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

Marine and Hydrokinetic Technology Development and Advancement

Funding Opportunity Announcement (FOA) Number: DE-FOA-0001663
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FOA Issue Date:	12/15/2016
Informational Webinar:	12/20/2016, 2:00pm ET
Submission Deadline for Concept Papers:	01/17/2017, 5:00pm ET
Submission Deadline for Full Applications:	03/01/2017, 5:00pm ET
Expected Submission Deadline for Replies to Reviewer Comments:	04/13/2017, 5:00pm ET
Expected Date for EERE Selection Notifications:	June 2017
Expected Timeframe for Award Negotiations	June – August 2017

- Applicants must submit a Concept Paper by 5:00pm ET 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 Funding Opportunity Announcement are highlighted in the body of the FOA.

Mod. No.	Date	Description of Modification
0001	1/10/2017	Appendix E – Text modified to provide Manufactured Material Costs (MMC) for structures requiring low and high level of effort, where structures warranting low or high MMC as described in the final table in Appendix E.

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I. Funding Opportunity Description

A. Description/Background

The mission of the Department of Energy (DOE) Water Power Technologies Office (WPTO) is to support research, testing, and development of innovative technologies capable of generating renewable, environmentally responsible and cost-effective electricity from U.S. water resources. These include marine and hydrokinetic (MHK) technologies that harness the energy from waves and ocean/tidal/river currents. The MHK sub-program (The Program) of the WPTO has the opportunity to focus on the technologies that can be deployed in early-adopter markets (i.e., wave and current resources with high energy costs) in the near-term while supporting next generation technologies that have the potential to be cost competitive with other energy generation technologies in large utility scale markets in the longer term. This Funding Opportunity Announcement (FOA) targets technologies aiming for economic competitiveness in either early-adopter or large utility scale markets. This FOA announces DOE's intent to support MHK research and development projects in two Topic Areas: (1) system advancement and sub-scale testing of high energy capture wave energy converters (WECs), and (2) open topic on MHK technology development.

Topic Area 1: Wave Energy Converters System Advancement

The goal of this Topic Area is to advance the design of wave energy converters from prototypes to full systems, resulting in reduced risk and increased certainty of the techno-economic potential of the full system. Objectives include:

- maintain high energy capture performance
- refine understanding and predictability of system dynamics in order to facilitate future full scale design
- quantify cost to better estimate Levelized Cost of Energy (LCOE) at full scale
- gain operational and maintenance experience including reliability, maintainability, and availability.

Successful awardees will design and build high energy capture WECs and conduct testing of a scaled system in open water (e.g., at $1/10^{th}$ to $1/4^{th}$ scale). The scaled system should function to capture wave energy and convert to electricity using subsystems representative of those that would be used in the full scale to perform the same functions. There are a large number of MHK systems being developed, and they are at varying levels of technology performance. The focus of this Topic Area is to advance the system readiness of those technologies which have the greatest potential to compete with other energy generation technologies in the longer term.

The Program anticipates selecting two awards, up to $5M total DOE share per award, each separated into two budget periods (BPs). The applicant may propose the exact split in each budget period, provided that BP1 does not exceed $2.5M DOE share and the total DOE share per award does not exceed $5M. The number of applications will be restricted to one (1) application per applying entity for this Topic Area.

- **Budget Period 1 - Full System Design (up to 18 Months):** Up to $2.5M DOE share per award with minimum 20% additional Cost Share required
- **Budget Period 2 - Test (up to 24 Months):** Up to the remainder of the DOE share (so that the total DOE share does not exceed $5M) with minimum 20% additional Cost Share required

Topic Area 2: Open Topic – MHK Technology Development

The objective of this Topic Area is to develop innovative technologies that have the potential to significantly advance MHK technologies and the state of the MHK industry. The MHK industry has a broad range of concepts for MHK components and systems with varying levels of maturity, and this Topic Area is intended to be open so that applicants can propose activities which address the needs that are most important to their present technology development. The WPTO specifically encourages applications in the areas of wave energy or tidal, river in-stream, or ocean current energy. The focus of this Topic Area is specifically on technology development and is not seeking applications that propose to address environmental/social barriers to deployment. Proposed activities should be relevant to an MHK system development pathway. Accordingly, whether focused at component-level or system-level technology advancement, the applicant should demonstrate that there is a market opportunity and a commercialization plan to bring the technology to market. In addition, the onus will be on the applicant to express the impact to the MHK industry, in terms of reducing cost, from the specific technology proposed. Furthermore, the number of applications will be restricted to one (1) application per applying entity for this Topic Area.

The Program anticipates selecting up to four awards, ranging from $500k - $1M DOE share, with minimum 20% additional Cost Share required. The duration of the project should be proposed by the applicant, though not exceed 24 months.

B. Topic Areas/Technical Areas of Interest

There are two Topic Areas proposed for this FOA. The number of applications will be restricted to one (1) application per applying entity for each Topic Area.

Topic Area 1: Wave Energy Converters System Advancement

This Topic Area is targeted to advance WEC concepts that have previously shown high energy capture potential, and supports the next step to complete detailed design of the full system and system testing in the open water to progress along the pathway towards commercial readiness. This Topic Area does not seek applications to initiate completely new concept designs for high energy capture. During the design process, further innovation will be required to ensure high energy capture of the system is maintained as it is scaled up, and sub-systems are integrated to assemble the device and function as a system. The goal at the end of the award period is to advance the design from device prototype to full system, resulting in reduced risk and increased certainty of the techno-economic potential of the full system.

Pre-award Information

Applicants should establish their level of preparedness and high techno-economic potential. The application must demonstrate that preliminary structural design, numerical modeling, and wave tank testing has been completed. This will ensure that the system is ready for Budget Period 1 design activities. Table 1 (later in this section) provides more information on the scope and requirements of Topic Area 1 (TA 1) awards.

At early stages of technology development, it is difficult to estimate LCOE, and proxies for cost of energy are commonly used in place of LCOE. This Topic Area will use the metric "Average Climate Capture Width per Characteristic Capital Expenditure", referred to as ACE, which is a benefit to cost ratio proxy for LCOE appropriate for evaluating early stage WEC designs. The two components that make up the ratio ACE are:

- Average Climate Capture Width (ACCW) = a measure of the effectiveness of a WEC at absorbing power from the incident wave energy field, measured in meters [m]; the term 'capture width' may be interpreted as the width of a wave crest that has been completely captured and absorbed by a WEC
- Characteristic Capital Expenditure (CCE) = a measure of the capital expenditure in commercial production of the load bearing device structure, in millions of dollars [$M]

ACE is defined as the ratio of ACCW to CCE, in units of [m/$M], and detailed descriptions of these variables are defined in Appendix E. At the time of application, systems must meet or exceed an ACE threshold of 3 m/$M calculated for a representative United States (U.S.) wave climate, which is specified and defined in Appendix E. Applicants must submit their ACE calculation and provide justification

(supporting documentation) to their ACE calculation. A Template Spreadsheet, available on EERE Exchange, has been provided to help applicants with the ACE calculation. Though not required, WPTO encourages applicants to submit their ACE calculation in this template format. Applicants must also submit an ACE Supporting Documentation file at the time of application that details the inputs to the ACE calculation, and justifies all values used for calculation of ACE for the particular WEC design (see Appendix E).

The ACE Supporting Documentation file must include numerical modeling and/or tank test results to support the calculation of ACCW.

If modeling results are used, the following guidelines should be followed:

- numerically model the device at full-scale
- calculate the device power matrices with a time-domain numerical simulation
- a time series should be produced using the Bretschneider spectrum for each sea state; this time series serves as the input to device performance codes to produce power output at the specified sea state
- use time series with a length of at least $200T_p$ (where T_p is peak wave period)
- document additional modeling parameters (e.g., time step used, the selection of viscous damping coefficient and mooring configuration, dimensions of device etc.) in the ACE Supporting Documentation file
- describe the numerical model and any model validation efforts to provide confidence that modeled predictions are accurate

For reference, although the open source WEC performance code WEC-Sim is not required to be used, it is available at http://wec-sim.github.io/WEC-Sim/. The code also includes the ability to create a wave time series from a sea state using Bretschneider spectrum.

If tank test data is used to support the calculation of ACCW at the time of application, tank test setup and scaling details must be documented clearly in the ACE Supporting Documentation file. For example, the documentation should include (but is not limited to):

- details on the test facility (e.g., size, capabilities),
- the test setup (including details of the scaled physical model device, Froude scaling overview, mooring setup, and measurement setup),
- instrumentation and data channel list,
- calibration sheets and data.

Details on full scale concept of the device structure (size, including surface area and representative thickness, material types, and density), as well as device drawings

must be included in the ACE Supporting Documentation file to support calculation of CCE. Typical manufactured material costs (MMC) are provided in Appendix E, and the applicant should justify the use of these typical values for their full scale device concept, or increase the cost accordingly if higher tolerances and/or manufacturing requirements would be needed. If other materials than those provided in Appendix E are used, the MMC should be justified clearly.

Budget Period 1 (up to 18 Months)

The following is a general overview of the scope of activity in Budget Period 1 (BP1). For a full listing of expected tasks, and required deliverables for BP1, see Table 1. Activities will begin with an existing high energy capture performance design concept where numerical modeling has been completed and tank testing has been conducted prior to application in order to validate the design concept and predictions of its performance. Applicants should propose to conduct the tasks required to progress the device concept design to a full system design during BP1. For example, pre-requisite tank testing may have been conducted at small scale where some component capabilities were likely not included, such as electric power generation by the power take-off (PTO), station keeping representative of full scale system, implementation of any device configuration changes (e.g. adjusting for different sea states), power electronics, storage and conditioning, on board data acquisition systems, etc. Therefore, the final design will be completed in BP1 to prepare for BP2 procurement, fabrication, and assembly of the scaled system that will be tested in open water. This scaled system must be capable of capturing wave energy and converting it to electricity using subsystems representative of those that would be used in the full scale to perform the same functions. The physical scale of the system to be tested in open water is assumed to be 1/10th to 1/4th scale (where the wave climate is assumed to be at 1/10th to 1/4th scale as well); however, the scale should be proposed and justified by the applicant in order to meet the Topic Area goal and objectives. In order to mitigate the risk associated with the open water testing, laboratory testing of some sub-systems under relevant conditions (motions, forces, as expected when integrated in system) is necessary. Small scale benchtop testing may be sufficient, rather than testing the actual component or sub-system that will be used for the open water test, however the applicant should justify which items should be tested as well as the scale and approach that is proposed. Permitting and National Environmental Policy Act (NEPA) activities will be initiated in BP1 as appropriate to prepare for procurement and fabrication and deployment activities that will begin in BP2. NEPA activities could include preparation of a Biological Assessment and/or Environmental Assessment.

BP1 will conclude with the delivery of the full system design with all critical components integrated in the system. Upon finalizing the design, a go/no-go

decision will be made to confirm full system energy capture performance meets the ACE target identified in the application (maintaining a minimum ACE value of 3 m/$M or greater) and determine if the awardee is ready to begin activities for prototype device build and test in open water via review of critical BP1 planning deliverables (such as build plan, installation plan, permitting plan). Independent expertise will be leveraged to review awardee's calculation of ACE in the BP1 go/no-go process prior to moving into BP2. Applicants must describe in their applications how they plan to share data with the independent evaluators. Contracts between the National Labs and DOE contain nondisclosure provisions that require the Labs to not disclose certain data provided to them by third parties. If an awardee nevertheless wishes to sign an additional nondisclosure agreement with the Lab, the negotiation should be set forth as a subtask in the Statement of Project Objectives, and the timeframe for negotiation must not exceed 60 days after the award is made.

Budget Period 2 (up to 24 Months)

The following is a general overview of the scope of activity in Budget Period 2 (BP2). For a full listing of expected tasks, and required deliverables for BP2, see Table 1. Prototype fabrication, assembly, and testing of the scaled system will prove performance as well as provide key results that enable modeling of full-scale cost characteristics (e.g., Capital Expenditure (CAPEX), Operational Expenditure (OPEX), energy produced, and reliability) to calculate LCOE. System performance must be measured to calculate ACE and in order to baseline reliability, maintainability, availability, and any other necessary measures to reduce risk of the proposed technology. The target energy capture performance is to maintain the aggressive ACE value that was established at the beginning of BP1, while not dropping below the minimum threshold of 3 m/$M. Relevant metrics for baselining reliability, maintainability, and availability performance of the system must be defined by the applicant. Detailed plans for performance measurement (including a listing of the required suite of sensors) and data acquisition will be required.

For the sub-scale testing in BP2, selection of a site with a wave climate that matches applicant justified appropriate scale is required. For example, for testing at 1/10th to 1/4th scale, applicants may propose partially sheltered locations and open water sites with wave climates that are relatively benign and represent a scaled wave climate appropriate for the scale of device being tested. The applicant should propose length of in water testing for BP2, with a minimum duration of 6 months of operation, and provide justification this is adequate to sufficiently populate a power matrix at the scale tested.

Budget Period 2 activities will commence with procurement and system fabrication. Checkout and readiness testing of the PTO and other sub-systems should be

conducted to the extent appropriate to reduce deployment risk. NEPA and other permitting activities will be completed in BP2 prior to deployment. The system will be installed upon obtaining a final NEPA determination and final permits.

The BP2 budget should plan for all maintenance and repair required to operate the device for the minimum test duration.

Finally, decommissioning will be completed in accordance with permitting requirements; and transportation and storage of the device should be accounted for.

BP2 concludes with final reporting to demonstrate the project goal (reduced risk and increased certainty of the techno-economic potential of the full system) was met and delivery of results on each of the project objectives:

- maintain high energy capture performance,
- refine understanding and predictability of system dynamics in order to facilitate future full scale design,
- quantify cost to better estimate LCOE at full scale,
- gain operational and maintenance experience including reliability, maintainability, and availability.

For Topic Area 1, DOE encourages applicants to perform all work within the U.S., and DOE may consider the percentage of work performed in the U.S. when making funding decisions. DOE will consider applications that propose to perform testing activities at international testing centers that provide infrastructure, pre-permitted test berths, and logistical support that maximize project value to the applicant and DOE. Note, however, that the applicant must justify why the work scope cannot be performed within the U.S. Section IV.J and Appendix C provide more detail and requirements for applications that propose work outside of the U.S.

Tasks, Deliverables, and Duration

Table 1 describes requirements for the tasks, deliverables, and duration of each budget period. The specific tasks, schedule, deliverables, and budget should be proposed and justified by the applicant, while staying within the requirements detailed in Table 1. Note that no system procurement, fabrication, or deployment activities may take place during BP1, however benchtop subsystem testing is allowable.

Table 1. TA 1 project tasks and deliverables requirements

	Tasks to be Performed	Minimum required deliverables	Duration
BP1: Full System Design	• Develop detailed WEC system design including design of all components required for the system to function to capture wave energy and convert it to electricity and design for system integration • Laboratory testing of any components/subsystems requiring derisking (e.g. the PTO under relevant conditions) • Conduct numerical modeling to predict performance at open water test location and confirm final design ACE value • Develop a system fabrication plan with defensible cost estimates (e.g., cost estimates supported with quotes) and assembly plan • Develop a preliminary IO&M plan (including securing access to required infrastructure, e.g. ships and ports) and testing plan (including measures to baseline system against applicant defined key performance metrics for reliability maintainability and availability at a minimum) • Develop a risk management plan • Confirm open water test location and perform necessary site and resource characterization tasks • Establish contact with all necessary state and federal permitting and regulatory bodies, develop a plan to obtain required permits and comply with relevant regulations, and begin required permitting processes	• Project management plan • Report describing the final system design with system integration plan • Component and subsystems test and verification report • Updated performance predictions from numerical simulations • Updated ACE metric with supporting calculation (See Appendix E) • System fabrication and assembly plan • Preliminary IO&M and testing plan • Risk management plan and risk register • Permitting status report and BP2 permitting plan • Project data uploaded to the MHK Data Repository (mhkdr.openei.org) – see Appendix D • Complete system overview and component overview content models	Proposed by applicant, maximum of 18 months
Go/No-Go 1	Participate in go/no-go meeting Decision criteria will include but are not limited to: • Satisfactory completion of BP1 work scope and deliverables • Degree to which the recipient's target ACE metric is maintained, while staying above the minimum threshold of 3m/$M • Likelihood that the project can be completed on schedule and budget in BP2		2 months, will take place during BP 1 to ensure project continuity
BP2: Fabrication, Deploy, Test, and Decommission	• Finalize IO&M and testing plan • Complete system procurement, fabrication, and assembly • Checkout and testing of the PTO and other sub-systems as necessary • Obtain required permits • Deploy the system at the test location • Conduct activities required for regulatory compliance • Test the system and gather system performance data for at least 6 months • Perform a detailed analysis of experimental measurements • Recover and decommission system	• Updated risk management plan and risk register • Pre-commissioning (including onsite checkout and testing procedures pre deployment) plan • Final IO&M and testing plan • System performance baseline according to applicant defined key metrics for reliability maintainability and availability at a minimum • Updated ACE calculation based on field test data (See Appendix E) • LCOE reporting according to DOE guidance for system http://en.openei.org/community/document/mhk-lcoe-reporting-guidance-draft and LCOE content model • Final report describing project progress, IO&M, testing activities, and decommissioning activities, system performance (energy capture, reliability, maintainability, availability, LCOE), lessons learned, opportunities identified for improving LCOE before advancing to full scale, and next steps in technology development and commercialization • Final report for immediate public release • Upload comprehensive project data to the MHK Data Repository (mhkdr.openei.org) – see Appendix D • Updated system overview and component overview content models, and complete LCOE content models • Upload completed WEC field testing content model monthly	Proposed by applicant, maximum of 24 months
Total			Maximum of 42 months

Topic Area 2: Open Topic – MHK Technology Development

The MHK industry has a full range of systems at varying levels of maturity, and this Topic Area is intended to be open so that applicants can propose activities which address the needs that are most important to their present technology development. The WPTO specifically encourages applications in the areas of wave energy or tidal, river in-stream, or ocean current energy. The focus of this Topic Area is specifically on technology development and is not seeking applications that propose to address environmental/social barriers to deployment. Proposed technologies should advance the state of the industry and address a challenge or opportunity described in the MHK technology assessment section of the 2015 DOE Quadrennial Technology Review (see the following link for more information: http://energy.gov/sites/prod/files/2015/12/f27/QTR2015-4N-Marine-and-Hydrokinetic-Power.pdf). Applicants should propose technologies that are currently in a Technology Readiness Level (TRL) stage of 3-6 and propose research and development that will advance their technology to a TRL 5-8 stage. Each application is required to describe, and provide evidence of, the current stage of readiness of their technology. Please refer to the DOE Technology Readiness Assessment Guide (https://www.directives.doe.gov/directives-documents/400-series/0413.3-EGuide-04-admchg1) for further information on TRLs and descriptions of each level.

The WPTO particularly encourages submissions that augment the WPTO's existing portfolio (i.e. ideas that didn't fit, and/or have not been submitted to prior program Small Business Innovation Research (SBIRs) solicitations and FOAs – see former funding announcements list on water.energy.gov site at http://energy.gov/eere/water/water-power-closed-funding-opportunities) and that will benefit multiple MHK device types. The following technology development subtopics are of particular interest:

- Energy Conversion Devices
- Device components
- Instrumentation systems
- Components for energy transfer to shore
- Mooring or anchoring systems

Other technologies may be proposed that fall outside of these subtopics of particular interest. As an open topic, the onus will be on the applicant to express the impact to the MHK industry from the specific technology proposed.

Specific tasks and deliverables requirements will be negotiated with selected applicants. As applicable, DOE anticipates deliverables to include, though not be limited to, the following:

- Project Management Plan

- Performance predictions from numerical simulations
- Risk management plan and risk register
- LCOE reporting according to DOE guidance for system http://en.openei.org/community/document/mhk-lcoe-reporting-guidance-draft and LCOE content model
- Final report describing project progress, system/component performance (energy capture, reliability, maintainability, availability, LCOE), lessons learned, opportunities identified for further improvement of LCOE, and next steps in technology development and commercialization
- Final report for immediate public release
- Project data uploaded to the MHK Data Repository (mhkdr.openei.org) – see Appendix D
- System/component overview content models

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

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):

- Applications that fall outside the technical parameters specified in Section I.B of the FOA.
- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics).
- Topic Area 1:
  - Applications considering energy conversion technologies that do not extract energy from ocean waves.
  - Applications proposing technologies that do not credibly demonstrate an ultimate commercial goal of delivering electricity to a grid.
  - Applications proposing technologies which have not previously completed numerical modeling and conducted tank testing in order to validate the design concept and predictions of its performance.
- Topic Area 2:
  - Applications considering energy conversion technologies that do not extract energy from ocean waves or tidal, ocean, or river currents. Note that for the purposes of this FOA, current energy conversion technologies that use a dam, diversionary structure, or impoundment for electrical power purposes are specifically not of interest.

- Applications that propose to address environmental/social barriers to deployment.

D. Authorizing Statutes

The programmatic authorizing statute is the Energy Policy Act of 2005, section 931(a)(2)(E)(i) and the Energy Independence and Security Act of 2007 (EISA), Section 633-Marine and Hydrokinetic Renewable Energy Research and Development, Public Law 110-140 (Dec. 19, 2007).

Awards made under this announcement will fall under the purview of 2 CFR Part 200 as amended by 2 CFR Part 910.

II. Award Information

A. Award Overview

Estimated Funding

EERE may issue awards in one, multiple, or none of the following topic areas:

Topic Area 1 - Wave Energy Converters System Advancement: system advancement and sub-scale testing of high energy capture wave energy converters. EERE may issue approximately 2 awards in this topic area, with an average award amount of $5,000,000.

Topic Area 2 - Open Topic – MHK Technology Development: open topic on MHK technology development. EERE may issue approximately 2 – 4 awards in this topic area, with an average award amount of $500,000 - $1,000,000.

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 and is subject to the availability of appropriated funds.

Period of Performance

EERE anticipates making awards that will run up to 3.5 years (TA1) and up to 2 years (TA2) in length. 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 the project, re-direct the project, or discontinue funding the project.

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.

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.9 of the FOA for more information on what substantial involvement may involve.

Funding Agreements with FFRDCs

In most cases, Federally Funded Research and Development Centers (FFRDC) 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.

Grants

Although EERE has the authority to provide financial support to Prime Recipients through Grants, EERE generally does not fund projects through Grants. EERE may fund a limited number of projects through Grants, as appropriate.

Technology Investment Agreements

In rare cases and if determined appropriate, EERE will consider awarding a Technology Investment Agreement (TIA) to a non-FFRDC applicant. TIAs, governed by 10 CFR Part 603, are assistance instruments used to increase the involvement of commercial entities in the Department's research, development, and demonstration programs. A TIA may be either a type of cooperative agreement or an assistance transaction other than a cooperative agreement, depending on the intellectual property provisions. In both cases, TIAs are not necessarily subject to all of the requirements of 2 CFR Part 200 as amended by 2 CFR Part 910.

In a TIA, EERE may modify the standard Government terms and conditions, including but not limited to:

- Intellectual Property Provisions: EERE may negotiate special arrangements with recipients to avoid the encumbrance of existing intellectual property rights or to facilitate the commercial deployment of inventions conceived or first actually reduced to practice under the EERE funding agreement.
- Accounting Provisions: EERE may authorize the use of generally accepted accounting principles (GAAP) where recipients do not have accounting systems that comply with Government recordkeeping and reporting requirements.

EERE will be more amenable to awarding a TIA in support of an application from a consortium or a team arrangement that includes cost sharing with the private sector, as opposed to an application from a single organization. Such a consortium or teaming arrangement could include a FFRDC. If a DOE/NNSA FFRDC is a part of the consortium or teaming arrangement, the value of, and funding for the DOE/NNSA FFRDC portion of the work will be authorized and funded under the DOE field work authorization system and performed under the laboratory's Management and Operating contract. Funding for a non-DOE/NNSA FFRDC would be through an interagency agreement under the Economy Act or other statutory authority. Other appropriate contractual accommodations, such as those involving intellectual property, may be made through a "funds in" agreement to facilitate the FFRDCs participation in the consortium or teaming arrangement. If a TIA is awarded, certain types of information described in 10 CFR 603.420(b) are exempt from disclosure under the Freedom of Information Act for five years after DOE receives the information.

An applicant may request a TIA if it believes that using a TIA could benefit the RD&D objectives of the program (see section 603.225) and can document these benefits. If an applicant is seeking to negotiate a TIA, the applicant must include an explicit request in its Full Application. After an applicant is selected for award negotiation, the Contracting Officer will determine if awarding a TIA would benefit the RD&D objectives of the program in ways that likely would not happen if another type of assistance agreement (e.g., cooperative agreement subject to the requirements of 2 CFR Part 200 as amended by 2 CFR Part 910). The Contracting Officer will use the criteria in 10 CFR 603, Subpart B, to make this determination.

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 initial requirements, it will be considered non-responsive, removed from further evaluation, and ineligible for any award.

A. Eligible Applicants

Individuals

U.S. citizens and lawful permanent residents are eligible to apply for funding as a Prime Recipient or Subrecipient.

Domestic Entities

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 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.

State, local, and tribal government entities are eligible to apply for funding as a Prime Recipient or Subrecipient.

DOE/NNSA Federally Funded Research and Development Centers (FFRDCs) and DOE Government-Owned, Government-Operated laboratories (GOGOs) are eligible to apply for funding as a Subrecipient, but are not eligible to apply as a Prime Recipient.

Non-DOE/NNSA FFRDCs are eligible to apply for funding as a Subrecipient, but are not eligible to apply as a Prime Recipient.

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.

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. 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.

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.

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.

B. Cost Sharing

- *Cost Sharing Generally*

  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.)

- *Special Cost Share Waiver for Domestic Institutions of Higher Education, Domestic Nonprofit Entities, FFRDCs, or U.S. State, Local, or Tribal Government Entity*
  The Assistant Secretary for the Office of Energy Efficiency and Renewable Energy has issued a Cost Share Reduction determination pursuant to Section 988(b)(3) of the Energy Policy Act of 2005 that is applicable to certain entities applying under this FOA. Specifically, recipient cost share requirement for applied research and development activities projects is reduced from 20% to 10% where:

  1. The Prime Recipient is a domestic institution of higher education; domestic nonprofit entity; FFRDC; or U.S. State, local, or tribal government entity; and
  2. The Prime Recipient performs more than 50% of the project work, as measured by the Total Project Cost.

  Applicants who believe their project qualifies for the reduced recipient cost share must be able to provide verification that the above requirements are satisfied.

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

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. The Prime Recipient's cost share obligation is expressed in the Assistance Agreement as a static amount in U.S. dollars (cost share amount) and as a percentage of the Total Project Cost (cost share percentage). 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.

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.

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. Cash contributions may be provided by the Prime Recipient or Subrecipients. Allowable in-kind contributions include, but are not limited to: rental value of buildings or equipment, the value of a donated service or resource, or third party in-kind contribution.

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 & 10 CFR 603.525-555 for additional guidance on cost sharing.

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.

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.

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).

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.

C. 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, Full Applications, and Replies to Reviewer Comments 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.

Compliance Criteria

1. **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.

2. **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.

3. **Replies to Reviewer Comments**
   Replies to Reviewer Comments are deemed compliant if:

   - The Reply to Reviewer Comments complies with the content and form requirements in Section IV.E of the FOA; and
   - The applicant successfully uploaded all required documents to EERE Exchange by the deadline stated in the FOA.

D. 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.

E. 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:

1. **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.

2. **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 [Enter Laboratory Name] 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.

3. **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 system and non-DOE/NNSA FFRDC through an interagency agreement with the sponsoring agency.

4. **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 and the FFRDC's portions of the project.

5. **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.

6. **Limit on FFRDC Effort**
   The scope of work to be performed by the FFRDC may not be more significant than the scope of work to be performed by the applicant.

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

Applicants may only submit one Full Application for each topic area of this FOA. If an applicant submits more than one Full Application to the same topic area, EERE will only consider the last timely submission for evaluation. Any other submissions received listing the same applicant for the same topic area will be considered noncompliant and not 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 prime applicant on one Full Application submitted under this FOA.

G. 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.

IV. 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 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, and 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 Exchange application process. This control number must be included with all Application documents, as described below.

The Concept Paper, Full Application, and Reply to Reviewer Comments 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.
- 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, Full Application, or Reply to

Reviewer Comments. Once the Concept Paper, Full Application, or Reply to Reviewer Comments is submitted in EERE Exchange, applicants may revise or update that submission until the expiration of the applicable deadline. If changes are made, the applicant must resubmit the Concept Paper, Full Application, or Reply to Reviewer Comments 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.2 of the FOA.

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 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 Application should contact the Exchange helpdesk for assistance (EERE-ExchangeSupport@hq.doe.gov). The Exchange helpdesk and/or the EERE Exchange system administrators will assist Applicants in resolving issues.

Applicants that experience issue 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 Exchange helpdesk for assistance (EERE-ExchangeSupport@hq.doe.gov). The 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, however, those applicants who are unable to submit their application on time due to their waiting until the last minute when network traffic is at its heaviest to submit their materials 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:
ControlNumber_LeadOrganization_Project_Part_1
ControlNumber_LeadOrganization_Project_Part_2, etc.

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.

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 Topic Area being addressed, both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Technology Description	3 pages maximum	Applicants are required to describe succinctly: • The proposed technology, 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.
Addendum	2 pages maximum	Applicants are required to describe succinctly the qualifications, experience, and capabilities of the proposed Project Team, including: • 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. Applicants may provide graphs, charts, or other data to supplement their Technology Description.

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 sent to applicants 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 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.

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

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 (See Chart in Section IV.D.2)	ControlNumber_LeadOrganization_TechnicalVolume
	Statement of Project Objectives (10 page limit. Microsoft Word format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_SOPO
	SF-424	ControlNumber_LeadOrganization_App424
	Budget Justification (EERE 335) (Microsoft Excel format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_Budget_Justification

	Summary for Public Release (1 page limit)	ControlNumber_LeadOrganization_Summary
	Summary Slide (1 page limit, Microsoft PowerPoint format)	ControlNumber_LeadOrganization_Slide
	Subaward Budget Justification, if applicable (EERE 335) (Microsoft Excel format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_Subawardee_Budget_Justification
	DOE O 412.1.A FWP for FFRDC, if applicable	ControlNumber_LeadOrganization_FWP
	Authorization from cognizant Contracting Officer for FFRDC, if applicable	ControlNumber_LeadOrganization_FFRDCAuth
	SF-LLL Disclosure of Lobbying Activities	ControlNumber_LeadOrganization_SF-LLL
	Foreign Entity and Performance of Work in the United States waiver requests, if applicable	ControlNumber_LeadOrganization_Waiver
	U.S. Manufacturing Plans	ControlNumber_LeadOrganization_USMP
	Data Management Plan	ControlNumber_LeadOrganization_DMP
	Risk Management Checklist (TA 1 only)	ControlNumber_LeadOrganization_RiskCheck
	Risk Register (TA 1 only) (Microsoft Excel or PDF format. Applicants encouraged to use the template available at available at http://www.nrel.gov/docs/fy15osti/63258_template.xlsx)	ControlNumber_LeadOrganization_RiskReg
	ACE Calculation (TA 1 only) (Microsoft Excel or PDF format. Applicants encouraged to use the template available in EERE Exchange)	ControlNumber_LeadOrganization_ACE
	ACE Supporting Documentation (TA 1 only) (Microsoft Word or PDF format)	ControlNumber_LeadOrganization_ACE_Support

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:

ControlNumber_LeadOrganization_TechnicalVolume_Part_1
ControlNumber_LeadOrganization_TechnicalVolume_Part_2, etc.

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.

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.2 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 for TA1 and 15 pages for TA2**, 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.2 of the FOA) when preparing the Technical Volume.

SECTION/PAGE LIMIT	DESCRIPTION
	The cover page should include the project title, the specific FOA Topic Area being addressed , 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)	The Project Overview should contain the following information: • 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)	The Technical Description should contain the following information: • 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 constitute approximately 40% of the Technical Volume)	The Workplan should include a summary of the Project Objectives, Technical Scope, Work Breakdown Structure, Milestones, Go/No-Go Decision Points (TA1 projects), and Project Schedule. A detailed Statement of Project Objectives (SOPO) is separately requested. The Workplan should contain the following information: • 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. • Work Breakdown Structure (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 work breakdown structure (WBS) for any project. The Workplan shall contain a concise description of the specific activities (e.g. design, fabrication, NEPA and permitting, testing, etc.) 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 **S**pecific, **M**easurable, **A**chievable, **R**elevant, and **T**imely, 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 (TA1 projects): 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, 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: o The overall approach to and organization for managing the work o Any critical handoffs/interdependencies among Project Team members o The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices o The approach to project risk management o A description of how project changes will be handled o If applicable, the approach to Quality Assurance/Control o How communications will be maintained among Project Team members • Market Transformation Plan: The applicant should provide a market transformation plan, including the following: o Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including a mitigation plan o 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 etc., and product distribution.
Technical Qualifications and Resources (Approximately 20% of the Technical Volume)	The Technical Qualifications and Resources should contain the following information: • 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 support from partners/end users as an appendix (1 page maximum per letter). Letters of support do not count towards the page limit.
	• For multi-organizational or multi-investigator projects, describe succinctly:
	  o The roles and the work to be performed by each PI and Key Participant;
	  o Business agreements between the applicant and each PI and Key Participant;
	  o How the various efforts will be integrated and managed;
	  o Process for making decisions on scientific/technical direction;
	  o Publication arrangements;
	  o Intellectual Property issues; and
	  o Communication plans

Statement of Project Objectives

Applicants are required to complete a Statement of Project Objectives (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".

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".

Budget Justification Workbook (EERE 335)

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, and provide all requested documentation (e.g., a Federally-approved rate agreement, vendor quotes). 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".

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".

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.

Subaward Budget Justification (EERE 335) (if applicable)

Applicants must provide a separate budget justification, EERE 335 (i.e., budget justification for each budget year and a cumulative budget) for each subawardee 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 subaward budget justification in a Microsoft Excel file using the following convention for the title "ControlNumber_LeadOrganization_Subawardee_Budget_Justification".

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 Field Work Proposal (FWP) in accordance with the requirements in DOE Order 412.1, Work Authorization System. DOE Order 412.1 and DOE O 412.1 (Field Work Proposal form) area available at the following link, under "DOE Budget Forms": https://www.directives.doe.gov/directives/0412.1-BOrder-a/view. Save the FWP in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_FWP".

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".

SF-LLL: Disclosure of Lobbying Activities

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" (http://www.whitehouse.gov/sites/default/files/omb/grants/sflllin.pdf) if any non-Federal funds have been paid or will be paid to any person for influencing or attempting to influence any of the following in connection with your 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".

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

1. **Foreign Entity Participation***:*
   As set forth in Section III.A.3, 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.

2. **Performance of Work in the United States**
   As set forth in Section IV.K.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.

U.S. Manufacturing Commitments

As part of the application, applicants are required to submit a U.S. Manufacturing Plan. The U.S. Manufacturing Plan represents the applicant's measurable commitment to support U.S. manufacturing as a result of its award.

The weight given to the U.S. Manufacturing Plans during the review and selection process varies based on the particular FOA. Applicants should review Section V.A.2 of this FOA to determine the weight given to the U.S. Manufacturing Plans under this FOA.

A U.S. Manufacturing Plan should contain the following or similar preamble: "If selected for funding, the applicant agrees to the following commitments as a condition of that funding:" and, after the preamble, the plan should include one or more specific and measureable commitments. For example, an applicant may commit particular types of products to be manufactured in the U.S. In addition to or instead of making a commitment tied to a particular product, the applicant may make other types of commitments still beneficial to U.S. manufacturing. An applicant may commit to a particular investment in a new or existing U.S. manufacturing facility, keep certain activities based in the U.S. (i.e., final assembly) or support a certain number of jobs in the U.S. related to the technology and manufacturing. For 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 licensing strategy that would likely support U.S. manufacturing.

When an applicant that is a domestic small business, domestic educational institution, or nonprofit organization is selected for an award, the U.S.

Manufacturing Plan submitted by the applicant becomes part of the terms and conditions of the award. The applicant/awardee may request a waiver or modification of the U.S. Manufacturing Plan from DOE upon a showing that the original U.S. Manufacturing Plan is no longer economically feasible.

When an applicant that is a domestic large business is selected for an award, a class patent waiver applies as set forth in Section VIII. L. Under this class patent 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 patent waiver, a domestic large business must agree that any products embodying or produced through the use of an invention conceived or first actually reduced to practice under the award will be substantially manufactured in the United States, unless DOE agrees that the commitments proposed in the U.S. Manufacturing Plan are sufficient.

For other entity types that are selected for award, please see Section VIII.L regarding U.S. manufacturing commitments.

Data Management Plan

Applicants are required to submit a Data Management Plan with their Full Application. The Data Management Plan is a document that outlines the proposed plan for data sharing or preservation. Submission of a Data Management Plan with the Full Application is required; failure to submit a complete Data Management Plan may result in a determination of non-compliance for your Full Application. Guidance for preparing a Data Management Plan, including the required Table of Deliverables, is included in Appendix D of the FOA.

Risk Management Checklist (Topic Area 1 Only)

Applicants should review the "Marine and Hydrokinetic Technology Development Risk Management Framework" (http://www.nrel.gov/docs/fy15osti/63258.pdf) and submit a Risk Management Checklist, as outlined below, with their application. In addition, applicants should list their top 10 expected project risks, as indicated in the last item of the checklist below.

The Risk Management Checklist should address the following items:

- Provide a brief description of the system and/or constituent components to be developed within this FOA project

- Describe the risk management strategy with reference to each of the following subsystems and project metrics:
    - Loss of functionality to:
        - power take-off (PTO) or rotor assembly
        - electrical systems
        - mechanical systems
        - wear items (seals, bearings, etc.)
        - structure (break, fatigue, etc.)
        - mooring or foundation
        - control system
        - data/monitoring system
    - Loss of device
    - Reduced power production compared to expectations/predictions
    - Low availability
    - Incomplete data amount collected during testing
    - Delay in deployment or commissioning
    - Breach of safety requirements
- If using a risk management plan other than the MHK Risk Management Framework, provide adequate documentation of this plan that includes detail equivalent to the MHK Risk Management Framework (i.e., it must contain structured reviews [design, test readiness, and risk] and activities described in Table 3 of the Marine and Hydrokinetic Technology Development Risk Management Framework).
- Describe the technology TRL and TPL (pre-FOA).
- Define the expected TRLs and TPLs at funding conclusion.
- Identify the proposed TRL and TPL steps to take during FOA period of performance (e.g., starting at TRL-1 and TPL-1, then TRL-3 and TPL-3, etc.).
- Describe components or subsystems, if any, that will be developed and tested in parallel with the overall system and how that will de-risk the overall system test.
- Describe the preliminary survivability targets and the strategy to obtain these targets, per Section 4.8 of the Marine and Hydrokinetic Technology Development Risk Management Framework.
- If the TRL is 5 or more at FOA conclusion, then describe the preliminary targets for reliability and maintainability—and the strategy to obtain these targets—at the project conclusion, per Section 4.9 of the Marine and Hydrokinetic Technology Development Risk Management Framework.

- List the planned risk management deliverables during the FOA period of performance, i.e., as stated in Table 3 of the Marine and Hydrokinetic Technology Development Risk Management Framework (or equivalent), that apply to this project.
- List the relevant standards to be used during the technology development under this FOA.
- List the top 10 expected project risks.

Risk Register (Topic Area 1 Only)

Applicants should review Section 5 of the "Marine and Hydrokinetic Technology Development Risk Management Framework" (http://www.nrel.gov/docs/fy15osti/63258.pdf) and must submit a quantitative evaluation of each risk considering severity and frequency of their top 10 project risks listed in the Risk Management Checklist submission. Though not required, applicants are encouraged to provide the quantitative representation of their top 10 risks through submission in the MHK Risk Register format (available at http://www.nrel.gov/docs/fy15osti/63258_template.xlsx).

ACE Spreadsheet (Topic Area 1 Only)

Applicants must complete the ACE calculation. A Template Spreadsheet, available on EERE Exchange at https://eere-Exchange.energy.gov/, has been provided to help applicants with the ACE calculation. Though not required, applicants are encouraged to submit the ACE calculation in this template format. See Appendix E for more information on the calculation of ACE.

ACE Supporting Documentation (Topic Area 1 Only)

Applicants must submit ACE Supporting Documentation. The ACE Supporting Documentation details the inputs to the ACE calculation, and justifies all values used for calculation of ACE for the particular WEC design. For more information on the requirements for the ACE supporting documentation, see Section I.B. pre-award information. More information on the calculation of ACE is also available in Appendix E.

E. Content and Form of Replies to Reviewer Comments

EERE will provide applicants with reviewer comments following evaluation of all eligible Full Applications. Applicants will have a brief opportunity to review the comments and to prepare a short Reply to Reviewer Comments responding to comments however they desire or supplementing their Full Application. The Reply to Reviewer Comments is an optional submission; applicants are not required to

submit a Reply to Reviewer Comments. EERE will notify applicants via email when the Reviewer Comments are available for reply. The expected submission deadline is on the cover page of the FOA; however, it is the applicant's responsibility to monitor email in the event that the expected date changes. The deadline will not be extended for applicants who are unable to timely submit their reply due to failure to check email or relying on the expected date alone. Applicants should anticipate having approximately three (3) business days to submit Replies to Reviewer Comments.

EERE will not review or consider ineligible Replies to Reviewer Comments (see Section III of the FOA). EERE will review and consider each eligible Full Application, even if no Reply is submitted or if the Reply is found to be ineligible.

Replies to Reviewer Comments must conform to the following content and form requirements, including maximum page lengths, described below. If a Reply to Reviewer Comments is more than three pages in length, EERE will review only the first three (3) pages and disregard any additional pages.

SECTION	PAGE LIMIT	DESCRIPTION
Text	2 pages max	Applicants may respond to one or more reviewer comments or supplement their Full Application.
Optional	1 page max	Applicants may use this page however they wish; text, graphs, charts, or other data to respond to reviewer comments or supplement their Full Application are acceptable.

F. Post-Award Information Requests

If selected for award, EERE reserves the right to request additional or clarifying information for any reason deemed necessary, including but not limited to:

- 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
- Environmental Questionnaire

G. Dun and Bradstreet Universal Numbering System Number and System for Award Management

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 System for Award Management (SAM) at https://www.sam.gov before submitting its application; (2) provide a valid Dun and Bradstreet Universal Numbering System (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 may 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.

H. Submission Dates and Times

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

I. Intergovernmental Review

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

J. Funding Restrictions

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:

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

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.

1. **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 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 a project 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.

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

request.

Construction

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

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.

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.

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" (http://www.whitehouse.gov/sites/default/files/omb/grants/sflllin.pdf) if any non-Federal funds have been paid or will be paid to any person for influencing or attempting to influence any of the following in connection with your 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.

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 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.

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
- Other items as required by DOE

V. Application Review Information

A. Technical Review Criteria

Concept Papers

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

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

- The applicant clearly describes the proposed technology, describes how the technology is unique and innovative, and how the technology 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.

Full Applications

Applications will be evaluated against the merit review criteria shown below. All sub-criteria are of equal weight.

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

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;
- Degree to which the applicant demonstrates the technical feasibility of the proposed technology and capability of achieving the anticipated performance targets, including a description of previous work done to meet incoming application requirements;
- 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 topic area objectives and target specifications and metrics
- Degree to which the work proposed in the application could potentially benefit the entire MHK industry; and
- The potential impact of the project on advancing the state-of-the-art.

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

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.
- Demonstrated ability to share data with National Laboratories to validate work.

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 etc., and product distribution.

Criterion 3: Team and Resources (20%)

- 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.

Criteria for Replies to Reviewer Comments

EERE has not established separate criteria to evaluate Replies to Reviewer Comments. Instead, Replies to Reviewer Comments are attached to the original applications and evaluated as an extension of the Full Application.

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 "Department of Energy Merit Review Guide for Financial Assistance," which is available at: http://energy.gov/sites/prod/files/meritrev.pdf.

C. Other Selection Factors

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, including proposed cost share, disseminates project data and results to the entire MHK industry in a timely manner, including the degree to which information is made open source.

D. Evaluation and Selection Process

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.

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 distinct from and more formal than pre-selection clarifications (See Section V.D.3 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.

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.

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.

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 Dates

EERE anticipates notifying applicants selected for negotiation of award by June 2017 and making awards by August 2017.

VI. Award Administration Information

A. Award Notices

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 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.

Concept Paper Notifications

EERE will notify applicants of its determination to encourage or discourage the submission of a Full Application. EERE will send a notification letter by email to the technical and administrative points of contact designated by the applicant in 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 letter encouraging the submission of a Full Application does not authorize the applicant to commence performance of the project. Please refer to Section IV.J.2 of the FOA for guidance on pre-award costs.

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.

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) 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.2 of the FOA for guidance on pre-award costs.

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.

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

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:

1. **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.**

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**.

2. **DUNS Number**
   Obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number (including the plus 4 extension, if applicable) at http://fedgov.dnb.com/webform.

3. **System for Award Management**
   Register with the System for Award Management (SAM) at https://www.sam.gov. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Please update your SAM registration annually.

4. **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 http://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf.

5. **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.

6. **Electronic Authorization of Applications and Award Documents**
   Submission of an application and supplemental information under this FOA through electronic systems used by the Department of Energy,

including EERE Exchange and FedConnect.net, constitutes the authorized representative's approval and electronic signature.

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.

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, 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.

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.

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.

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 the National Environmental Policy Act (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.

Applicant Representations and Certifications

1. **Lobbying Restrictions**
   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 contactors 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:

(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, Form 4414, 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.

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 usual 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.

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 that the Go/No Go decision point(s).

4. EERE participates in major project decision-making processes.

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.

Intellectual Property Provisions

The standard DOE financial assistance intellectual property provisions applicable to the various types of recipients are located at http://www1.eere.energy.gov/financing/resources.html.

Reporting

Reporting requirements are identified on the Federal Assistance Reporting Checklist, attached to the award agreement. The checklist can be accessed at http://www1.eere.energy.gov/financing/resources.html.

Go/No-Go Review

Each project selected under Topic Area 1 of this FOA will be subject to a periodic project evaluation referred to as a Go/No-Go Review. Federal funding beyond the Go/No Go decision point (continuation funding), is contingent on (1) the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) meeting the objectives, milestones, deliverables, and decision point criteria of recipient's approved project and obtaining approval from EERE to continue work on the project; and (3) the submittal of required reports in accordance with the Statement of Project Objectives.

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.

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.

VII. 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: MHKFOA1663@ee.doe.gov. Questions must be submitted not later than 3 business days prior to the application due date and time.

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.

VIII. 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. Informational Webinar

EERE will conduct one informational webinar during the FOA process. It will be held after the initial FOA release but before the due date for Concept Papers.

Attendance is not mandatory and will not positively or negatively impact the overall review of any applicant submissions. As the webinar will be open to all applicants who wish to participate, applicants should refrain from asking questions or communicating information that would reveal confidential and/or proprietary information specific to their project. Specific dates for the webinar can be found on the cover page of the FOA.

C. 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.

D. 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.

E. 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 the Freedom of Information Act.

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

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.

F. 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. The applicant, by submitting its application, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign conflict of interest and non-disclosure agreements

prior to reviewing an application. Non-Federal personnel conducting administrative activities must sign a non-disclosure agreement.

G. 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.

H. 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).

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

Under the Freedom of Information Act, (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.

J. 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.

K. Retention of Submissions

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

L. 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.
- 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.

- Determination of Exceptional Circumstances (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. For example, the commitments and enforcement of a U.S. Manufacturing Plan may be tied to subject inventions. Any Bayh-Dole entity (domestic small business or nonprofit organization) affected by this DEC has the right to appeal it.

M. Government Rights in Subject Inventions

Where Prime Recipients and Subrecipients retain title to subject inventions, the U.S. Government retains certain rights.

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.

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.

N. 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, 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.

O. 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.

P. Personally Identifiable Information (PII)

All information provided by the Applicant must to the greatest extent possible exclude Personally Identifiable Information (PII). The term "personally identifiable information" refers to information which can be used to distinguish or trace an individual's identity, such as their name, social security number, biometric records, etc. 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, etc. (See OMB Memorandum M-07-16 dated May 22, 2007, found at: https://www.whitehouse.gov/sites/default/files/omb/memoranda/fy2007/m07-16.pdf

By way of example, Applicants must screen resumes to ensure that they do not contain PII such as personal addresses, phone/cell numbers, personal emails and/or SSNs. In short, if the PII is not essential to the application, it should not be in the application.

Q. Annual Compliance Audits

If a for-profit entity is a Prime Recipient and has expended $750,000 or more of DOE funds during the entity's fiscal year, an annual compliance audit performed by an independent auditor is be 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 funds 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 sub-recipients (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. 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:

- 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.

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 Federal Acquisition Regulation, 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

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 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: Foreign Entity Participation as the Prime Recipient and Performance of Work in the United States

1. Waiver for Foreign Entity Participation as the Prime Recipient

As set forth in Section III.A.3, 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, 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 U.S. 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;
- 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

As set forth in Section IV.J.3, 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 U.S. 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 - Data Management Plan

A data management plan ("DMP") explains how data generated in the course of the work performed under an EERE award will be shared and preserved or, when justified, explains why data sharing or preservation is not possible or scientifically appropriate.

DMP Requirements

In order for a DMP to be considered acceptable, the DMP must address the following:

At a minimum, the DMP must describe how data sharing and preservation will enable validation of the results from the proposed work.

In an effort to improve future data management and access, the Department of Energy's (DOE) Water Power Program launched a Marine in Hydrokinetics Data Repository (MHK-DR) to manage the receipt, protection, and dissemination of scientific and technical data generated by DOE funded awards.

EERE will collect a standard set of data on all projects for submission to the MHK-DR, including the following:

1. All reports as specified as deliverables in Statement of Project Objectives (SOPOs)
2. Peer/Program Review Presentation and Report;
3. Other reports as deemed necessary by HQ; and
4. Data (i.e., raw and/or post-processed data such as modeling results, map filters, analysis results) generated as a result of the applicants Research, Development, and Demonstration (RD&D) is to be structured (see https://mhkdr.openei.org/faq#fileformats) and uploaded to the DOE MHK-DR. If a DOE recommended Content Model exists for the research data generated as a result of the funded RD & D, the applicant will use the recommended Content Model to standardize the structured data. Where a Content Model does not exist, the applicant should upload the data in a structured format (where data can be easily entered, stored, queried and analyzed, such as Excel) using existing, accepted community standards. While the use of Content Models or structured data is preferred, unstructured data (i.e. word documents, video, photos, audio files, presentations, webpages, etc.…) is also acceptable.

   The Recipient must provide data to the DOE Marine and Hydrokinetic Data Repository (MHK-DR) as it is generated, but no later than the end of each reporting quarter in which the data is generated. The data will be submitted to the MHK-DR at http://mhkdr.openei.org. If the data is protected and thus subjected to a moratorium, it will not be made publicly available until the moratorium has expired, and it will be held in a secure section of the MH-KDR. All Data will be treated according to the Intellectual Property Provisions for the Award.

   The DMP must provide a plan to ensure all research data generated from the proposed work (including publications required within the scope of work, such as the final technical report, and beyond) is also digitally accessible via the MHK-DR, at the time of publication. This includes data that are displayed in

charts, figures, images, etc. In addition, data used to generate the displayed data (experimental, observational, and simulation data; codes, software and algorithms; text; numeric information; image; video; audio; and associated metadata) should be made as accessible as possible in accordance with the principles stated above. This requirement could be met by including the data as supplementary information (e.g. as part of the same MHK-DR data submission to the published article, or through other means. All published articles containing data generated from the proposed work should indicate that the data can be accessed via the MHK-DR.

The DMP should consult and reference available information about data management resources to be used in the course of the proposed work. In particular, a DMP that explicitly or implicitly commits data management resources at a facility beyond what is conventionally made available to approved users should be accompanied by written approval from that facility. In determining the resources available for data management at DOE User Facilities, researchers should consult the published description of data management resources and practices at that facility and reference it in the DMP. Information about other DOE facilities can be found in the additional guidance from the sponsoring program.

The DMP should reference available information about the MHK Data Repository submission requirements (https://mhkdr.openei.org/faq) to be used in the course of proposed work.

The DMP must protect confidentiality, personal privacy, Personally Identifiable Information, and U.S. national, homeland, and economic security; recognize proprietary interests, business confidential information, and intellectual property rights; avoid significant negative impact on innovation, and U.S. competitiveness; and otherwise be consistent with all laws (e.g., export control laws), and DOE regulations, orders, and policies.

Data Determination for a DMP

The Principal Investigator should determine which data should be the subject of the DMP and, in the DMP, propose which data should be shared and/or preserved in accordance with the DMP Requirements noted above.

For data that will be generated through the course of the proposed work, the Principal Investigator should indicate what types of data should be protected from immediate public disclosure by DOE and placed under a limited-time moratorium (referred to as “protected data”) and what types of data that DOE should be able to release immediately (referred to as “unlimited data”). Similarly, for data developed outside of the proposed work at private expense that will be used in the course of the proposed work, the Principal Investigator should indicate whether that type of data will be subject to public release or kept confidential (referred to as “limited rights data”). Any use of limited rights data or labeling of data as “protected data” must be consistent with the DMP Requirements noted above.

A table of data deliverables inclusive of all report deliverables must be provided in the DMP in the following format.

Table of deliverables, including but not limited to milestone verification deliverables and all data generated under award. Data produced under this Award will be treated according to the Intellectual Property Provisions.

Anticipated Completion (Quarter)	Task (# and Name)	Associated Milestone # if Applicable	Deliverable Type (Report, Presentation, Data (e.g. Drawing, image, time-series, input/output files, etc.)	Description of Deliverable or Data Content*	Data Format**	Protection (Unlimited, Protected, Limited)	Expected File Size	Special Requirements ***	Where to submit the deliverable (PMCD, MHK-DR, etc.)

* List data generated over course of proposed work. E.g. Milestone verification report; Risk Register; System specifications; Predicted material and manufacturing costs; CAD drawings; Actual Material and manufacturing costs; Measured performance; and comparisons against initial numerical model projections

** (See https://mhkdr.openei.org/faq#datatypes for examples); Content Models uploaded to the MHK-DR website should be used whenever possible. If not possible, then existing, accepted community standards should be used.

*** For example, proprietary software needed to access or interpret data, applicable policies, provisions, and licenses for re-use and re-distribution, and for the production of derivatives, including guidance for how data and data products should be cited.

Additional Suggested Elements for a DMP

The following list of elements for a DMP provides suggestions regarding the data management planning process and the structure of the DMP:
Data Types and Sources: A brief, high-level description of the data to be generated or used through the course of the proposed work and which of these are considered digital research data necessary to validate the research findings or results.

Format: Note the rationale for the selection of appropriate standards. A statement of plans for data and metadata content and format including, where applicable, a description of documentation plans, annotation of relevant software, and the rationale for the selection of appropriate standards. Existing, accepted community standards should be used where possible. Where Content Models and community standards are missing or inadequate, the DMP should propose alternate strategies for facilitating sharing, and should advise the sponsoring program of any need to develop or generalize standards.

Sharing and Preservation: Note which data content will not be directly uploaded to the MHK-DR, rather will be accessible for download via a public website link to an alternative preservation platform. A description of the plans for data sharing and preservation. should include, when appropriate the anticipated means for sharing and the rationale for any restrictions on who may access the data and under what conditions; a timeline for sharing and preservation that addresses both the anticipated delay to data access after research findings are published; any special requirements for data sharing, for example, proprietary software needed to access or interpret data, applicable policies, provisions, and licenses for re-use and re-distribution, and for the production of derivatives, including guidance for how data and data products should be cited; any resources and capabilities (equipment, connections, systems, software, expertise, etc.) requested in the research proposal that are needed to meet the stated goals for sharing and preservation (this could reference the relevant section of the associated research proposal and budget request); and if data preservation location is only linked from the MHK-DR and not directly uploaded to the MHK-DR whether/where the data will be preserved after direct project funding ends and any plans for the transfer of responsibilities for sharing and preservation.

Protection: A statement of plans, where appropriate and necessary, to protect confidentiality, personal privacy, Personally Identifiable Information, and U.S. national, homeland, and economic security; recognize proprietary interests, business confidential information, and intellectual property rights; and avoid significant negative impact on innovation, and U.S. competitiveness.

Rationale: A discussion of the rationale or justification for the proposed data management plan including, for example, the potential impact of the data within the immediate field and in other fields, and any broader societal impact.

Additional Guidance

In determining which data should be shared and preserved, awardees must consider the data needed to validate research findings as described in the Requirements, and are encouraged to consider the potential benefits of their data to their own fields of research, fields other than their own, and society at large.

DMPs should reflect relevant standards and community best practices and make use of community accepted repositories whenever practicable.

Costs associated with data management, processing, uploading and resources articulated in a DMP, such as the submission and curation of data to MHK-DR, must be included in the proposed research budget as permitted by the applicable cost principles.

To improve the discoverability of and attribution for datasets created and used in the course of research, EERE encourages the citation of publicly available datasets (i.e. the MHK-DR) within the reference section of publications, and the identification of datasets with persistent identifiers such as Digital Object Identifiers (DOIs). In most cases, EERE can provide DOIs free of charge for data resulting from DOE-funded research through its Office of Scientific and Technical Information (OSTI) DataID Service. Once the MHK-DR is connected to OSTI in FY16, the MHK-DR will assign DOIs free of charge to appropriate data submissions. This is done as part of the curation process. The determination of the datasets submitted to the MHK-DR that will get a DOI will be made by OSTI.

Definitions

Data Management: The process of controlling the information generated during a RD&D project. How data is managed depends on the types of data involved, how data is collected and stored, and how it is used – throughout the project lifecycle.

Data Format: Preferred formats are those that contain standardized, structured data and support the best reusability. Ideally using the Content Models uploaded to the MHK-DR website would be the preferred format (see https://mhkdr.openei.org/models/). However, the MHK-DR will accept your data in whichever format you are able to provide it. If your data are in multiple formats, consider these data format guidelines. (See https://mhkdr.openei.org/faq#fileformats)

a. TIER 1: Good unstructured data
    i. PDF, PowerPoint, Image, etc.
b. TIER 2: Better structured data.
    i. Excel, CSV, XML, etc.
c. TIER 3: Best structured and standardized data
    i. Data or content model
    ii. Standardized Excel, CSV, XML, RDF, JSON, etc.

Content Model: Refers to a structured (e.g. Excel, CSV, XML) and standardized form developed by Department of Energy used to submit data. Content models are tools used to collect a subset of common data in a standardized form that allows quick data aggregations between projects. These Content models organize the data in a consistent manner, using standardized units, thereby allowing straightforward population and use.

Structured Data: Refers to data that resides in a fixed field within a record or file. This includes data contained in relational databases and spreadsheets (e.g. Excel, CSV, XML).

Unstructured Data: Refers to information that does not reside in a traditional row-column database. Unstructured data files often include e-mail messages, word processing documents, videos, photos, audio files, presentations, webpages and many other kinds of business documents.

Data Preservation: Data preservation means providing for the usability of data beyond the lifetime of the research activity that generated them.

Data Sharing: Data sharing means making data available to people other than those who have generated them. Examples of data sharing range from bilateral communications with colleagues, to providing free, unrestricted access to anyone through, for example, a web-based platform.

Digital Research Data: The term digital data encompasses a wide variety of information stored in digital form including: experimental, observational, and simulation data; codes, software and algorithms; text; numeric information; images; video; audio; and associated metadata.

Research Data: The recorded factual material commonly accepted in the scientific community as necessary to validate research findings. For DOE Water program awards, research data also includes development and demonstration data from RD&D projects. Includes numerical datasets, observational information, maps, texts, images, and time-dependent media, etc. Data are any and all complex data entities from observations, experiments, simulations, models, and higher order assemblies, along with the associated documentation needed to describe and

interpret the data. It also encompasses information in a variety of different forms including raw, processed, and analyzed data, published and archived data. Does NOT include any of the following: preliminary analyses, drafts of scientific papers, plans for future research, peer reviews, or communications with colleagues. This 'recorded' material excludes physical objects (e.g. laboratory samples). Research data also do not include:

5. Trade secrets, commercial information, materials necessary to be held confidential by a researcher until they are published, or similar information which is protected under law; and
6. Personnel and medical information and similar information the disclosure of which would constitute a clearly unwanted invasion of personal privacy, such as information that could be used to identify a particular person in a research study."

Validate: In the context of DMPs, validate means to support, corroborate, verify, or otherwise determine the legitimacy of the research findings. Validation of research findings could be accomplished by reproducing the original experiment or analyses; comparing and contrasting the results against those of a new experiment or analyses; or by some other means.

Appendix E – ACE

When comparing the economic attractiveness of power generating technologies, levelized cost of energy (LCOE) is a common metric frequently used in the power generation sector. LCOE is the ultimate expression of the ratio between *effort* (cost) to *benefit* (energy generated). Unfortunately, LCOE is difficult to use for lower Technology Readiness Levels (TRLs), because the data necessary is either not available or unreliable.

A new metric, termed 'ACE', was developed to determine effectiveness of low TRL concepts that is a modification of existing WEC metrics. This metric allows for robust analysis of various WEC devices archetypes, including those using novel methods and materials. ACE is a benefit to cost ratio, and is a proxy for LCOE, appropriate for comparing low TRL WEC designs. The two components that comprise the ratio ACE are:

- Average Climate Capture Width (ACCW) = the absorbed power of the device [kW] divided by the wave energy flux per meter crest width [kW/m];
- Characteristic Capital Expenditure (CCE) = Total Surface Area [m^2] x Representative Structural Thickness [m] x Density of Material(s) [kg/m^3] x Cost of Manufactured Material per unit Mass [$/kg] for all applicable materials.

ACE = ACCW/CCE, and is expressed in units of meters per million dollars [m/$M]. ACCW is a measure of the effectiveness of a WEC at absorbing power from the incident wave energy field. CCE is a measure of the capital expenditure in commercial production of the load bearing device structure.

ACCW

The average climate capture width (ACCW)—the numerator of ACE—represents an expected yearly average capture width for a WEC operating in typical West Coast wave climates. ACCW is calculated from a set of WEC capture widths for a select set of irregular wave conditions that are either measured in sub-scale physical model testing or calculated from numerical simulations. The full scale capture widths are weighted by the yearly contribution to annual energy of the specified test wave conditions at select locations and summed to yield the ACCW. This means that a device that performs very well in one sea state but poorly in other sea states may have a relatively low ACCW when compared with the maximum capture width. Alternatively, a device that has modest performance over a wide range of sea states and wave directions may have a higher ACCW.

ACCW is calculated in two steps, first by calculating the average annual capture width (AACW) for each wave climate of interest through weighted absorbed power measurements in the sea states of each wave climate, and then by averaging the AACW values to give ACCW.

In general, to understand device performance, both tank testing and numerical simulations must cover enough sea states to represent a realistic wave climate. Simulations should be performed in enough irregular sea states that the power in every bin of the resource matrix, or joint probability distribution (JPD), at the wave climate can be approximated. For tank testing, testing at every sea state bin at the wave climate would be over burdensome, but enough sea states should be tested to represent the characteristics of that climate.

In both cases, the sea states that are tested should be weighted so that average annual power absorbed for a particular wave climate can be estimated. In order to evaluate WEC devices that have completed tank testing, but may not have a validated numerical model, only a select number of sea states that could have been tested in a wave tank, or evaluated through modeling are considered in ACE for the purpose of this FOA. Average absorbed power should be measured or modeled for six wave sea states ($i = 1,2, \dots ,6$) that are used to represent a full climate (i.e., the West Coast of the U.S.). The representative climate is made of seven deep water locations listed in Table 1. Buoy data in deep water offshore of the locations given was used to select the six sea states. The assumed depth for the representative climate is 122m. Note that Bretschneider spectrum should be assumed. The average annual capture width, $AACW(j)$, produced in a single wave climate is calculated by summing the products of the average absorbed power produced in each of the six sea states, $\langle AP(i) \rangle$, and a corresponding scaling factor $\Xi(i,j)$ (related to the percentage contribution to omnidirectional wave power density in each wave climate), and then dividing by the annual omnidirectional wave power density, $\langle C_p(j) \rangle$:

$$AACW(j) = \frac{\sum_{i=1}^{6} \langle AP(i) \rangle \ \Xi(i,j)}{\langle C_p(j) \rangle}$$

The scaling factors $\Xi(i,j)$ are shown in Table 1 and in the template provided. Note that scaling factors (percentages) do not add to 100% because the weightings represent the contribution to annual omnidirectional wave power density (rather than simply occurrence).

The annual capture widths $AACW(j)$ for these seven climates are averaged to determine the annual climate capture width,

$$ACCW = \frac{\sum_{j=1}^{7} AACW(j)}{7}$$

which is divided by the characteristic capital expenditure CCE to determine the metric ACE.

Table 1. The full scale wave climate is represented using six sea states. The states, as well as weightings and annual omnidirectional wave power at each of the seven climates are listed for calculating ACE (all at full scale). Note that Bretschneider spectrum should be assumed. Off-head waves are included to represent directionality in the realistic climates considered. Applicants must use the ACE Template available on EERE Exchange to show calculation of ACE. Tp is peak wave period, and Hs is significant wave height.

Tp [s]	Hs [m]	Direction (Heading) [deg]	Scaling Factors for Each Climate						
			Alaska	Washington	Northern Oregon	Oregon	Northern California	Southern California	Hawaii
7.31	2.34	10	24.3%	13.7%	15.5%	17.5%	20.7%	15.2%	32.8%
9.86	2.64	0	33.2%	27.7%	30.7%	26.8%	23.0%	27.0%	24.5%
11.52	5.36	-70	7.5%	4.1%	5.6%	5.8%	1.2%	1.4%	0.1%
12.71	2.05	-10	20.0%	33.8%	34.4%	29.5%	46.6%	39.1%	13.3%
15.23	5.84	0	2.4%	2.2%	3.7%	3.4%	1.6%	1.0%	0.0%
16.50	3.25	0	1.2%	4.5%	4.2%	5.4%	6.4%	9.5%	1.3%
<Cp(j)> [kW/m] =			35.5	32.7	39.3	37.9	31.5	31.2	16.8

CCE

Previous work has indicated that the structural load bearing mass is the greatest Capital Expenditure (CapEx) driver, and that CapEx is the greatest part of overall cost (on a levelized basis). CapEx is determined by the design choices of the proposed WEC device, with the structural expenditure playing a dominant role. However, since existing metrics to evaluate WEC devices are derived from a body of research and knowledge based on predominantly rigid bodies systems manufactured out of steel, they do not cater for novel materials and non-rigid bodies. ACE is thus designed to allow for benefit-to-effort evaluation of many diverse devices, like collapsible structures made out of materials other than steel, or perhaps concepts manufactured out of concrete or composite materials, each with differing structural, loading type and material cost. Therefore Characteristic Capital Expenditure (CCE) is used to estimate the structural cost of a device, which uses a calculated measure of the structural load bearing mass of a device, and adjusts for the material types selected for the design as well as their manufactured cost per unit mass in volume production. The device structure accounts for the mass of any and all load bearing structures that are critical to the power conversion path. This includes:

- any structure that interacts with the wave environment,
- any supporting structures used to resist forces in the power conversion chain in the load path / force flow path,
- any significant load-bearing foundation components.

This implies that for a heaving buoy, for example, not only must the structure of the buoy be used to calculate CCE, but the structure of the reaction body must also be used. For offshore devices that require substantial structures, such as jack up barges or gravity bases, those structures must be included as well.

Once the structure is defined the CCE of a device is calculated using the following equation

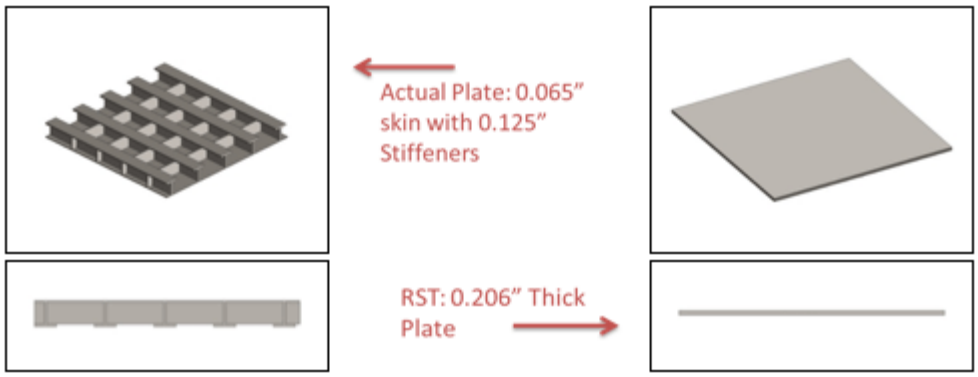
$$CCE = RST * A_{surf} * \rho * MMC$$

where:

- RST is representative structural thickness [m]
- A_{surf} is the total structural surface area [m^2]
- ρ is the material density [kg/m^3]
- MMC is the manufactured material cost [US$/kg]

If more than one structural material is used in a device, the individual CCEs for each material are summed to give a total CCE. Below are details on calculating each of the variables above for a single material in a device.

The surface area, A_{surf}, reflects a simple profile of the device (or of the part of the device made out of a particular material) and not the surface area of a detailed device design (e.g., does not include surface area of supporting girders, stiffeners, etc.). The representative structural thickness, RST, is a scalar that is used to determine the structural mass when multiplied by the surface area of the material. The RST is not the actual physical thickness of a structure; instead, it is the thickness that when multiplied with the A_{surf} of the particular material type of the WEC device, represents the volume of the structural material that is used to build the manufactured structural design of the WEC system. Multiplication of this volume with the structural material density will give the structural mass of a particular material. RST accounts for all the structural elements (e.g., girders, stiffeners, etc.) in a generalized / averaged manner. It can be visualized as a single uniform thickness obtained by "melting down" all of the structural components of a material, and then "casting" the shape of the WEC with a constant wall thickness, the RST. This means that all stiffeners and support structures are "lumped" together. A simple representation of the RST is shown below with a flat plate. The original structure includes a grid of stiffeners with a thin hull. That same quantity of material is then represented by a solid plate with the thickness given by the RST.



RST is also a function of loading conditions that the surface area will experience; different WEC designs and different parts of A_{surf} can be exposed to different loads. Therefore, documentation of the approximate anticipated loading cases, as well as the supporting structural analysis used to determine the required thickness of the structure with safety factors, should be provided in the FOA application. The safety factor quantities should be provided and justified, and the method(s) for applying them should also be included.

Small portions of materials that form part of the device (e.g., nuts and bolts) do not need to be separately accounted for. For material types that are a small portion of the total surface area of the device, and that are not essential elements of the load bearing mass, they should be allocated to one of the other material types in the load bearing mass.

The last critical variable to calculate CCE is the manufactured material cost (MMC). This value represents the total cost to manufacture the material used in a device at full production scale. Therefore, the MMC includes the raw material cost, any fabrication, forming, and assembly. In practice, the value of MMC will fluctuate due to material suppliers, complexity of device, number of devices, along with many other market factors. For example, the raw cost of structural steel may be approximately 1 $US/kg but by the time any forming, cutting, or welding is made the MMC may be closer to 3 $US/kg at full production.

Typical manufactured material costs (MMC) are given in the table below. However, some structures may need particularly high tolerances or additional manufacturing requirements. In that case the cost should be increased accordingly. Descriptions of what could cause the MMC value to deviate from the 'Typical' value provided here are also shown below. If materials other than those listed below are used, references and justification for the MMC will need to be included.

	Density and MMC Reference Table:			
Material Type	**Density [kg/m^3]**	**Low Manufactured Material Cost [USD/Tonne]**	**Typical Manufactured Material Cost [USD/Tonne]**	**High Manufactured Material Cost [USD/Tonne]**
Aluminum	2660	$4,900	$5,900	$8,000
Fiberglass	1550	$7,500	$8,200	$9,500
Filament Wound FRP	1682	$4,630	$5,510	$6,620
High-Density Polyethylene (HDPE)	970	$6,000	$7,900	$12,000
Reinforced Concrete	2450	$424	$510	$557
Steel	7850	$2,250	$3,000	$4,500

Aluminum	
Low MMC	A low MMC for aluminum represents devices that have simple geometries with little cutting and welding time required. These devices will be primarily comprised of flat plate, tubing, or "stock" structural members (I-beams, T-sections, etc.) that are able to utilize robotic welding. In the event that many "small" members are used to create larger members (such as in a truss) a typical or high MMC value should be used to represent the time required to cut, weld, and assemble the structure.
Typical MMC	A typical MMC for aluminum represents a geometry that is primarily comprised of simple structures described as Low MMC, but also includes a small portion of components that are more intricate and require significant man hours per unit mass. These smaller components would include ladders, mounting flanges, or any additional components that would require significant fabrication (i.e. welding, cutting, milling) but does not account for a large percentage of mass.
High MMC	A high MMC for aluminum represents a geometry that utilizes either complex geometries that require significant amounts of cutting, shaping, or welding. Geometries such as large truss structures, plate utilizing a high percentage of welded stiffeners, or irregular shapes that will require significant amounts of material removal will be considered for high MMC values. This can also represent a geometry with tight tolerance requirements that would be needed, for example, for seals or alignment specifications.

Fiberglass	
Low MMC	A Low MMC for fiberglass is typical for simple geometries such as two dimensional profiles with little to no internal stiffeners. Two dimensional profiles may include simple cylinders, box type structures, and even simple hydrofoil designs. This cost is also representative of components that require little post mold fabrication. Post mold fabrication may include any milling, cutting, or additional adhesion required to join multiple components together.
Typical MMC	A typical MMC for fiberglass represents simple geometries such as two dimensional profiles that do include internal stiffeners or bracing. Two dimensional profiles may include simple cylinders, box type structures, and even simple hydrofoil designs. This cost is also representative of components that will require post mold fabrication. Post mold fabrication may include any milling, cutting, or additional adhesion required to join multiple components together.
High MMC	A high MMC for fiberglass represents complex geometries such as three dimensional profiles that do include internal stiffeners or bracing. Three dimensional profiles may include hydrofoils with twist angles, and intricate hull designs that require elaborate molds. This cost is also representative of components that will require excessive post mold fabrication. Post mold fabrication may include any milling, cutting, or additional adhesion required to join multiple components together.

Filament Wound FRP	
Low MMC	A Low MMC for Filament Wound FRP is appropriate for simple geometries where die costs and labor do not represent a significant portion of the cost. A low MMC represents simple geometries such as traditional circular cross sections. This cost is also representative of components that require very little assembly, meaning the entire structure can be manufactured without significant man hours to combine pultruded parts. Additionally this represents lowest cost quantities of low cost fiberglass (i.e. E-glass/epoxy).
Typical MMC	A Typical MMC for Filament Wound FRP is appropriate for geometries where die costs and labor do not represent a significant portion of the cost, but die cost reflect more complex geometries such as hemispherical, or capped ends. This is similar to the Low MMC where the majority of the structure can be manufactured without significant assembly time. This represents the most common cost of mass produced E-glass/Epoxy structure.

High MMC	A High MMC for Filament Wound FRP represents components that have both complex geometries as well as significant labor requirements during assembly due to sub-assemblies or internal supports. A high MMC represents geometries that require more complex cross sections and/or significant assembly and modification hours. In addition to part complexity this also represents a typical range of material cost associated with E-glass/Epoxy structures. Note that components larger than several meters may not be within existing manufacturing capabilities and would greatly increase cost.

High-Density Polyethylene (HDPE)	
Low MMC	A low MMC for HDPE represents devices that are assembled with primarily off the shelf, and simple geometries. Geometries such as off the shelf pipe, or flat plate with minimal fastening (i.e. welding, adhesive, strapping, etc.) would be appropriate for a Low MMC value.
Typical MMC	Typical MMC values for HDPE represent simple molded geometries such as rectangular or cylindrical enclosures. Typical representations of these are fuel or water tanks. These geometries will have minimal internal or external stiffeners and bracing allowing for a simple mold geometry.
High MMC	High MMC values for HDPE represent complex geometries or geometries that have significant internal or external bracing. These geometries are synonymous with devices such as personal watercraft (kayaks, rafts, etc.) that require complex or multi-part molds to form the intricate baffles or stiffeners.

Reinforced Concrete	
Low MMC	A low MMC represents reinforced concrete that are able to be pre-cast and shipped and easily shipped. A low MMC will also represent geometries primarily comprised of flat sections.
Typical MMC	A typical MMC for reinforced concrete represents components that are cast on shore, and have relatively simple geometries (i.e. simple cylinders, flat sections, etc.).
High MMC	A high MMC for reinforced concrete represents components that will likely have to be cast in place, typically due to size. This will also represent complex geometries such as non-planar sections and sections with hollow chambers.

Steel	
Low MMC	A low MMC for steel represents devices that have simple geometries with little cutting and welding time required. These devices will be primarily comprised of flat plate, tubing, or "stock" structural members (I-beams, T-sections, etc.) that are able to utilize robotic welding. In the event that many "small" members are used to create larger members (such as in a truss) a typical or high MMC value should be used to represent the time required to cut, weld, and assemble the structure.
Typical MMC	A typical MMC for steel represents a geometry that is primarily comprised of simple structures described as Low MMC, but also includes a small portion of components that are more intricate and require significant man hours per unit mass. These smaller components would include ladders, mounting flanges, or any additional components that would require significant fabrication (i.e. welding, cutting, milling) but does not account for a large percentage of mass.
High MMC	A high MMC for steel represents a geometry that utilizes either complex geometries that require significant amounts of cutting, shaping, or welding. Geometries such as large truss structures, plate utilizing a high percentage of welded stiffeners, or irregular shapes that will require significant amounts of material removal will be considered for high MMC values. This can also represent a geometry with tight tolerance requirements that would be needed, for example, for seals or alignment specifications.