement, then it is allowable as cost share. Conversely, if the cost is not allowable under the cost principles and not eligible for reimbursement, then it is not allowable as cost share. In addition, costs may not be counted as cost share if they are paid by the federal Government under another award unless authorized by federal statute to be used for cost sharing.

The rules associated with what is allowable as cost share are specific to the type of organization that is receiving funds under the grant or cooperative agreement, though are generally the same for all types of entities. The specific rules applicable to:

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- FAR Part 31 for For-Profit entities, (48 CFR Part 31); and
- 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

In addition to the regulations referenced above, other factors may also come into play such as timing of donations and length of the project period. For example, the value of ten years of donated maintenance on a project that has a project period of five years would not be fully allowable as cost share. Only the value for the five years of donated maintenance that corresponds to the project period is allowable and may be counted as cost share.

Additionally, EERE generally does not allow pre-award costs for either cost share or reimbursement when these costs precede the signing of the appropriation bill that funds the award. In the case of a competitive award, EERE generally does not allow pre-award costs prior to the signing of the Selection Statement by the EERE Selection Official.

General Cost Sharing Rules on a DOE Award

1. **Cash Cost Share** - encompasses all contributions to the project made by the recipient or subrecipient(s), for costs incurred and paid for during the project. This includes when an organization pays for personnel, supplies, equipment for their own company with organizational resources. If the item or service is reimbursed for, it is cash cost share. All cost share items must be necessary to the performance of the project.
2. **In-Kind Cost Share** - encompasses all contributions to the project made by the recipient or subrecipient(s) that do not involve a payment or reimbursement and represent donated items or services. In-Kind cost share items include volunteer personnel hours, donated existing equipment, donated existing supplies. The cash value and calculations thereof for all In-Kind cost share items must be justified and explained in the Cost Share section of the project Budget Justification. All cost share items must be necessary to the performance of the project. If questions exist, consult your DOE contact before filling out the In-Kind cost share section of the Budget Justification.
3. **Funds from other federal sources MAY NOT be counted as cost share.** This prohibition includes FFRDC subrecipients. Non-federal sources include any source not originally derived from federal funds. Cost sharing commitment letters from subrecipients must be provided with the original application.
4. **Fee or profit, including foregone fee or profit, are not allowable as project costs (including cost share) under any resulting award.** The project may only incur those costs that are allowable and allocable to the project (including cost share) as determined in accordance with the applicable cost principles prescribed in FAR Part 31 for For-Profit entities and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

DOE Financial Assistance Rules 2 CFR Part 200 as amended by 2 CFR Part 910

As stated above, the rules associated with what is allowable cost share are generally the same for all types of organizations. Following are the rules found to be common, but again, the specifics are contained in the regulations and cost principles specific to the type of entity:

(A) Acceptable contributions. All contributions, including cash contributions and third party in-kind contributions, must be accepted as part of the prime recipient's cost sharing if such contributions meet all of the following criteria:

- (1)** They are verifiable from the recipient's records.
- (2)** They are not included as contributions for any other federally-assisted project or program.
- (3)** They are necessary and reasonable for the proper and efficient accomplishment of project or program objectives.
- (4)** They are allowable under the cost principles applicable to the type of entity incurring the cost as follows:
 - a.** For-profit organizations. Allowability of costs incurred by for-profit organizations and those nonprofit organizations listed in Attachment C to OMB Circular A-122 is determined in accordance with the for-profit cost principles in 48 CFR Part 31 in the FAR, except that patent prosecution costs are not allowable unless specifically authorized in the award document. (v) Commercial Organizations. FAR Subpart 31.2—Contracts with Commercial Organizations; and
 - b.** Other types of organizations. For all other non-federal entities, allowability of costs is determined in accordance with 2 CFR Part 200 Subpart E.
- (5)** They are not paid by the federal government under another award unless authorized by federal statute to be used for cost sharing or matching.
- (6)** They are provided for in the approved budget.

(B) Valuing and documenting contributions

- (1)** Valuing recipient's property or services of recipient's employees. Values are established in accordance with the applicable cost principles, which mean that amounts chargeable to the project are determined on the basis of costs incurred. For real property or equipment used on the project, the cost principles authorize depreciation or use charges. The full value of the item may be applied when the item

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will be consumed in the performance of the award or fully depreciated by the end of the award. In cases where the full value of a donated capital asset is to be applied as cost sharing or matching, that full value must be the lesser or the following:

- a. The certified value of the remaining life of the property recorded in the recipient's accounting records at the time of donation; or
 - b. The current fair market value. If there is sufficient justification, the Contracting Officer may approve the use of the current fair market value of the donated property, even if it exceeds the certified value at the time of donation to the project. The Contracting Officer may accept the use of any reasonable basis for determining the fair market value of the property.
- (2) Valuing services of others' employees. If an employer other than the recipient furnishes the services of an employee, those services are valued at the employee's regular rate of pay, provided these services are for the same skill level for which the employee is normally paid.
- (3) Valuing volunteer services. Volunteer services furnished by professional and technical personnel, consultants, and other skilled and unskilled labor may be counted as cost sharing or matching if the service is an integral and necessary part of an approved project or program. Rates for volunteer services must be consistent with those paid for similar work in the recipient's organization. In those markets in which the required skills are not found in the recipient organization, rates must be consistent with those paid for similar work in the labor market in which the recipient competes for the kind of services involved. In either case, paid fringe benefits that are reasonable, allowable, and allocable may be included in the valuation.
- (4) Valuing property donated by third parties.
 - a. Donated supplies may include such items as office supplies or laboratory supplies. Value assessed to donated supplies included in the cost sharing or matching share must be reasonable and must not exceed the fair market value of the property at the time of the donation.
 - b. Normally only depreciation or use charges for equipment and buildings may be applied. However, the fair rental charges for land and the full value of equipment or other capital assets may be allowed, when they will be consumed in the performance of the award or fully depreciated by the end of the award, provided that the Contracting Officer has approved the charges. When use charges are applied, values must be determined in accordance with the usual accounting policies of the recipient, with the following qualifications:

- i. The value of donated space must not exceed the fair rental value of comparable space as established by an independent appraisal of comparable space and facilities in a privately-owned building in the same locality.
 - ii. The value of loaned equipment must not exceed its fair rental value.
- (5) Documentation.** The following requirements pertain to the recipient's supporting records for in-kind contributions from third parties:
 - a. Volunteer services must be documented and, to the extent feasible, supported by the same methods used by the recipient for its own employees.
 - b. The basis for determining the valuation for personal services and property must be documented.

APPENDIX B – SAMPLE COST SHARE CALCULATION FOR BLENDED COST SHARE PERCENTAGE

The following example shows the math for calculating required cost share for a project with \$2,000,000 in federal funds with four tasks requiring different non-federal cost share percentages:

Task	Proposed Federal Share	Federal Share %	Recipient Share %
Task 1 (R&D)	\$1,000,000	80%	20%
Task 2 (R&D)	\$500,000	80%	20%
Task 3 (Demonstration)	\$400,000	50%	50%
Task 4 (Outreach)	\$100,000	100%	0%

Federal share (\$) divided by federal share (%) = Task Cost

Each task must be calculated individually as follows:

Task 1

\$1,000,000 divided by 80% = \$1,250,000 (Task 1 Cost)

Task 1 Cost minus federal share = Non-federal share

\$1,250,000 - \$1,000,000 = \$250,000 (Non-federal share)

Task 2

\$500,000 divided 80% = \$625,000 (Task 2 Cost)

Task 2 Cost minus federal share = Non-federal share

\$625,000 - \$500,000 = \$125,000 (Non-federal share)

Task 3

\$400,000 / 50% = \$800,000 (Task 3 Cost)

Task 3 Cost minus federal share = Non-federal share

\$800,000 - \$400,000 = \$400,000 (Non-federal share)

Task 4

Federal share = \$100,000

Non-federal cost share is not mandated for outreach = \$0 (Non-federal share)

The calculation may then be completed as follows:

Tasks	\$ Federal Share	% Federal Share	\$ Non-Federal Share	% Non-Federal Share	Total Project Cost
Task 1	\$1,000,000	80%	\$250,000	20%	\$1,250,000
Task 2	\$500,000	80%	\$125,000	20%	\$625,000
Task 3	\$400,000	50%	\$400,000	50%	\$800,000
Task 4	\$100,000	100%	\$0	0%	\$100,000
Totals	\$2,000,000		\$775,000		\$2,775,000

Blended Cost Share %

Non-federal share (\$775,000) divided by Total Project Cost (\$2,775,000) = 27.9% (non-federal)

Federal share (\$2,000,000) divided by Total Project Cost (\$2,775,000) = 72.1% (federal)

APPENDIX C – WAIVER REQUESTS AND APPROVAL PROCESSES: 1. FOREIGN ENTITY PARTICIPATION AS THE PRIME RECIPIENT; AND 2. PERFORMANCE OF WORK IN THE UNITED STATES (FOREIGN WORK WAIVER)

1. Waiver for Foreign Entity Participation as the Prime Recipient

As set forth in Section III.A.iii., all prime recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a State or territory of the United States and have a physical location for business operations in the United States. To request a waiver of this requirement, an applicant must submit an explicit waiver request in the Full Application.

Overall, the applicant must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to have a foreign entity serve as the prime recipient. A request to waive the *Foreign Entity Participation as the prime recipient* requirement must include the following:

- Entity name;
- The rationale for proposing a foreign entity to serve as the prime recipient;
- Country of incorporation;
- A description of the project’s anticipated contributions to the US economy;
- How the project will benefit U.S. research, development and manufacturing, including contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
- How the project will promote domestic American manufacturing of products and/or services;
- A description of how the foreign entity’s participation as the prime recipient is essential to the project;
- A description of the likelihood of Intellectual Property (IP) being created from the work and the treatment of any such IP; and
- Countries where the work will be performed (Note: if any work is proposed to be conducted outside the U.S., the applicant must also complete a separate request for waiver of the Performance of Work in the United States requirement).

EERE may require additional information before considering the waiver request.

The applicant does not have the right to appeal EERE’s decision concerning a waiver request.

2. **Waiver for Performance of Work in the United States (Foreign Work Waiver)**

As set forth in Section IV.J.iii., all work under EERE funding agreements must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment, so a waiver is not required for foreign purchases of these items. However, the prime recipient should make every effort to purchase supplies and equipment within the United States. There may be limited circumstances where it is in the interest of the project to perform a portion of the work outside the United States. To seek a waiver of the Performance of Work in the United States requirement, the applicant must submit an explicit waiver request in the Full Application. A separate waiver request must be submitted for each entity proposing performance of work outside of the United States.

Overall, a waiver request must demonstrate to the satisfaction of EERE that it would further the purposes of this FOA and is otherwise in the economic interests of the United States to perform work outside of the United States. A request to waive the *Performance of Work in the United States* requirement must include the following:

- The rationale for performing the work outside the U.S. (“foreign work”);
- A description of the work proposed to be performed outside the U.S.;
- An explanation as to how the foreign work is essential to the project;
- A description of the anticipated benefits to be realized by the proposed foreign work and the anticipated contributions to the US economy;
- The associated benefits to be realized and the contribution to the project from the foreign work;
- How the foreign work will benefit U.S. research, development and manufacturing, including contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
- How the foreign work will promote domestic American manufacturing of products and/or services;
- A description of the likelihood of Intellectual Property (IP) being created from the foreign work and the treatment of any such IP;
- The total estimated cost (DOE and recipient cost share) of the proposed foreign work;
- The countries in which the foreign work is proposed to be performed; and
- The name of the entity that would perform the foreign work.

EERE may require additional information before considering the waiver request.

The applicant does not have the right to appeal EERE’s decision concerning a waiver request.

APPENDIX D – GLOSSARY

Applicant – The lead organization submitting an application under the FOA.

Continuation application – A non-competitive application for an additional budget period within a previously approved project period. At least ninety (90) days before the end of each budget period, the Recipient must submit to EERE its continuation application, which includes the following information:

- i. A report on the Recipient's progress towards meeting the objectives of the project, including any significant findings, conclusions, or developments, and an estimate of any unobligated balances remaining at the end of the budget period. If the remaining unobligated balance is estimated to exceed 20 percent of the funds available for the budget period, explain why the excess funds have not been obligated and how they will be used in the next budget period.
- ii. A detailed budget and supporting justification if there are changes to the negotiated budget, or a budget for the upcoming budget period was not approved at the time of award.
- iii. A description of any planned changes from the negotiated Statement of Project Objectives and/or Milestone Summary Table.

Cooperative Research and Development Agreement (CRADA) – a contractual agreement between a national laboratory contractor and a private company or university to work together on research and development. For more information, see <https://www.energy.gov/gc/downloads/doe-cooperative-research-and-development-agreements>

Federally Funded Research and Development Centers (FFRDC) - FFRDCs are public-private partnerships which conduct research for the United States Government. A listing of FFRDCs can be found at <http://www.nsf.gov/statistics/ffrdclist/>.

Go/No-Go Decision Points: – A decision point at the end of a budget period that defines the overall objectives, milestones and deliverables to be achieved by the recipient in that budget period. As of a result of EERE's review, EERE may take one of the following actions: 1) authorize federal funding for the next budget period; 2) recommend redirection of work; 3) discontinue providing federal funding beyond the current budget period; or 4) place a hold on federal funding pending further supporting data.

Project – The entire scope of the cooperative agreement which is contained in the recipient's Statement of Project Objectives.

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Recipient or “Prime Recipient”— A non-Federal entity that receives a Federal award directly from a Federal awarding agency to carry out an activity under a Federal program. The term recipient does not include subrecipients.

Subrecipient – A non-Federal entity that receives a subaward from a pass-through entity to carry out part of a Federal program; but does not include an individual that is a beneficiary of such program. A subrecipient may also be a recipient of other Federal awards directly from a Federal awarding agency. Also, a DOE/NNSA and non-DOE/NNSA FFRDC may be proposed as a subrecipient on another entity’s application. See section III.E.ii.

APPENDIX E – DEFINITION OF TECHNOLOGY READINESS LEVELS

TRL 1:	Basic principles observed and reported
TRL 2:	Technology concept and/or application formulated
TRL 3:	Analytical and experimental critical function and/or characteristic proof of concept
TRL 4:	Component and/or breadboard validation in a laboratory environment
TRL 5:	Component and/or breadboard validation in a relevant environment
TRL 6:	System/subsystem model or prototype demonstration in a relevant environment
TRL 7:	System prototype demonstration in an operational environment
TRL 8:	Actual system completed and qualified through test and demonstrated
TRL 9:	Actual system proven through successful mission operations

APPENDIX F – LIST OF ACRONYMS

COI	Conflict of Interest
DEC	Determination of Exceptional Circumstances
DER	Distributed Energy Resource
DMP	Data Management Plan
DOE	Department of Energy
DOI	Digital Object Identifier
EERE	Energy Efficiency and Renewable Energy
FAR	Federal Acquisition Regulation
FFATA	Federal Funding and Transparency Act of 2006
FOA	Funding Opportunity Announcement
FOIA	Freedom of Information Act
FFRDC	Federally Funded Research and Development Center
GAAP	Generally Accepted Accounting Principles
IPMP	Intellectual Property Management Plan
LCOE	Levelized Cost of Energy (LCOE)
M&O	Management and Operating
MPIN	Marketing Partner ID Number
MYPP	Multi-Year Program Plan
NDA	Non-Disclosure Acknowledgement
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Agency
NREL	National Renewable Energy Laboratory
O&M	Operations and Maintenance
OEM	Original Equipment Manufacturer
OMB	Office of Management and Budget
OSTI	Office of Scientific and Technical Information
PII	Personal Identifiable Information
R&D	Research and Development
RFI	Request for Information
RFP	Request for Proposal
SAM	System for Award Management
SMART	Specific Measurable Achievable Relevant and Timely
SOPO	Statement of Project Objectives
SPOC	Single Point of Contact
TRL	Technology Readiness Level
UCC	Uniform Commercial Code
USDA	United States Department of Agriculture
WETO	Wind Energy Technologies Office
WBS	Work Breakdown Structure
WIRED	Wind Innovations for Rural Economic Development (WIRED)
WP	Work Proposal

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APPENDIX G – SUMMARY RESULTS: REQUEST FOR INFORMATION ON NATIONAL OFFSHORE WIND ENERGY R&D TEST FACILITIES

Summary Results

Request for Information on National Offshore Wind Energy R&D Test Facilities

Introduction

On July 30, 2018, the Wind Energy Technologies Office (WETO) of the Department of Energy's Office of Energy Efficiency and Renewable Energy issued a request for information (RFI) on test facilities supporting offshore wind energy research and development. The RFI closed on September 14, 2018.

The stated purpose of the RFI was to solicit feedback from industry, academia, research laboratories, government agencies, and other stakeholders on issues related to national offshore wind test facilities. Through a series of questions, WETO requested information on:

- The facilities in the U.S. that are available for offshore wind-specific experimentation and testing;
- Facilities upgrades or new facilities that are required in the U.S. for offshore wind testing in order to perform cutting edge research and development (R&D); and
- The most pressing R&D-related testing needs that would utilize existing, upgraded, or new U.S. offshore wind-specific test facilities.

This report includes a compilation by WETO, in summary form, of key information received in responses to the RFI. This information has been edited and interpreted by WETO in order to present and utilize it in a common, condensed format.

Responses

WETO received detailed technical responses from twenty-one entities. This group of respondents was made up of:

- 7 from industry, including engineering consultants
- 9 from university-based research centers
- 3 from national laboratories
- 2 from state and national business development organizations

Analysis

WETO created four tables aggregating the information from all the responses into a single summary document with commonality of terms and concepts, avoiding duplication of recommendations and information. These tables are:

1. Testing Needs for Offshore Wind Research and Development

This table introduces the different categories of experimental testing that are needed to further the state of R&D for offshore wind. It identifies the type of testing, type of facilities required to perform the testing, what is being evaluated by the testing, and the rationale for or desired outcome of the testing.

2. U.S. Offshore Wind Energy Test Facility Inventory

This table is an inventory, based solely on RFI responses, of existing facilities in the U.S. that can support offshore wind testing. This inventory sorts facilities by their capabilities, includes their location, owner/operator, a brief facility description, and the type of offshore wind related testing that could be performed at the facility.

3. Potential Test Facilities Upgrades by Type

This table identifies types of potential upgrades that could be implemented at existing facilities in the U.S. to broaden their R&D capabilities, along with the rationale for and potential benefits to industry of those upgrades. The table is broken down by facility categories corresponding to those in the U.S. Offshore Wind Energy Test Facility Inventory (Table 2).

4. Potential New Facilities for Offshore Wind Testing in the U.S.

This table identifies potential new facilities that could be developed in the U.S. to support offshore wind R&D. The broad set of stakeholder responses in this category ranged from hydrodynamic testing at scale, to full-scale testing at sea of turbines and components.

IMPORTANT NOTE: The information in these table is based solely on the RFI responses. No prioritization or assessment of the relative importance of test types or facilities is implied in how the tables are organized and how the information is presented. The information listed regarding existing facilities is abbreviated and has not been verified for accuracy.

TABLE 1 - Testing Needs for Offshore Wind Research and Development

(Based solely on responses to DOE Request for Information 7/30/2018)

No prioritization or assessment of relative importance of test types or facilities is implied in the organization or presentation of information in this table

Test Category	Applicable Type of Test Facility*	What is being evaluated? (examples)	Rationale/Outcome of Testing (examples)
Hydrodynamic Performance Modeling of Structures (Testing of small-scale models under simulated conditions)			
	Hydrodynamic (basin or flume)	Support structure - Fixed	Hydrodynamic responses to operational and/or extreme wave conditions currents and other factors in order to perform studies on 3D motions, interaction of multiple devices, directional wave impact forces, scouring potential, stability, vortex-induced motions and vibrations, slamming, run-up, overtopping, optimization, deployment techniques, mooring systems, etc.
		Support structure - Floating	
		Submerged structural components and anchors	
		Support structure with static turbine mounted	
		Transport and tow-out scenarios	
		Design code validation	Comparison of physical model performance under simulated conditions to results from computer models
Coupled Hydrodynamic and Aerodynamic Performance Modeling (Testing of small-scale models under simulated conditions)			
	Hydrodynamic (basin or flume) plus aerodynamic (with wind generation capabilities)	Integrated turbine and structure in simulated operation	Coupled performance under simultaneous wind and wave loading
		Transport and tow-out scenarios	Evaluate behavior of turbine/foundation systems installation scenarios under simulated conditions
		Comparative evaluation of floating offshore wind system (turbine/platform) configurations	Establish key design parameters determining system performance and which configuration characteristics have the most influence on achieving desired results (e.g. decreased operating loads and overall mass)
		Design code validation	Comparison of physical model performance under simulated conditions to computer model results
Aerodynamic Performance Modeling (Testing of small-scale models under simulated conditions)			
	Aerodynamic (boundary layer wind tunnel)	Aerodynamic effects of turbines and support structures above the waterline in wind plant arrays	Develop and validate computer models to optimize the layout of offshore wind plants
Testing of Intermediate-scale Turbines and Structures (e.g. 1/4 scale prototypes)			
	Fixed or floating testbed in sheltered marine or fresh water environment	Turbine/structure/control concepts	Validation of designs, controls, and models in moderate conditions without cost of building and deploying full-scale articles
	Motion-simulation testbed on land	Coupled turbine/structure performance	Characterization of performance variables and design options under controlled conditions

Test Category	Applicable Type of Test Facility*	What is being evaluated? (examples)	Rationale/Outcome of Testing (examples)
Testing of Full-scale Turbines and Components			
	Turbine certification facility	Turbine/tower systems	Performance validation; compliance to type certification requirements; verification of component changes
	Large-scale dynamometer testbed	Turbine drivetrains	Performance validation; accelerated lifetime testing; failure modes analysis
	Large-scale blade test facility	Blades	Structural performance of full-size blades, blade segments, and/or structural elements
	Large-scale bearing test facility	Very large pitch, yaw and mainshaft bearings	Required for turbine certification, improving reliability, and lowering cost of bearing systems for next generation of turbines
	Structural testbed	Support structure and structural components	Load and fatigue tests for evaluating performance of large structural components under offshore wind and sea-state conditions. Test the stiffness, strength, and cyclic performance of component elements and how these are affected by stress levels, cyclic loading, material properties, and structural variables
Geotechnical Modeling (Testing of scale models under simulated conditions)			
	Large soil-structure interaction facility (geotechnical centrifuge and/or shake table)	Support structure - fixed	Fluid soil/structure interaction analysis including scour, stability, verification of uplift capacity and reducing ballast requirements
		Anchors for floating systems	Comparative testing of various configurations under identical simulated conditions
Materials and Coatings Validation			
	Coatings test and verification facility (focused on offshore wind turbine componentry and conditions)	Component coating systems under accelerated conditions	Ensure compliance of coating systems with corrosion, abrasion, and safety protection requirements for offshore structures and turbines, in immersion and above waterline
	Rain erosion test facility	Blades - leading edge and tip erosion	Evaluate leading edge and blade tip material and treatments in a controlled but realistic environment through material modeling, characterization and testing in order to avoid structural degradation and loss of energy production due to surface erosion
	Ice accretion test facility	Blades - ice accretion characteristics and mitigation types	Avoid lost production time and damage due to ice buildup on blades and support structure; test mitigation processes
Atmospheric and Environmental Characterization			
	Meteorological reference site	Remote wind scanning and characterization devices	Testing and validation of innovative, lower cost technologies and methods for wind resource observations and site characterization
	Deployable instrumentation buoys	Performance related site characteristics prior to project development	Data on factors such as wind speed, wind direction, air temperature, humidity, ocean temperature, salinity, current profiles, and wave height and direction used in project design, and for comparison to long term post-construction measurements

Test Category	Applicable Type of Test Facility*	What is being evaluated? (examples)	Rationale/Outcome of Testing (examples)
Marine Sciences and Seawater Testing (Related to offshore wind technology)			
	Marine sciences and seawater laboratory	Offshore-related instruments and underwater vehicles	Evaluate and calibrate instrument packages and remotely-operated or autonomous vehicles for site characterization and environmental and performance monitoring
		Responses of marine organisms to various types of structures, materials, coatings and operating systems used in offshore wind	Conduct behavioral and physiological experiments on marine organisms in order to evaluate responses to different environmental conditions and stimuli
Data Collection at Full-scale Offshore Wind Plants			
	Standard instrumentation package and protocols for in situ monitoring of commercial and demonstration wind plants	Full turbine system performance and environmental conditions over time	Large body of data to compare actual to predicted structural loads, energy production, environmental conditions, etc. in order to inform future designs, operating assumptions, and risk assessments
		Array-level energy losses and control paradigms	Better understanding of the interaction and impacts of multiple-turbine arrays in the marine environment and how losses may be mitigated through advanced controls architecture
	Open water testbed or demonstration project	Performance of individual or multiple prototype or first-of-a-kind systems under research controls and parameters	Characterization of system performance, structural loads and installation/operations process against pre-construction and design assumptions
Computer Simulated Testing, Validation, and Data Archiving			
	High performance computing facility	Relevance and accuracy of computational design tools	Increased confidence in new, complex tools such as coupled aeroelastic hydrodynamic numerical models for floating offshore wind turbines, leading to more optimal designs in terms of performance and cost
		Integrated data protocols and repository to support multi-party and multi-discipline collaboration	Facilitate a network of research entities sharing testing data and outcomes to advance the capabilities and accuracy of all parties' research
	System controls simulator	Coupled turbine and structure controls for floating systems	Modeled validation of advanced wind turbine control strategies for floating wind turbines prior to full-scale deployment

***Not all facilities of a general type can support the all types of tests indicated here. See facility inventory table for greater detail on varying capabilities within the facility types.**

TABLE 2 - U.S. Offshore Wind Energy Test Facility Inventory

(Based solely on responses to DOE Request for Information 7/30/2018)

No assessment of relative merit or suitability for carrying out given types of tests at listed facilities is implied in the organization or presentation of information in this table

The information listed regarding existing facilities is abbreviated and has not been verified for accuracy.

Upgrades may be required for individual listed facilities to meet specific offshore wind testing requirements.

Facility Type	Facility Name	Location	Owner/ Operator	Brief Facility Description*	Type of Testing that could be Accommodated (facility upgrades may be required)	Website
Hydrodynamic (basin or flume for physical model testing)						
	Large Wave Flume	Corvallis OR	Oregon State	104 m long, 3.7 m wide, and 4.5 m deep, capable of generating periodic and episodic waves	Hydrodynamic performance modeling; design code validation	http://wave.oregonstate.edu/large-wave-flume
	Directional Wave Basin	Corvallis OR	Oregon State	48.8 m long, 26.5 m wide, and 2.2 m deep, capable of generating currents, and periodic and episodic multidirectional waves including tsunamis	Hydrodynamic performance modeling; design code validation	http://wave.oregonstate.edu/directional-wave-basin
	Hydraulics Wave Basin	Coralville IA	U. of Iowa	40 m long, 20 m wide, and 3 m deep, capable of generating periodic and episodic multidirectional waves	Hydrodynamic performance modeling; design code validation	https://www.ihr.uiowa.edu/facilities/annexes-labs-and-shops/hydraulics-wave-basin-facility/
	David Taylor Model Basin (Carderock)	Bethesda MD	U.S. Navy	846 m long x 15.5m wide x 6.7 m deep, capable of generating periodic and episodic waves	Hydrodynamic performance modeling; design code validation	www.navsea.navy.mil/Home/Warfare-Centers/NSWC-Carderock/Resources/News/
Hydrodynamic and Aerodynamic (basin or flume with wind simulation)						
	Alfond Wind/Wave Ocean Engineering Laboratory	Orono ME	U. of Maine	~1:50-scale offshore model testing facility equipped with a high-performance rotatable wind machine over a multidirectional wave basin (30 m x 9 m x 4.5 m)	Coupled hydrodynamic and aerodynamic performance modeling; design code validation	https://composites.umaine.edu/key-services/offshore-model-testing/
	Offshore Technology Research Center Wave Basin	College Station TX	Texas A&M	45.7 m long x 30.5 m wide x 5.8 m deep wave basin with adjustable depth pit (9.1 m x 4.6 m x 16.8 m), current generator, multiple fans for wind simulation	Coupled hydrodynamic and aerodynamic performance modeling; design code validation	https://otrc.tamu.edu/otrc-wave-basin/
	Offshore Technology Research Center Wind/Wave/ Current Flume	College Station TX	Texas A&M	New (December 2018) flume (25 m long, 0.8 m wide, and 1.0 m high) with wind, wave, and current generators	Coupled hydrodynamic and aerodynamic Performance Modeling (note width limitations for model testing)	Not yet available
Aerodynamic (boundary layer wind tunnel with unique capabilities)						
	Boundary layer wind tunnel	Gainesville FL	U. of Florida	19-foot wide, 10-foot tall, and 130-foot long wind tunnel with continuously adjustable terrain roughness field	Aerodynamic performance modeling (with simulated variations in surface characteristics)	https://multihazard.eng.ufl.edu/experimentation/testing-apparatuses/wind-engineering/boundary-layer-wind-tunnel/
Intermediate-scale Testbed Simulating Offshore Conditions						
	National Wind Technology Test Center	Golden CO	National Renewable Energy Laboratory	Facility includes several test turbines with configuration properties similar to full-scale offshore turbines; frequent extreme wind events; and sophisticated instrumentation to characterize turbine response	Scaled turbine, control system, and tower tests on land	https://www.nrel.gov/nwtc 7

Facility Type	Facility Name	Location	Owner/ Operator	Brief Facility Description*	Type of Testing that could be Accommodated (facility upgrades may be required)	Website
	Scaled Wind Farm Technology (SWiFT) facility	Lubbock TX	Sandia National Laboratory	Three turbines with high-resolution atmospheric, turbine, and blade measurements, open-source controller, highly characterized blade design to reduce modeling uncertainty and enable innovative experiments at low cost to qualify new initiatives.	Scaled turbine, control system, and tower tests on land	https://energy.sandia.gov/energy/renewable-energy/wind-power/wind_plant_opt/scaled-wind-farm-technology-swift-facility/
Testing of Full-scale Turbines and/or Components						
	Wind Technology and Testing Center (Blades)	Boston MA	Massachusetts Clean Energy Center	Three test stands; accommodates blades to 90m; static and fatigue testing	Static strength testing and accelerated fatigue testing of turbine blades	https://www.masscec.com/wind-technology-testing-center
	Advanced Structures and Composites Center	Orono ME	U. of Maine	Test stand accommodates blades to 70m; static and fatigue testing	Static strength testing and accelerated fatigue testing of turbine blades	https://composites.umaine.edu/key-services/wind-blade-testing/
	Blade Test Facility	Potsdam NY	Clarkson U.	Test stand accommodates blades to 14m; static and fatigue testing	Scaled testing of blade materials and construction	https://www.clarkson.edu/btf
	National Wind Technology Test Center	Golden CO	National Renewable Energy Laboratory	Two test stands; accommodates blades to 19m; static and fatigue testing; 2.5 MW and 5.0 MW dynamometers with controllable grid interface	Blade sub-component validation tests; lubricant and gearbox component reliability testing	https://www.nrel.gov/nwtc/
	SCE&G Energy Innovation Center	Charleston SC	Clemson U.	15 MW and 7.5 MW dynamometers with off-axis force applicators; max specimen 13m diameter x 20 m length; 15 MW grid simulator for testing electrical characteristics	Complete (full scale) turbine nacelle or drivetrain components	https://clemsonenergy.com/wind-turbine-test-beds/
Full-scale structural testbed (substructures, towers, anchors)						
	Stress Engineering Services	Houston TX	Stress Engineering	130,000 sq. ft. offshore structures test lab with capacity of up to 26.7 MN in tension, 20.9 MN in compression 1356 KN-m bending; internal and external pressure and high and low temperature testing capabilities	Load and fatigue tests for evaluating performance of large structural components under offshore wind and sea-state conditions	https://www.stress.com/capabilities/testing-services/
	Multi-Axial Subassemblage Testing Laboratory (MAST)	Minneapolis MN	University of Minnesota	Structural testbed up to 20 feet x 20 feet in plan and 29 feet high; up to 1320 kips of vertical force and 880 kips of horizontal force in each lateral direction	Load and fatigue tests for evaluating performance of large structural components under offshore wind and sea-state conditions	http://nees.umn.edu/
	Newmark Structural Engineering Laboratory	Urbana IL	U. of Illinois	Structural testbed with three portable 6 degree-of-freedom loading units	Load and fatigue tests for evaluating performance of large structural components under offshore wind and sea-state conditions	https://www.ideals.illinois.edu/handle/2142/3519
Geotechnical Modeling						
	Center for Geotechnical Modeling	Davis CA	U.C. Davis	9 m radius centrifuge able to simulate an area 130 m long by 50 m wide with a soil depth of 50 m; shaking table; payload capacity of 1500 kg	Fluid soil/structure interaction analysis (testing of scale models under simulated conditions)	http://cgm.ucdavis.edu
	Geotechnical Centrifuge Research Center	Troy NY	Rensselaer Polytechnic Institute	3.0 m radius, 100 g-ton centrifuge with shaker	Fluid soil/structure interaction analysis (testing of scale models under simulated conditions)	http://homepages.rpi.edu/~dobryr/centrifuge2.html
	CIEST Geotechnical Centrifuge	Boulder CO	U. of Colorado	5.6 m radius 400 g-ton centrifuge	Fluid soil/structure interaction analysis (testing of scale models under simulated conditions)	https://www.colorado.edu/center/ciest/geotechnical-centrifuge

Facility Type	Facility Name	Location	Owner/ Operator	Brief Facility Description*	Type of Testing that could be Accommodated (facility upgrades may be required)	Website
Materials and Coatings Laboratory						
	Ice Adhesion Testing Facility	Hanover NH	U.S. Army Corps of Engineers	Range of capabilities for specimen testing of the adhesion of ice to various surfaces, and weathering tests to verify the durability of a broad range of coatings	Ensure compliance of coating systems with ice-shedding, corrosion, abrasion, and safety protection requirements	https://www.erdc.usace.army.mil/Media/Fact-Sheets/Fact-Sheet-Article-View/Article/518761/ice-adhesion-testing-facility
Atmospheric and Environmental Characterization						
	DOE Lidar Research Buoys	Deployable	Pacific Northwest National Laboratory	WindSentinel buoys with motion-compensated LIDAR for measurements of the wind profile to 200m above the sea surface, plus supplemental surface measurements of wind speed, wind direction, air temperature, humidity, ocean temperature, salinity, ocean current profiles, and wave height and direction.	Atmospheric and environmental characterization at specific sites of interest	https://wind.pnnl.gov/lidar/buoyloanprogram.asp
Seawater Testing						
	Marine Sciences Laboratory	Sequim WA	Pacific Northwest National Laboratory	Laboratory facilities and expertise in marine sciences and operations. Marine and hydrokinetic test facility.	Characterization of the offshore environment ; materials and corrosion testing in marine conditions	https://marine.pnnl.gov/
	SMAST-East Seawater Laboratory	New Bedford MA	UMass Dartmouth	Laboratory capabilities to replicate a variety of seawater conditions, including with live organisms	Evaluate test articles in a controlled setting; behavioral and physiological experiments on marine organisms to evaluate responses to environmental conditions and stimuli	https://www.umassd.edu/smast/about/facilities/
	SMAST Acoustic/Optic Test Tank	New Bedford MA	UMass Dartmouth	5.8 m deep 90,000-gallon tank, with more than one-half atmosphere in pressure difference from surface to bottom, supported on an array of neoprene shock absorbers	Testing and calibration of instrumentation packages and/or remotely-operated or autonomous vehicles	http://www.smast.umassd.edu/tank-time/

TABLE 3 - Potential Test Facilities Upgrades by Type

(Based solely on responses to DOE Request for Information 7/30/2018)

No prioritization or assessment of relative importance of upgrades is implied in the organization or presentation of information in this table

See Table 2 for a listing of facilities in each category

Category of Facility	Potential Facility Upgrade*	Rationale for Upgrade	Benefits to Industry
Hydrodynamic Facilities (basin or flume for physical model testing)			
	Enhance depth, current and or bimodal wave simulation capabilities	Truer representation of currents and multidirectional seas impacting turbine support structures; enhance overall calibration capabilities to match design sea state conditions	Greater certainty and risk reduction in design validation, particularly with regard to irregular waves and effects such as wave slamming and run-up
	Add wind simulation capabilities	Truer representation of the coupled dynamics that exist in offshore wind systems between the wind turbine, tower, substructure and moorings	Accelerate the development and validation of numerical tools for efficient analysis and design of offshore wind systems
	Upgrade data acquisition systems, including instrumentation	Ensure that methodology and sampling rates are sufficient to capture the desired results	Greater accuracy and fidelity of data
Hydrodynamic and Aerodynamic Facilities (basin or flume with wind simulation)			
	Enhance wind generation system	More accurate representation of hub height turbulence and shear, and directionality relative to waves; enhance overall wind field calibration capabilities to match design conditions	Greater certainty and risk reduction in design validation
	Enhance sophistication of test models to better replicate operating characteristics of full-scale wind turbine systems	Add simulation of active blade pitch control in order to sustain the target aerodynamic thrust being tested under operational conditions	Greater certainty and risk reduction in design validation
		Add replication of major events such as start-up, emergency stop, and faults to simulate critical design loads	Greater certainty and risk reduction in design validation
		Ensure that Eigen frequencies (flexural properties) of tower and support structure can be replicated in order to avoid resonant structural responses	Greater certainty and risk reduction in design validation

Category of Facility	Potential Facility Upgrade*	Rationale for Upgrade	Benefits to Industry
	Expansion of wind flow instrumentation and visualization techniques to enable more advanced studies of the wind field	Facilitate testing of multiple turbines to understand and quantify wake interaction for floating offshore wind turbines	Improved power production in large arrays
	Upgrade data acquisition systems, including instrumentation	Ensure that methodology and sampling rates are sufficient to capture the desired results	Greater accuracy and fidelity of data
Facilities for Testing of Full-scale Turbines and Components			
	Increase dynamometer capacity to accommodate 12 - 20 MW drive systems	Accommodate next generation(s) of offshore turbines	Risk reduction and design optimization of innovative technologies; development of innovative full turbine testing tools and methods
	Add or increase blade test stand capacity to accommodate 100 to 130m blades for turbines up to 15 MW capacity	Accommodate next generation(s) of offshore turbines; development of new techniques such as dual-axis testing of long blades; and methods of testing segmented blades	Risk reduction and design optimization of innovative technologies; development of innovative full turbine testing tools and methods
	Increase blade test facility capability to carryout validation testing of components of ultra long blades such as spars, studs, laminate structures	Ultra long (>90M) blades will require subsection and materials testing prior to design completion; and to limit time needed on full length test stand	Risk reduction for financing and insurance; increased component life
	Increase bearing test stand capacity to accommodate hub/pitch systems, including bearings, for 10+MW turbines	Enable testing of ultra-large bearings for next generation(s) of offshore turbines	Risk reduction and design optimization of innovative technologies; development of innovative full turbine testing tools and methods
Geotechnical Modeling Facilities			
	Increase the capabilities of facilities for testing soil and structure interaction, such as large-scale centrifuges and shake tables, to match the specific needs of offshore wind structure modeling testing and data processing	Enable large-scale 1-g fatigue and ultimate strength tests on a variety of offshore support structures, and evaluate installation and anchoring approaches	Optimize foundation designs to lower fatigue loads while reducing fabrication and installation costs

Category of Facility	Potential Facility Upgrade*	Rationale for Upgrade	Benefits to Industry
Simulation Testbed for Intermediate-scale Turbines and Structures			
	Create land-based floating wind simulator by adding movable base to intermediate-scale test turbine	Utilize controlled environment to validate simulations of the aerodynamic effects of coupled wind/wave effects, and test control methodologies	Data to help bridge the uncertainty gap between basin-scale models and full-scale prototypes
Seawater Testing Laboratory			
	Add large recirculating flume tank to seawater research facility	Facilitate development and testing of underwater vehicles; observe fish behavior; investigate oceanographic characteristics such as the dynamics of mixing and turbulence	Increase scientific knowledge of the offshore operating environment and enable design and testing of instruments and tools to function in that environment

*Certain facilities listed in Table 2 already have the capabilities that would be gained through the potential upgrades listed here

TABLE 4 - Potential New Facilities for Offshore Wind Testing in the U.S. (Based solely on responses to DOE Request for Information 7/30/2018) No prioritization or assessment of relative importance of new facilities is implied in the organization or presentation of information in this table			
Applicable Test Category	New Facility Type	Rationale for Facility	Benefits to Industry
Hydrodynamic Performance Testing of Structures (under simulated conditions)			
	Very large wave flume	Provide capabilities for testing large foundation components under various hydrodynamic conditions and seabed soil types	Aid engineers and developers in the selection of foundation and anchorage types, optimization of designs, validation of models, and testing of structural health monitoring systems
Testing of Intermediate-scale Turbines and Structures (e.g. 1/4 scale prototypes)			
	Intermediate scale floating structures test bed	A fully characterized turbine testbed with grid connection in a sheltered marine environment would allow more accurate assessment of turbine/structure operations and performance and control parameters than at the scale of a wave basin or wind tunnel	Lower risks, uncertainty and costs of design validation compared to transitioning directly from small models to full-scale turbine/platform tests in development of the next generation of turbines and support structures
Testing of Full-scale Turbines and Components			
	Port-side knowledge, innovation, testing and logistics center	Provide state-of-the-art port-side facilities for collaborative testing and validation of offshore wind components, equipment, materials, processes, and logistics. Include capabilities for full-scale tests of large structural members	Shared, mutually beneficial facilities, data and innovations; aid developers in selecting foundation types, and optimizing designs and operating strategies
	Floating offshore wind test center	Testbed for full-scale testing of floating platforms and componentry including dynamic moorings, anchoring systems and cables	Available "suitable for purpose" testing infrastructure, data acquisition systems and protocols. Decrease risk, uncertainty and cost of designs and hardware
		Test site for offshore wind integrated with storage technologies such as ocean-based hydrogen electrolyzers and compressed-air storage and recovery	Enhance the energy export potential of floating offshore wind technology designs
	Full-scale test and certification site for offshore-scale turbines	Full-scale turbine testing and performance validation is required for type certification. Testing at commercial wind project sites is problematic	A U.S. test facility would encourage development of turbines optimized for U.S. conditions and utilizing components from U.S. suppliers
	Large bearing test facility	No U.S. test facilities can accommodate testing of pitch, yaw and main shaft bearings of the scale required for 10 + MW turbines	Risk reduction; increased potential for U.S. supply chain
	Large-scale facility for studying soil-foundation-fluid interaction	Study hydro-geo-structural interactions in large "pit" facility up to 15m deep and 50m in diameter, with a "strong wall" and capacity to hold water for simulation of a subsea environment	Aid developers in the selection of foundation types, optimization of designs, validation of models, testing of structural health monitoring systems and installation strategies
	Subsea electrical cable fatigue testbed	Carry out research on long-term performance of subsea cables and provide test bed for developing cable innovations	Improve cable efficiency and resilience, avoid expensive failures, better understanding of practical operating life
Materials and Coatings Validation			
	Centralized national-scale capabilities for testing coatings to wind industry standards, including accredited leading edge erosion test facility	Current capabilities and knowledge are not centralized or optimized for wind industry requirements. Capabilities are needed to evaluate leading edge and blade tip material and coatings in a controlled environment through material modeling, characterization and testing	Coatings that extend the service life of turbines by resisting corrosion or enhancing the efficiency of blades by resisting ice formation or erosion help avoid degradation of energy output and increases in maintenance costs
	Material characterization and fatigue testing facility	Enable testing of candidate materials in a uniaxial/biaxial testbed with very high-cycle fatigue loading capabilities, within a controlled environment chamber	Existing state-of-the-art and related test practices need to be improved to accommodate the variety of potential new design solutions, and the sensitivity of material performance to structural details

Table 4 - Potential New Test Facilities

Applicable Test Category	New Facility Type	Rationale for Facility	Benefits to Industry
Atmospheric and Environmental Characterization			
	Add data capture from multiple LIDARs at a commercial offshore wind project	Map wind characteristics, turbine wakes and array-level effects for comparison with pre-installation data and assumptions	Risk reduction, better understanding of offshore wind characteristics and array effects
	Test bed for development and demonstration of Doppler-based remote monitoring technologies	Neutral test site for hub height validation of specific technologies and approaches	Develop innovative methods for wind power resource and site characterization to increase accuracy, reduce siting costs, and inform installation planning
Data Collection at Full-scale Offshore Wind Plants			
	Standardized instrumentation package for data collection at offshore wind sites	A campaign or virtual facility utilizing a common set of instrumentation, software and protocols for a broad set of measurement parameters in order to facilitate gathering of critical data at the first U.S. offshore projects	Field data from the initial U.S. offshore projects, gathered and disseminated in a manner that protects confidentiality while benefiting the entire industry, is critical to risk and cost reduction through verifying design assumptions and better characterizing the operating environment

Table 4 - Potential New Test Facilities

APPENDIX H – GUIDELINES FOR TALL TOWER COST ESTIMATES

Levelized Cost of Energy (LCOE) is commonly used as a metric to objectively assess the value of wind plant innovations and technologies over the entire project lifecycle (i.e. component production, assembly & installation, operations & maintenance, and decommissioning costs). The entire integrated system and lifecycle costs should be considered because focusing on one particular sub-system alone may yield an incomplete analysis and inaccurate system LCOE conclusions. For example, increasing a turbine's hub height may increase costs for systems such as tower, foundation, turbine installation, etc. but may still be a worthwhile due to the increase in energy production, resulting in an overall LCOE reduction.

For the analysis required under AOI 4 of this FOA, DOE has provided a baseline 5-MW “near future” turbine that includes innovation in the drivetrain and rotor systems but assumes a conservative tower. This case was selected to enable applicants to highlight the impact of their innovations in the context of the turbines in which they are likely to ultimately be employed. Tables below include detailed cost (Table 1) and mass (Table 2) assumptions necessary to complete the required LCOE analysis. The power curve for the baseline turbine (Figure 1, Table 3) is also provided. In more detail:

- **Applicants are required to provide plant-level LCOE analysis of their proposed tower technologies employed in the 5 MW turbine outlined below, in comparison with the baseline 5 MW configuration including the baseline tower.**
- Applicants should conduct their analysis consistent with the fixed charge rate method described in NREL's 2017 *Cost of Wind Energy Review*, available here: <https://www.nrel.gov/docs/fy18osti/72167.pdf>.
- DOE suggests using the NREL's System Advisor Model (SAM), available at <https://sam.nrel.gov>, to conduct this LCOE analysis. If applicants prefer to use their own or third party tools, they should provide thorough documentation of their calculations.
- In the provided 5MW case, component installation and transportation costs are assigned by turbine component rather than accounted for under balance of station costs. Therefore, applicants proposing innovations that will reduce tower transportation or installation costs should allocate those cost savings to tower costs rather than to balance of plant or another category.
- **Applicants should hold all non-tower costs constant in their comparison case.** If the proposed innovation is likely to lead to cost reductions in other turbine or plant cost categories, applicants may provide an additional comparison case (or cases) including those innovations. The guidance above regarding the allocation and installation costs applies (e.g. if the applicant's proposed tower innovations will also reduce rotor installation costs, those installation cost savings should be allocated to rotor costs, rather than balance of plant).
- **Applicants should provide details on cost information and document all assumptions that are not provided in table 1 below.**
- All costs should be provided in constant year dollars.
- As alluded to in the technical review criteria, applications will be evaluated on the fidelity and clarity of their cost estimates to assess knowledge of the proposed innovation's strengths and limitations. **Rigorous and well documented assumptions—particularly associated with any changes in the assumptions provided below—are as important as the provided costs themselves.**

Questions about this FOA? Email FY19WETOFOA@ee.doe.gov.

Problems with EERE Exchange? Email EERE-ExchangeSupport@hq.doe.gov Include FOA name & number in subject line.

**List of Cost Assumptions for FOA 2017 5 MW Baseline
Turbine for LCOE Analysis**

Assumption	Units	Value
Wind plant characteristics		
Wind plant capacity	MW	200
Number of turbines		40
Turbine rating	MW	5
Rotor diameter	m	167
Hub height	m	140
Specific power	W/m ²	227
Cut-in wind speed	m/s	3
Cut-out wind speed	m/s	25
Annual average wind speed at 50 meters	m/s	7.25
Annual average wind speed at hub height	m/s	8.40
Weibull k factor		2.0
Shear exponent		0.143
Turbine elevation above sea level	m	450
Losses	%	15%
Availability	%	98%
Net energy capture	MWh/M W/yr	3,963
Net capacity factor	%	45.2%
Capital Expenditures (CapEx)		
Total CapEx	\$/kW	1,227
Turbine	\$/kW	862
Rotor module (includes transport and installation)	\$/kW	90
Nacelle module (includes transport and installation)	\$/kW	390
Tower module (includes transport and installation)	\$/kW	382
Balance of system	\$/kW	243
Soft Costs	\$/kW	122
Operations and Maintenance Expenditures (OpEx)		
Total OpEx	\$/kW/year	40
Financials		
Project design life	Years	25
Tax Rate (combined state and federal)	%	27%
Federal	%	21%
State	%	7.5%
Inflation rate	%	2.5%
Interest during construction (nominal)	%	8.0%

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Construction finance factor	%	105%
Debt fraction	%	46%
Debt interest rate (nominal)	%	4.1%
Return on equity (nominal)	%	12.0%
WACC (nominal; after-tax)	%	7.8%
WACC (real; after-tax)	%	5.2%
Capital recovery factor (nominal; after-tax)	%	9.2%
Capital recovery factor (real; after-tax)	%	7.2%
Depreciable basis	%	100%
Depreciation schedule	5-year MACRS	5-year MACRS
Depreciation adjustment (NPV)	%	81%
Project finance factor	%	107%
FCR (nominal)	%	9.9%
FCR (real)	%	7.7%
Levelized cost of energy	\$/MWh	34

Table 1. List of Cost Assumptions for FOA 2017 LCOE analysis - 5 MW Baseline Turbine

Assumption	Units	Value
Wind plant characteristics		
Wind plant capacity	MW	200
Number of turbines		40
Turbine rating	MW	5
Rotor diameter	m	167
Hub height	m	140
Specific power	W/m ²	227
Cut-in wind speed	m/s	3
Cut-out wind speed	m/s	25
Maximum Cp		0.47
Tip speed ratio		8
Maximum tip speed	m/s	80
Annual average wind speed at 50 meters	m/s	7.25
Annual average wind speed at hub height	m/s	8.40
Weibull k factor		2.0
Shear exponent		0.143
Turbine elevation above sea level	m	450
Losses	%	15%
Availability	%	98%
Net energy capture	MWh/MW/yr	3,963

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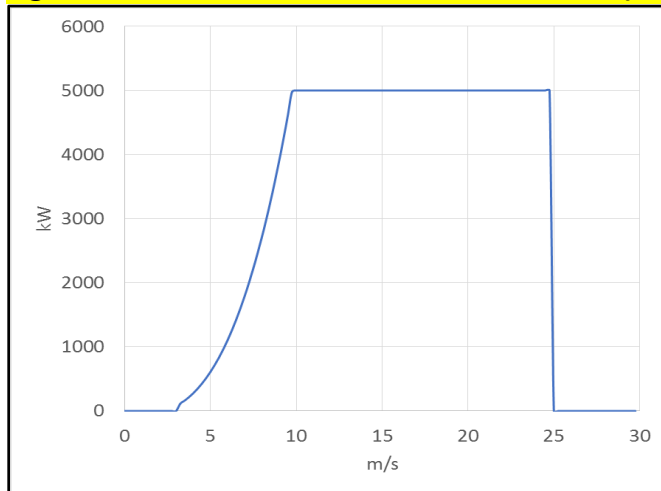
Net capacity factor	%	45.2%
CapEx		
Total CapEx	\$/kW	1,227
Turbine	\$/kW	862
Rotor module (includes transport and installation)	\$/kW	90
Nacelle module (includes transport and installation)	\$/kW	390
Tower module (includes transport and installation)	\$/kW	382
Balance of system	\$/kW	243
Soft Costs	\$/kW	122
OpEx		
Total OpEx	\$/kW/year	40
Financials		
Project design life	Years	25
Tax Rate (combined state and federal)	%	27%
Federal	%	21%
State	%	7.5%
Dollar year	Year	2019
Inflation rate	%	2.5%
Interest during construction (nominal)	%	8.0%
Construction finance factor	%	104%
Debt fraction	%	65%
Debt interest rate (nominal)	%	4.1%
Return on equity (nominal)	%	12.0%
WACC (nominal; after-tax)	%	6.15%
WACC (real; after-tax)	%	3.56%
Capital recovery factor (nominal; after-tax)	%	7.93%
Capital recovery factor (real; after-tax)	%	6.10%
Depreciable basis	%	100%
Depreciation schedule	5-year MACRS	5 year MACRS
Depreciation adjustment (NPV)	%	85.0%
Project finance factor	%	106%
FCR (nominal)	%	8.37%
FCR (real)	%	6.44%
Levelized cost of energy	\$/MWh	30

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Table 2. Single Turbine Mass Assumptions for FOA 2071 5 MW Baseline

Assumption	Units	Value
Turbine	kg	841,602
Rotor module (blades only)	kg	35,880
Nacelle module (including pitch and hub assemblies)	kg	180,322
Tower module	kg	625,400

Figure 1. 5 MW Baseline Turbine Power Curve (see Table 3 for tabular form)

Table 3. 5 MW Baseline Turbine Power Curve

Wind Speed (m/s)	Power Output (kW)	Wind Speed (m/s)	Power Output (kW)	Wind Speed (m/s)	Power Output (kW)
0	0	9.25	4239.97	18.5	5000
0.25	0	9.5	4599.08	18.75	5000
0.5	0	9.75	4977.6	19	5000
0.75	0	10	5000	19.25	5000
1	0	10.25	5000	19.5	5000
1.25	0	10.5	5000	19.75	5000
1.5	0	10.75	5000	20	5000
1.75	0	11	5000	20.25	5000
2	0	11.25	5000	20.5	5000
2.25	0	11.5	5000	20.75	5000
2.5	0	11.75	5000	21	5000
2.75	0	12	5000	21.25	5000
3	0	12.25	5000	21.5	5000
3.25	115.527	12.5	5000	21.75	5000
3.5	162.087	12.75	5000	22	5000
3.75	215.796	13	5000	22.25	5000
4	277.165	13.25	5000	22.5	5000

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4.25	346.706	13.5	5000	22.75	5000
4.5	424.929	13.75	5000	23	5000
4.75	512.344	14	5000	23.25	5000
5	609.463	14.25	5000	23.5	5000
5.25	716.796	14.5	5000	23.75	5000
5.5	834.853	14.75	5000	24	5000
5.75	964.147	15	5000	24.25	5000
6	1105.19	15.25	5000	24.5	5000
6.25	1258.48	15.5	5000	24.75	5000
6.5	1424.55	15.75	5000	25	0
6.75	1603.89	16	5000	25.25	0
7	1797.02	16.25	5000	25.5	0
7.25	2004.45	16.5	5000	25.75	0
7.5	2226.69	16.75	5000	26	0
7.75	2464.25	17	5000	26.25	0
8	2717.65	17.25	5000	26.5	0
8.25	2987.38	17.5	5000	26.75	0
8.5	3273.97	17.75	5000	27	0
8.75	3577.93	18	5000	27.25	0
9	3899.76	18.25	5000	27.5	0

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