

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

**Fiscal Year 2023 Vehicle Technologies Office (VTO) Program
Wide Funding Opportunity Announcement**

Funding Opportunity Announcement (FOA) Number: DE-FOA-0002893

FOA Type: Initial

Assistance Listing Number: 81.086

FOA Issue Date:	5/19/2023
Submission Deadline for Concept Papers:	6/26/2023 5:00pm ET
Anticipated Date of Concept Paper Notifications	7/14/2023
Submission Deadline for Full Applications:	8/11/2023 5:00pm ET
Expected Date for EERE Selection Notifications:	November 2023
Expected Timeframe for Award Negotiations:	December 2023 – January 2024

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

NOTE: REGISTRATION/SUBMISSION REQUIREMENTS

Registration Requirements

There are several one-time actions that must be completed before submitting an application in response to this Funding Opportunity Announcement(FOA) (e.g., register with EERE eXCHANGE.gov, register with the System for Award Management (SAM), obtain a Unique Entity Identifier (UEI) number, register with Grants.gov, and, if selected for award, be registered in FedConnect). 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.

Applicants must register through the EERE eXCHANGE.

EERE eXCHANGE website: <https://eere-exchange.energy.gov/>

Applicants must register with the SAM.

SAM website: <http://www.sam.gov/> NOTE: Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. More information about SAM registration for applicants is found at:

[https://www.sam.gov/sam/transcript/Quick Guide for Grants Registrations v1.7.pdf](https://www.sam.gov/sam/transcript/Quick%20Guide%20for%20Grants%20Registrations%20v1.7.pdf).

Failure to register with SAM will prevent your organization from applying through Grants.gov. The applicant must maintain an active SAM registration with current information at all times during which it has an active Federal award or application under consideration. More information about SAM registration for applicants is found at:

[https://www.fsd.gov/gsafsd_sp?id=gsafsd kb articles&sys_id=650d493e1bab7c105465eaccac4bcbcb](https://www.fsd.gov/gsafsd_sp?id=gsafsd_kb_articles&sys_id=650d493e1bab7c105465eaccac4bcbcb).

NOTE: If clicking the SAM links do not work, please copy and paste the link into your browser.

Due to the high demand of SAM registrations and UEI requests, entity legal business name and address validations are taking longer than expected to process. Entities should start the SAM and UEI registration process as soon as possible. If entities have technical difficulties with the SAM registration or UEI validation process they should utilize the HELP feature on SAM.gov. SAM.gov will work entity service tickets in the order in which they are received and asks that entities not create multiple service tickets for the same request or technical issue. Additional entity validation resources can be found here: [GSAFSD Tier 0 Knowledge Base - Validating your Entity](#).

Unique Entity Identifier (UEI) – Applicants must obtain an UEI from the SAM to uniquely identify the entity. The UEI is available in the SAM entity registration record.

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NOTE: Subawardees/subrecipients at all tiers must also obtain an UEI from the SAM and provide the UEI to the Prime Recipient before the subaward can be issued. Full registration in SAM is not required to obtain an UEI for subaward reporting.

Applicants must register with Grants.gov.

Grants.gov website: <https://www.grants.gov/>

Applicants must register with Grants.gov in order to receive automatic updates, in the event that Amendments to this FOA are posted. However, please note that applications will not be accepted through Grants.gov. More information about the registration steps for Grants.gov is provided at: <https://www.grants.gov/web/grants/applicants/registration.html>

Applicants must register with FedConnect.

FedConnect website: www.fedconnect.net.

In the event that an application is selected for negotiation of award, Applicants must be registered with FedConnect to receive the award. For more information regarding registration with FedConnect review the FedConnect Ready, Set, Go! Guide at https://www.fedconnect.net/FedConnect/Marketing/Documents/FedConnect_Ready_Set_Go.pdf.

Submission Requirements

All application submissions are to be made via the EERE eXCHANGE at <https://eere-exchange.energy.gov/>. To gain access to the EERE eXCHANGE system, the applicant must first register and create an account on the main EERE eXCHANGE site. This account will then allow the user to submit an application for open EERE Funding Opportunity Announcements (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, utilize one account as the appropriate contact information for each submission.

Applicants will receive an automated response when the Application is received; this will serve as a confirmation of EERE receipt. Please do not reply to the automated response. A “User Guide” for the EERE eXCHANGE can be found on the EERE website at <https://eere-exchange.energy.gov/Manuals.aspx> after logging in to the system.

To receive notices via email regarding an FOA in EERE Exchange, such as amendments to the announcement or the posting of new questions and answers from eXCHANGE you must initiate an application submission to the FOA of interest. Please note that you must finalize and submit your application before the specified due date and time to be considered for award.

Questions

Questions related to the use of the EERE eXCHANGE website or technical issues concerning the application submittal should be submitted to: EERE-ExchangeSupport@hq.doe.gov.

Questions related to the content of the Funding Opportunity Announcement must be submitted to: DE-FOA-0002893@netl.doe.gov and shall be submitted not later than three (3)

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business days prior to the application due date and time. Questions submitted after that date may not allow the Government sufficient time to respond.

All questions and answers related to the content of this FOA will be posted at <https://eere-exchange.energy.gov/FAQ.aspx>. Applicants are encouraged to check the FAQ prior to submitting a question. DOE will try to respond to questions within 5 business days. Applicants are encouraged to review the posted questions and answers daily. **Please note that you must first select this FOA Number in order to view the questions and answers specific to this FOA.**

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I. FUNDING OPPORTUNITY DESCRIPTION

A. Background and Context

The Office of Energy Efficiency and Renewable Energy (EERE), on behalf of the Vehicle Technologies Office (VTO), is issuing a Funding Opportunity Announcement (FOA) entitled, “Fiscal Year 2023 Vehicle Technologies Office Program Wide Funding Opportunity Announcement”. The activities supported by this FOA are authorized under the Energy Policy Act of 2005 (EPACT 2005) Public Law 109-58, TITLE IX - Energy Efficiency, Section 911. These provisions are found in the United States Code at 42 U.S.C. § 16191. Additional authorities include the following:

- Title VII, Subtitles B, C, D of EPACT 2005 (42 U.S.C. §§ 16061-16093)
- Sections 131-136 of EISA 2007 (42 U.S.C. § Electric Drive System Innovations
- § 17011-17013)

i. Background and Purpose

Building a clean and equitable energy economy and addressing the climate crisis is a top priority of the Biden Administration. This FOA will advance the Biden Administration’s goals to achieve carbon pollution-free electricity by 2035 and to “deliver an equitable, clean energy future, and put the United States on a path to achieve net-zero emissions, economy-wide, by no later than 2050”¹ to the benefit of all Americans. The Department of Energy is committed to pushing the frontiers of science and engineering, catalyzing clean energy jobs through research, development, demonstration, and deployment (RDD&D), and ensuring environmental justice and inclusion of underserved communities.

The research and development (R&D) activities to be funded under this FOA will support the government-wide approach to the climate crisis by driving the innovation that can lead to the deployment of clean energy technologies, which are critical for climate protection. Specifically, this FOA is seeking innovative solutions for on-road and off-road vehicles to develop and accelerate the charging infrastructure and drastically-reduced GHG emissions in support of Administration goals. In partnership with industry, VTO has established aggressive targets to focus research, demonstration and deployment on cost-reduction, efficiency, and emissions reduction that improve air quality and improved mobility.

¹ Executive Order 14008, “Tackling the Climate Crisis at Home and Abroad,” January 27, 2021.

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ii. Technology Space and Strategic Goals

This funding opportunity announcement (FOA) seeks research projects to address priorities in the following areas: the cost-effective deployment of EV charging for those without easy home charging; innovative solutions to improve mobility options for underserved communities; community engagement to accelerate clean transportation options in underserved communities; batteries and electrification; materials technologies; mobility system supporting public transportation; advanced vehicle charging solutions, dimethyl ether engine for off-road applications, hydrogen combustion engines, to improve fuel economy and reduce GHG emissions with the goals of carbon pollution free electricity by 2035 and net-zero of GHG emissions by 2050. Detailed technical descriptions of the specific topics are provided in the sections that follow.

iii. Teaming Partner List

DOE is compiling a Teaming Partner List to facilitate the formation of new project teams for this FOA. The Teaming Partner List allows organizations who may wish to participate on an application to express their interest to other applicants and to explore potential partnerships.

SUBMISSION INSTRUCTIONS: Any organization that would like to be included on this list should access EERE eXCHANGE and choose the menu item labelled Teaming Partners. From the pulldown menu, select this FOA, DE-FOA-0002893. Enter your organization and contact information and press Register. For further information regarding teaming partner lists, see <https://eere-exchange.energy.gov/Manuals.aspx>.

B. Topic Areas

Topic Area of Interest Number	Topic Area of Interest Title
Batteries and Electrification	
1a	High-Capacity, Long Cycle Life Lithium-Sulfur (Li-S) Batteries
1b	Mechanistic Modeling of Li-S Batteries
2	Improved 12-volt Lead Acid Batteries for Safety-critical Electric Vehicle Applications
3	Advanced Integrated On-board Charging System
4	Advanced Wireless Charging Concepts for Heavy-Duty Vehicles
Combustion and Advanced Fuels	
5	Development and Demonstration of Dimethyl Ether Engine for Off-Road Applications
6	Hydrogen Combustion Engines
Lightweight Materials	
7	Circularity and Sustainability of Polymer Composites for Vehicle Lightweighting and Decarbonization
8	Domestic Magnesium Production Research
9	Novel Lightweight Materials
Energy Efficient Mobility Systems	
10	Mobility System Approaches Supporting Public Transportation
Technology Integration	
11	Reducing Soft Costs of Electric Vehicle Infrastructure to Enable Widespread Deployment
12	Consumer Education Campaign for Electric Vehicles and Charging
13	Demonstration and Deployment (Open topic)
14	Clean Cities Coalition Network Outreach, Education and Training

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Area of Interest 1a: High-Capacity, Long Cycle Life Lithium-Sulfur (Li-S) Batteries

Introduction

Lithium-based batteries are the favored technology for decarbonization of the transportation sector via electric vehicles; however, several key targets, including cost and energy density (which is coupled to vehicle range), are difficult to meet based on the materials presently in use. In particular, layered metal oxide cathode materials like NMC are composed of cobalt and nickel, which incur higher cost, potential price instability due to the rapid increase in demand, and supply chain constraints with regards to ore sourcing and processing.

Sulfur cathodes, by contrast, are based on low-cost, highly abundant material, alleviating supply chain concerns and also have a very high specific capacity, promising a path forward to higher cell energy densities. Technical feasibility of lithium-sulfur batteries has been made difficult by several materials and cell design issues, including the polysulfide shuttle phenomenon, volume change with cycling, and low electronic and ionic conductivity which lead to poor cycling behavior and low energy density due to low S utilization in high loading electrodes.

This topic seeks 2 Ah or greater Li-S cells designed to address these issues sufficiently to rival lithium-ion battery performance and cycle life.

Objective

Proposed work must be cathode-focused in order to improve S utilization, control polysulfide shuttle and other loss mechanisms. The expected final deliverable includes five 2 Ah or greater Li-S cells delivered for independent testing and demonstrating at least 250 Wh/kg and over 1,000 cycles at C/3 charge/discharge rate, 80% depth of discharge, with 80% capacity retention. Higher sulfur cathode loadings and long cycle life may be achieved, for example, through novel cathode architectures or cell designs, improved catholytes, catalysts to improve Li₂S conversion or to decompose polysulfides, and sulfurized polymers, among other innovative approaches.

Table: Performance targets for Li-S cells deliverables

Initial cell capacity	≥2 Ah
Cell energy density	≥250 Wh/kg
Cell cycle life	≥1,000 cycles with 80% initial capacity
Cell applied pressure	≤1 MPa
Temperature	Ambient (25 °C)

Requirements

Final deliverables:

1. Identify the cell components' composition/construction with a focus on the sulfur based cathode being developed, but also describe and justify the choice of cathode material(s) including conductive components, catalysts (if any), binder, and the sulfur active material and electrolyte composition;

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2. Identify major issues impeding the proposed cell chemistry and the specific barriers to be overcome during the research effort to reach the deliverable targets for energy density and cycle life. Include the strategy for minimizing applied pressure for solid electrolyte systems;
3. Describe how the proposed effort is different than past and current research efforts;
4. Include supporting theoretical predictions and/or relevant experimental data supporting performance claims;
5. Indicate if data is from half-cells or paired with an anode material; full cell data is preferred, however in the event only half cell data is available coulombic efficiency must be included:
 - a. Include the electrode loading (mAh/cm² and mg S/cm²) and composition (weight %), and electrolyte loading (μL/mg S for liquid; thickness of membrane layer for solid) and electrolyte composition of all cell performance data; and
 - b. Indicate what temperature the experiments were performed at as well as the upper and lower voltage and applied pressure used for cycling the cell.
6. Identify performance targets that represent the highest risk for achievement during the project and the strategies to mitigate these risks;
7. The cell specific energy milestone of this topic is 250 Wh/kg, but S cathode cells can achieve much higher specific energies. Detail a viable strategy to achieve 350 Wh/kg or higher through improvements to cell design such as lean electrolyte formulations (≤6 μL/mg S, liquid; ≤50 μm membrane thickness, solid) and high sulfur loading (≤6 mg S/cm²) that is compatible with the materials and design that will be pursued to meet the 250 Wh/kg deliverable;
8. Describe the testing and diagnostics planned to characterize, investigate, and mitigate issues; and
9. Go-No Go decision point based on internal full cell test results demonstrating progress towards final targets must be included in the SOPO.

Teaming Arrangements

It is strongly encouraged that a battery manufacturer or OEM be the prime applicant.

Special Deliverables

Final deliverables:

1. Five ≥2 Ah cells meeting the above requirements to be delivered to DOE for independent testing; and
2. At least one month of testing data for all deliverable cell builds will be carried out by the Applicant following test protocols approved by the DOE. This data will be shared with DOE and the testing lab prior to deliverable shipment to the testing laboratory.

Note: All cell deliverables must be greater than 2 Ah. It is acceptable to deliver cells that do not meet performance targets, as long as the cell components (electrodes with similar active material content, porosity, thickness, loading, etc. and separator thickness) in the delivered

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cells, when scaled to automotive size (40Ah or greater) are capable of meeting the targets: i.e., an applicant will not be penalized for packaging inefficiencies of small cells, but needs to deliver cells with automotive relevant electrodes, separators, and electrolyte volume. If the deliverable cells do not meet performance targets, a model validating the proposed scaling factors will also be required for baseline, interim, and final cells.

All cells shall be provided to the DOE for validation testing at a to-be-designated DOE National Laboratory. Non-Destructive Performance Validation testing will be conducted on the cells to validate performance. This testing will be conducted outside the scope of the proposed project and should not be included in the total estimated project costs included with the application. Participation by a DOE National Laboratory in test planning and execution will be addressed by a Non-Disclosure Agreement (NDA) between the National Laboratory and the Applicant.

Test procedures will be provided by the Applicant and shall incorporate specifications and limits supplied by the manufacturer for the specific technology such as voltage and current limits, state of charge, charging, and temperature recommendations, number of test sequences, and/or other relevant test conditions as appropriate. The results of the DOE national laboratory testing may be documented in a publicly releasable Summary Test Report (approved by both DOE and the Applicant prior to release) that validates performance of the deliverables relative to the end item performance targets as well as the technology deployment impact relative to DOE strategic goals. The Summary Test Report will be approved by the DOE (Vehicle Technologies Office) and the Applicant. Test cells or special test equipment supplied by the end item manufacturer for the purposes of the test will be returned at the conclusion of testing at no cost to the project.

Applications Discouraged

The following applications are discouraged:

1. Those that focus on anode or electrolyte development;
2. Those that incorporate precious or expensive metals such as Ag or In; and
3. Those that include excess applied cell stack pressure ≥ 1 MPa.

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Area of Interest 1b: Mechanistic Modeling of Li-S Batteries**Introduction**

In addition to being low-cost and abundant, sulfur battery cathodes can achieve much higher energy densities than cathodes presently in commercial use for lithium-ion batteries. To date, however, only modest energy densities and low cycle life cells have been achieved due to the difficulty of increasing sulfur utilization in high-loading sulfur cathodes. Because the sulfur cathode depends on the conversion of sulfur to Li_2S on discharge and the reverse reaction during charging, lithium ions and electrons must be distributed to the sulfur cathode active material to enable the reaction, as sulfur is neither electronically nor ionically conductive. Furthermore, the complex set of electrochemical steps and intermediates between elemental sulfur, S_8 , and Li_2S , impose thermodynamic, kinetic and transport limitations (including the high solubility of the intermediate polysulfide species in organic electrolytes).

Improving the state of the art in Li-S batteries depends on comprehensive understanding of the sulfur to Li_2S conversion reaction and its reverse to overcome the present limitations in sulfur cathode design and cell cycle life. This understanding is also necessary to point the way towards effective integration of sulfur cathodes into high-cycle life, high-energy density Li-S batteries. Although many aspects of sulfur cathode cycling have been reported in the literature, the field lacks a comprehensive electrochemical model incorporating reaction pathways, electrolyte interactions, and cathode composition and morphology, all bolstered by experiment. This topic seeks coupled experimental and computational investigation resulting in a significantly enhanced understanding of the thermodynamic, kinetic, and transport parameters governing electrochemical cycling of sulfur conversion cathodes.

Objective

The topic seeks more accurate and in-depth understanding of sulfur cathode electrochemistry through closely coupled experimental and computational investigation of all relevant phenomena. The goal of this understanding is to indicate materials and electrode design approaches that will improve practical sulfur cathode energy density and cycle life.

Requirements

1. Outline methodology and tools for investigating:
 - a. Thermodynamics and kinetics of sulfur oxidation to Li_2S and Li_2S reduction to sulfur, including all intermediate steps;
 - b. Relevant transport phenomena, including the dissolution and deposition of polysulfide intermediate species and lithium ion and electron transport during sulfur reduction and oxidation;
 - c. The role of electrolyte composition and the electron conductor composition and distribution in the cathode to promote sulfur cycling; and
 - d. Loss mechanisms, including deleterious side reactions, formation of isolated sulfur or Li_2S , etc.

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2. Identify critical barriers and risks in approach that potentially impede full, accurate understanding of sulfur cathode electrochemical cycling; and
 3. Describe how the proposed effort is different than past and current research efforts.

Teaming Arrangements

None.

Special Deliverables

In addition to standard reporting requirements, reports will be prepared and submitted to be published as part of the Advanced Battery Materials Research (BMR) quarterly report (available at bmr.lbl.gov).

Applications Discouraged

Applications that focus on anode or electrolyte development.

Area of Interest 2: Improved 12 Volt Lead Acid Batteries for Safety-Critical Electric Vehicle Applications**Introduction**

The lead acid battery is a mature technology and has been used in many power applications for over 100 years. The technology employs lead (Pb) as the active material of the negative electrode, lead dioxide (PbO₂) as the active material of the positive electrode, and sulfuric acid (about 35% by weight) as the electrolyte. The theoretical specific energy of the technology is 171 Wh/kg, but practical lead acid batteries' specific energies are in the range of 30-45 Wh/kg.

In addition to having the highest cell voltage (2 Volts) of all battery technologies using aqueous electrolytes, a major advantage of lead acid batteries is their ability to supply both high and low currents over a wide range of temperatures (-40°C to 55 °C). As a result, lead acid batteries are primarily used to start an Internal Combustion Engine Vehicle (ICEV), typically known as Starting, Lighting and Ignition (SLI) application.

Objective:

Although lead acid batteries are not suitable for present electric vehicles (EVs) due to their low specific energy and limited cycle life, a 12V (typically rated at 70 Ah) lead acid battery can still be employed in EVs. In this application, the 12V battery serves as a critical safety feature to engage and disengage the high-voltage propulsion battery (typically a lithium-ion battery rated between 400-800V and 60-100 kWh). Additionally, EVs that utilize a primary lithium battery require redundant power for safety critical features such as automated driving assistance, adaptive cruise control, street sign recognition, lane centering, steer-by-wire systems, brake-by-wire systems, and evasion assistance. Today's EVs use either lead acid or lithium-ion batteries for this 12V auxiliary (AUX) battery application. For lead acid batteries, either the enhanced flooded battery (EFB) type (also referred to maintenance free lead acid battery) or the absorbed glass mat (AGM) battery can perform this critical safety function. The main objective of this FOA is to improve the service life and performance requirements to meet these critical safety features while reducing the cost of the EFB and AGM lead acid battery. Improvements in 12V lead battery performance and cost can be achieved through development of more robust product designs and manufacturing processes.

Requirements:

For both types of lead acid batteries, self-discharge and especially corrosion of the lead grid used at the current collectors are life limiting. Research is needed to improve the service life by a factor of 1.5-2.0 over current commercial battery technology (i.e. go from 5-8 year currently for lead acid to 10 – 15 years to match OEM current practice), while meeting safety critical performance requirements.

For AGM acid batteries, the cost is high due to expensive components such as the fiberglass mat used between the positive and negative electrodes. Research is needed to find alternate,

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low-cost materials to lower battery cost by a factor of 1.55 - 2.0 over existing technology without sacrificing the performance needed to meet safety critical performance requirements.

Applications ***must*** include:

1. Identify the battery components' composition/construction;
2. Identify major issues impeding the proposed cell chemistry and the specific barriers to be overcome during the research effort to reach the deliverable targets;
3. Describe how the proposed effort is different than past and current research efforts;
4. Include supporting theoretical predictions and/or relevant experimental data supporting performance claims;
5. Indicate current service life and cost and the proposed goal of the research plan;
6. Identify performance targets needed to meet safety critical applications and the performance targets that represent the highest risk for achievement during the project and the strategies to mitigate these risks;
7. Describe the testing and diagnostics planned to characterize, investigate, and mitigate issues; and
8. Explain how, if the proposed R&D plan is successful, the 12V lead acid battery developed would be a competitive commercial option to a lithium-ion 12V battery for safety critical applications in electric vehicles.

Teaming Arrangements

Collaborative teams combining knowledge and capabilities are encouraged.

Special Deliverables

Three, 12V lead acid batteries for an independent evaluation. Technical reports and research papers that document battery life and cost improvement.

All batteries shall be provided to the DOE for validation testing at a to-be-designated DOE National Laboratory. Non-Destructive Performance Validation testing will be conducted on the batteries to validate performance. This testing will be conducted outside the scope of the proposed project and should not be included in the total estimated project costs included with the application. Participation by a DOE National Laboratory in test planning and execution will be addressed by a Non-Disclosure Agreement (NDA) between the National Laboratory and the Applicant. Test procedures will be provided by the Applicant and shall incorporate specifications and limits supplied by the manufacturer for the specific technology such as voltage and current limits, state of charge, charging, and temperature recommendations, number of test sequences, and/or other relevant test conditions as appropriate. The results of the DOE national laboratory testing may be documented in a publicly releasable Summary Test Report (approved by both DOE and the Applicant prior to release) that validates performance of the deliverables relative to the end item performance targets as well as the technology deployment impact relative to DOE strategic goals. The Summary Test Report will be approved by the DOE (Vehicle Technologies Office) and the Applicant. Test batteries or special test

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equipment supplied by the end item manufacturer for the purposes of the test will be returned at the conclusion of testing at no cost to the project.

Applications Discouraged

None.

Applications not of Interest

Lead acid batteries used or designed for energy storage grid application and uninterrupted power supply application.

Lead acid batteries for EV propulsion application.

Area of Interest 3: Advanced Integrated On-board Charging System**Introduction**

Plug-in electric vehicles (EVs) have an on-board charging system, which converts alternating current (AC) input power into direct current (DC) power for the on-board battery and controls the current and voltage at which the battery is charged. Development of EVs has historically focused on independent advancement of on-board charging systems and electric traction drive systems. This approach has resulted in a system that is not optimized for vehicle cost, mass, and volume, and does not enable the full capabilities of the technologies utilized. Functional integration of the charging and electric traction drive systems can enable not only reduced vehicle cost, mass, and volume, but can provide enhanced capabilities, such as enabling the vehicle to provide power to homes, buildings, or the grid, enabling smart charge management. Today this enhanced capability is only available through separate components that increase cost and require additional packaging space, which hinders the adoption in most electric vehicles.

Objective

The objective of this area of interest (AOI) is to research, develop, and demonstrate innovative, functionally integrated systems co-optimizing both on-board charging and electric traction drive power electronics to reduce cost and improve charging capability, including bi-directional vehicle-to-home (V2H) and vehicle-to-building (V2B). The projects should focus on integration and optimization of the on-board charger and inverter to provide increased functionality with an improved efficiency and reduced overall cost. This AOI focuses on integration of on-board charger/inverter and utilization of advanced materials to improve performance and reliability of on-board power electronics while reducing overall cost, mass, and volume. Vehicle demonstration and validation in real world environments is required, with technologies applicable to light, medium, and/or heavy-duty battery electric vehicles.

Potential areas of innovation for integration include, but are not limited to:

1. Novel technologies which co-optimize the functional integration of the on-board charger/inverter;
2. Advanced component integration (Wide Band Gap semiconductors, capacitors, magnetics);
3. Thermal management innovations;
4. Innovative use of advanced materials to improve or benefit the integrated system;
5. Multi-physics integration of power electronics;
6. Bi-directional inductive power transfer systems; and
7. Higher voltage on-board system architecture (> 1kV).

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General Requirements

Applications ***must*** include:

1. Identify the approach for the co-optimized integrated charging/electric traction drive solution and the proposed advancements to the state-of-the-art charging and electric traction drive systems;
2. Identify the baseline system, specifications, and the associated cost, mass, volume, and efficiency;
3. Describe the improvements to the charging and propulsion system packaging, capabilities, performance, and lifetime/reliability and reductions in the system cost;
4. Describe the overall integrated systems charge power rating, bi-directional capability, electric traction drive power rating, system voltage, and efficiency;
5. Target a technology that provides a bi-directional charging capability of at least 7.2 kW;
6. Provide schematics of the proposed integrated system topology;
7. Identify the planned vehicle application, typical usage of the system, and the impact of the increased charging and/or propulsion capability, and the potential impact of the technology to the market;
8. Identify and describe the flexibility and scalability of the integrated system design to different power levels and/or vehicle applications (vehicle classes and vocations);
9. Describe the proposed R&D to be performed and describe the advancements of the technology to overcome current challenges;
10. Describe the benefits of the technology on EV adoption and the market penetration of the technology;
11. Identify the potential technological and market risks and a plan to mitigate these risks;
12. Describe the proposed demonstration vehicle(s) to be used and the plan for validation of the system in real world environments;
13. Describe the proposed validation plan of the full-scale system in a vehicle;
14. Describe the supporting off-board infrastructure requirements for the vehicle and/or technology;
15. Describe the supporting distribution grid requirements (voltage, capacity, etc.) for the vehicle and/or technology;
16. Describe the approach to comply with applicable vehicle, safety, and isolation standards; and
17. Identify all team members and their role in the project.

Teaming Arrangements

Teams are highly encouraged to include vehicle manufacturers, power electronics and charging equipment manufacturers/suppliers.

Special Deliverables

None.

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Area of Interest 4: Advanced Wireless Charging Concepts for Heavy -Duty Vehicles

Introduction

The electrification of commercial heavy-duty vehicles for short-haul applications (often point-to-point, multiple daily trips of 100- 150 miles or depot to destination delivery) is garnering strong interest due to a combination of environmental and economic benefits. However, many of these vehicles will require high-power charging rates to meet their high-power requirements and long daily usage rates with a reasonable battery size. Fast charging, within the operating patterns of these trucks, will enable broader utilization of battery-electric trucks. Wireless power transfer technologies are a potentially viable solution to more seamless charging due to the operational nature of vehicles in these applications, which often need to stop at depots, ports, warehouses and/or distribution centers for loading and unloading. Furthermore, these vehicles typically have known, well-defined operation and routes which enables optimal placement of coils for automated stationary or opportunity charging. To date, the development of wireless power transfer in high-power applications has been limited and further development is needed for the charging coils, thermal management, materials, shielding, and power electronics. Advances in these areas are needed to improve the operating efficiency, reduce cost, mass, and volume, and address market adoption challenges. In addition, experience and real world data is needed on the operating patterns for these types of trucks to evaluate if wireless charging can deliver the needed benefits and lower total cost of charging, including decreased down time. The development of novel high-power wireless power transfer concepts and cost reduction measures for short-haul heavy-duty vehicle charging systems could enable greater market penetration in other applications, such as medium-duty vehicles and off-road vehicles. Ultimately, demonstrations in real world applications are needed to show potential use cases where wireless charging can offer significant improvement in operational efficiency compared to conventional wired charging.

Objective

The objective of this AOI is to research, develop, and demonstrate advanced wireless charging concepts for electrified heavy-duty commercial vehicles in static and/or opportunity charging applications capable of charging at rates required to meet the vehicle's daily energy and operational requirements. Applications in depots and warehouses used by short-haul/regional HD trucks are of particularly strong interest given the vast number of these depots and the potential replicability of projects that focus on depots. Advancements in coil design, coil materials, electromagnetic field shielding, thermal management, and power electronics are needed to improve the performance, reliability, and efficiency of wireless power transfer systems while reducing volume, mass, and costs. The projects must focus on identifying an appropriate use case for the advanced wireless charging systems use in heavy commercial short-haul applications, developing the technological advances, and then demonstrating the final system in a real-world application to validate the potential for the system to provide value to electric heavy-duty commercial short-haul vehicles. Demonstrations in northern climates are of particular interest.

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The project must demonstrate a compelling use case for wireless charging (compared to fixed, wired charging), including the added hardware/infrastructure cost vs. the operational cost savings.

Potential areas of technical innovation include, but are not limited to:

1. Novel charging coil configurations;
2. Advanced coil materials;
3. Novel approaches to shielding;
4. Advanced thermal management approaches;
5. Power electronics;
6. Controls and communications; and
7. Foreign object detection.

General Requirements

Applications ***must*** include:

1. Identify the use case(s) for the proposed wireless power transfer system including: (a) the planned vehicle and/or equipment application, (b) the location of the chargers and how they support the operational profile of the trucks using the system, (c) the planned usage of the charging system (charging power, anticipated charge profile, charging time, total energy required), and (d) the anticipated equipment, installation, and charging costs;
2. Compare the total system cost and benefits of the proposed solution as compared to wired charging options;
3. Identify the wireless power transfer technology advancement and how the research will lead to a real-world demonstration of a full system with a total system efficiency greater than 90%;
4. Identify the approach for the advanced wireless power transfer system and the proposed advancements to the state of the art;
5. Identify the improvements to all wireless charging system components, including the coils, shielding, thermal management, materials, and/or power electronics;
6. Provide schematics of the proposed wireless power transfer system topology;
7. Describe the anticipate and misalignment tolerance;
8. Describe the potential impact of the technology to the market;
9. Describe the proposed R&D to be performed and describe the advancements of the technology to overcome current challenges;
10. Describe the supporting distribution grid requirements (voltage, capacity, etc.) for the technology;
11. Describe the approach to comply with applicable safety standards; and
12. Describe the proposed real-world demonstration plan of the full-scale system and vehicles operating in a northern climate, in areas with high ratio of renewable energy deployment.

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Specific Requirements

None.

Teaming Arrangements

Applicant teams must include operators of truck fleets and freight distribution sites where the proposed wireless charging would occur. Applicants are encouraged to include a vehicle manufacturer, wireless charging technology manufacturer, utility, and national laboratories as needed.

Special Deliverables

None.

Area of Interest 5: Development and Demonstration of Dimethyl Ether Engine for Off-Road Applications

Introduction

Dimethyl ether (DME) is a gaseous fuel that condenses at relatively low pressure and has potential for use as a fuel in medium- and heavy-duty off-road vehicles and equipment. DME is suitable for use in compression-ignition (CI) engines, produces little or no soot, and can be produced from renewable sources, resulting in a reduction in GHG emissions. The use of DME in off-road vehicles, such as construction and agricultural equipment, has the potential to improve local air quality due to its characteristically non-sooting combustion. Though NO_x emissions continue to be a concern, the decoupling of NO_x and PM (avoiding “the NO_x-PM tradeoff”) should prove beneficial. Reducing GHG emission from these non-road applications through battery electrification is also challenging, but DME produced from renewables could provide an approach to addressing GHG emissions.

Objective

The objective of this AOI is to develop and demonstrate a near-commercial, direct-injection engine prototype suitable for use in off-road vehicles or equipment that demonstrates a substantial reduction in GHG emissions when operated with a renewable source of DME. Engine demonstration may be conducted via engine dynamometer testing or vehicle platform integration and chassis dynamometer testing.

General Requirements

Applications ***must*** include:

1. Identify a baseline, medium-duty engine using commercial emission control;
2. Identify EPA emission standards applicable to the project period and how the technology will achieve emissions equal to or lower than prevailing, applicable EPA off-road standards;
3. Identify a route to reduced GHG emissions, including an estimate of level of reduction, when paired with renewably-produced DME and demonstrate compatibility with renewable DME;
4. Include a detailed test plan, including duty cycle, to demonstrate the benefit of the developed technology, the plan should consist of two phases:
 - a. Phase 1 – Technology Development: (Not to exceed two budget periods) This phase should culminate in a Go/No-Go milestone that provides a proof-of-concept and validation of the new technology leading to GHG emission improvement.
 - b. Phase 2 – Demonstration: (At least one budget period), this phase should include integration of the technology on the engine and demonstration of the GHG reduction benefits on a testbed that can simulate the relevant duty-cycles (regulatory and/or real world), or on a vehicle. Demonstration should be conducted with renewable DME, if available.
5. Identify barriers to improved engine efficiency using DME;

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6. Identify technology approaches to overcome these barriers during the project period;
 7. Identify the projected efficiency of the developed engine as well as the increase in efficiency when compared to the baseline engine;
 8. Identify metrics and measures to be used to track project progress;
 9. Identify the plan for testing and validating engine efficiency and emissions compliance when operating on DME;
 10. Include a plan to demonstrate, via engine or chassis dynamometer testing, 200-hour engine durability (credible, accelerated durability testing protocol is also acceptable);
 11. Applicant team must include an engine OEM;
 12. Include a credible cost-effectiveness analysis showing that the total cost of ownership for a vehicle employing the proposed enabling technology will be reduced if the technology is applied at commercial scale (modeled); and
 13. Identify metrics and measures to be used to track project progress.

Selected projects will be required to participate in the VTO Annual Merit Review held in Washington DC.

Area of Interest 6: Hydrogen Combustion Engines

Introduction

Hydrogen fuel has been identified as a key part of decarbonizing the transportation industry in the recently released the U.S. National Blueprint for Transportation Decarbonization, the landmark interagency framework of strategies and actions to remove all emissions from the transportation sector by 2050⁹. Directly using hydrogen in medium- and heavy-duty fuel cell trucks and non-road vehicles is a core strategy to achieve net zero GHG emissions and has been widely supported by industry with significant R&D happening within government and industry. Until fuel cells can achieve the cost and durability targets needed, it is possible to efficiently use hydrogen in internal combustion engines in on- and non-road vehicles as a bridge technology to fuel cells or as an alternative in applications where fuel cells currently do not have the demonstrated capabilities. Hydrogen fueled internal combustion engine (H₂-ICE) has several favorable attributes including the use of the existing engine platforms, insensitivity to hydrogen quality, and use of existing hydrogen production and distribution systems that can enable rapid and widespread deployment of both powertrains and the associated infrastructure which could later complement fuel cell vehicles. Recognizing the importance of hydrogen fuel, there is a need for research and development that can achieve significant efficiency and emissions improvements in hydrogen combustion engines.

Objective

The objective of the area of interest is to research, develop, and validate an internal combustion (IC) engine for on-road and non-road (off-road, rail, and shipping) applications that can fully operate on hydrogen while achieving near or equivalent efficiency of conventional diesel engines and meeting prevailing EPA emission standards. While 4-stroke IC engines are predominant in commercial vehicle application, we also encourage proposals for hydrogen combustion by two-stroke opposed piston engines.

Technology approaches are anticipated to include, but are not limited to:

1. Lean spark-ignited hydrogen combustion;
2. Direct-injection hydrogen combustion;
3. Fuel injection system for direct injection and port fuel injection;
4. Improved injectors for direct injection hydrogen engines;
5. Improved turbochargers for hydrogen combustion engine;
6. Improved knock sensors; and
7. After-treatment systems for hydrogen combustion engine.

General Requirements

Applications **must** include:

⁹ <https://www.energy.gov/eere/us-national-blueprint-transportation-decarbonization-joint-strategy-transform-transportation>

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1. Describe the status of hydrogen engine technology and potential application and market penetration;
 2. Describe the benefits of this technology on transportation decarbonization.
 3. Identify major technical challenges to hydrogen engine development and commercialization such as, power density, engine and injector durability, pre-ignition, thermal management, criteria emissions, material compatibility, etc;
 4. Identify technology approaches to overcome these barriers during the project period;
 5. Identify the projected efficiency over the operating range of the developed hydrogen engine as well as the increase in efficiency when compared to the baseline commercial engine;
 6. Identify baseline engine NOx and PM and the projected reduction;
 7. Identify metrics and measures to be used to track project progress and their validation;
 8. Identify the plan for testing and validating hydrogen engine efficiency and emission compliance; and
 9. Include a detailed cost-effectiveness analysis showing the total cost of ownership when this engine is used in a state-of-the art commercial vehicle.

Teaming Arrangements

Applicant teams should include an Original Equipment Manufacturer (OEM). Teams are also encouraged to include research partners from universities and/or National Laboratories.

Special Deliverables

In addition to the deliverables required in the Federal Assistance Reporting Requirements Checklist, VTO will require recipients to participate in the EERE Annual Merit Review (AMR) in Washington, D.C. and report on annual project accomplishments for inclusion in the VTO Annual Accomplishments Report.

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**Area of Interest 7: Circularity and Sustainability of Polymer Composites for Vehicle
Lightweighting and Decarbonization**

Introduction

Vehicle lightweighting provides opportunities to increase electric vehicle (EV) drive range, reduce battery size and cost, and decrease carbon emissions. EVs are driving significant strides in the decarbonization of the nation’s transportation system. This burgeoning demand places ever greater importance on the development of lightweight and low carbon footprint materials. Polymer composites offer great opportunities for lightweighting but have a relatively high manufacturing carbon footprint and low recyclability. Reuse/repurposing and recycling are key elements in a circular economy. A paradigm shift in polymer composites design and manufacturing is urgently needed to enable vehicle decarbonization via low carbon footprint polymer composites.

Recyclable polymer composites are an important class of materials with low density, high strength, and low carbon footprint. Recyclable polymeric materials can be reinforced with natural or recycled/reclaimed high-performance fibers to make composites more eco-friendly and sustainable. Such recycled polymer composites have the potential to replace traditional nonrecyclable petroleum-based composite materials and other metallic materials such as steels and aluminum. As such, the next generation EV systems can have significantly increased performance at a reduced cost, embodied energy, and carbon footprint. Several technology roadmaps on circularity and sustainability of polymers and composites can be seen from ACC¹ and IACMI².

Objective

The objective of this area of interest is to reduce the embodied energy and lifecycle greenhouse gas emissions of polymer composites. This could be accomplished through novel recycling methods for existing polymer composites, development of new polymer composite materials to enable recyclability, or improvements to manufacturing processes to reduce CO₂ emissions. Proposed materials should be applicable for structural automotive components considering strength, stiffness, durability, manufacturing cycle time, end of life, and cost. New recycling or production processes should target high volume manufacturing and broad applicability to the current automotive manufacturing environment. Awarded projects will produce a structural automotive component from polymer composites demonstrating significant reduction in carbon footprint from baseline.

Performance targets are listed below:

Reduction of embodied energy	Reduction of carbon emissions (GHG)	Mechanical property retention	Reduction of manufacturing cost	Recyclability or reuse in useful products	Cost benefit
>50%	>75%	>90%	>50%	>95%	<\$5/kg-saved

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Requirements

Proposed technologies with a pathway to high-volume manufacturing are encouraged.

Applications are sought in the following areas, but are not limited to:

1. Develop novel recycling methods for existing high-value fiber-reinforced composite automotive materials to enable these materials to retain their functional properties into subsequent uses;
2. Reintegrate and repurpose polymeric composite materials through the use of low-cost recycled materials for circular economy and lower carbon footprint;
3. Upcycle carbon fiber and other polymers, resins, and recycled batteries for use of the second life;
4. Incorporate sustainability within manufactured parts via use of renewables; and
5. Develop and industrialize separation and sorting pathways and quantify environmental and economic benefits of recycled material content to enable circularity for end-of-life vehicles;

General Requirements

Applications ***must*** include:

1. Identify a vehicle component to be targeted;
2. Identify major technical barriers impeding the use of proposed materials or processes and provide innovative solutions;
3. Specify the significant impact on the current state-of-the-art that will be achieved by successfully accomplishing the proposed research and surmounting the technical challenges;
4. Indicate how, and to what degree, the use of the new material or production process will reduce vehicle weight, cost, embodied energy, and/or carbon footprint; and
5. Utilize life cycle assessment (LCA) to assess environmental impact.

Teaming Arrangements

Applicant teams are encouraged to include members from all parts of the materials development, manufacturing, scale-up production, and/or recycling aspects of the supply chain.

Special Deliverables

In addition to the deliverables required in the Federal Assistance Reporting Requirements Checklist, the following are deliverables for awards made under this area of interest:

1. Cost model that shows a pathway for future commercialization of the developed technology in the selected specific components;
2. Documentation of the project's weight savings and cost impact compared to DOE provided baseline weight and cost for the selected components.

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Area of Interest 8: Domestic Magnesium Production Research

Introduction

Vehicle lightweighting provides opportunities to increase electric vehicle (EV) drive range, reduce battery size and cost, and decrease carbon emissions. EVs are driving significant strides in the decarbonization of the nation's transportation system. This burgeoning demand places ever greater importance on the development of lightweight and low carbon footprint materials. Magnesium is of particular interest as it can provide 30 - 60% weight savings over heavy steel components and 20-40% weight savings over Aluminum

Currently, the vast majority of magnesium is produced in China, followed by Russia. The US produces less than 5% of global production. Production in China and Russia is also energy and GHG intensive due to utilization of older, less environmentally friendly processes.

In order to provide a stable reliable source of magnesium for the domestic automotive industry, EERE seeks to develop a low-cost approach to making magnesium. This process would utilize readily available raw materials from the United States, an energy conversion approach that is clean and efficient, and a form of the product that is sufficiently pure to be readily inserted into a vehicle manufacturing value stream to enable a straightforward commercialization strategy into the vehicular market. Successful market implementation of these materials in vehicles requires that they be low relative cost and available in sufficient abundance to make a compelling business case. For this reason, the focus of this AOI

Current Magnesium production cost is \$3.90 per kg, which is 9 times as costly as Steel (0.42c/kg) and 2.7 times as costly as Aluminum (\$1.44/kg) as per data pulled from the USGS 2022 U.S. spot Western production cost average report. During manufacturing, Cast AL generates 2.77 kg of CO₂eq/kg, Wrought AL produces 10.074 kg of CO₂eq/kg, Magnesium generates 28.8 kg of CO₂eq/kg (Pidgeon) and 12.997 kg of CO₂eq/kg (electrolysis), and Steel generates 4.014 kg of CO₂eq/kg, as per Impacts of Vehicle Weight Reduction via Material Substitution on Life-Cycle Greenhouse Gas Emissions report from Argonne.

Objective

The objective of this area of interest is to develop low cost, low carbon footprint methods of domestic magnesium production for lightweight vehicle components. VTO is targeting expanding the current domestic landscape to include additional primary and secondary methods to produce magnesium including reducing cost and greenhouse gas emissions of electrolysis and Pidgeon methods. Proposals will identify the targeted domestic source of magnesium as either primary or secondary, as well as the proposed production methods being developed for extraction/recovery/concentration, refining, and alloying to structural automotive grades. Awarded projects will produce at least 20 kg of automotive casting grade magnesium from a domestic source demonstrating significant cost and greenhouse gas emissions reduction as compared to the baseline. Solutions should address the technological, economic, business and environmental merits for their proposed demonstration technology.

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Objective/Goal	Target	Baseline
Green House Gas	10 kg CO ₂ e/kg and below	>11 KG CO ₂ eq (Electrolytic) > 28 KG CO ₂ eq (Thermal)
Cost	\$1.44/kg	\$3.90/kg
Separation or extraction efficiency	10% increase in efficiency	Current extraction % by weight of Thermal or Electrolytic process

Requirements

Applications are sought in the following areas, but are not limited to:

1. Improving the efficiency and cost of the electrolytic process, to include improvements to electrode usage life;
2. Improving the efficiency of the thermal process in terms of a reduction in GHG;
3. Low cost and low GHG recovery of magnesium from secondary sources; and
4. Developing innovative methods for recovery, concentration, refining, or alloying to structural automotive grades.

Applications ***must*** include:

1. Identify if the source of Magnesium proposed is Primary or Secondary, and provide details regarding supply availability;
2. If the selection is primary, the applicant will need to establish if the process is either electrolytic or thermal reduction in nature and associated constituents of products to be used in the process. If the application proposes a new innovative method, the application will have to provide details regarding the process;
3. Identify improvement in fuel and materials used;
4. If applicants are proposing on the thermal process, applicants are encouraged to Target cost reduction based off the current cost to produce Magnesium (\$3.90/kg);
5. Identify the amount of Mg to be produced;
 - a. Quantities should be presented as Mass fraction as well as Purity of Magnesium produced
6. If the source identified is Secondary, applicant should state the recycled or sustainable aggregate that will be used for source material;
 - a. Application should also state both the GHG emitted from Secondary source during processing
 - b. Application should state the mass fraction per incoming content as well as purity of Magnesium produced
7. Include plans to produce 20 kg of automotive casting grade magnesium; and
8. Include a test plan to verify strength, ductility, and castability of material produced.

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Teaming Arrangements

Applicant teams are encouraged, to include members from all parts of the materials development, manufacturing, scale-up production, and/or recycling aspects of the supply chain.

Special Deliverables

In addition to the deliverables required in the Federal Assistance Reporting Requirements Checklist, the following are deliverables for awards made under this area of interest:

1. Cost model that shows a pathway for future commercialization of the developed technology in the selected specific components;
2. Life Cycle Analysis documenting reduced GHG emissions of the new process as compared to the baseline; and
3. Improvements/lower energy usage for any new and improvements to current processes as compared to the baseline.

Applications Discouraged

None.

Area of Interest 9: Novel Lightweight Materials

Introduction

Materials play an important role in increasing the efficiency of electric vehicles through weight reduction. Lighter weight vehicle structures and electric drivetrains will require fewer batteries to achieve the same range, which in turn reduces battery cost, material needs, and reduces the greenhouse gas emissions from battery production. The materials and manufacturing methods used to make vehicles also contribute to greenhouse gases and it’s important to consider the full life cycle effects of lightweight material substitution.

Current lightweight materials used in the automotive industry include advanced high-strength steels, aluminum alloys, magnesium alloys, and polymer composites. The EERE Vehicle Technologies office has a goal to enable a 25% weight reduction for light-duty vehicles including body, chassis, and interior as compared to a 2020 baseline at no more than a \$5/kg-saved increase in cost by 2030. To achieve this goal, further research into novel, advanced materials are needed to cost-effectively bridge critical gaps and provide weight savings with a low carbon footprint.

Objective

The objective of this area of interest is to explore promising new lightweight materials beyond current industry use or Program focus (e.g. advanced high-strength steel, aluminum, magnesium, and polymer composites reinforced with carbon fiber or conventional fillers) and assess applicability to automotive structural components. Proposed materials should strive to match incumbent properties such as strength, ductility, corrosion resistance, fatigue life, appearance, and manufacturability, and significantly improve upon incumbent properties such as density, cost, and carbon footprint. Awarded projects will produce a minimum of 20 kg of the novel lightweight material for materials property testing as well as conduct a techno-economic analysis and a life cycle assessment.

Attribute	Target
Specific strength	+50%
Cost	<\$5/kg-saved
GHG emissions from production	-25%

Recyclable materials are encouraged as well as those with low production carbon footprint.

Materials may include, but are not limited to:

1. Composite natural fibers;
2. Carbon fibers from non-fossil sources;
3. Novel, lightweight alloys;
4. Metal matrix composites;
5. Novel, low-cost, high-performance resins;
6. High-temperature nonmetallic materials;
7. Multi-functional materials; and
8. Bio-inspired materials structures;

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9. High entropy alloys.

General Requirements

Applications ***must*** include:

1. Identify a specific lightweight baseline material currently used in automotive production;
2. Propose a novel material that will significantly reduce density, cost, and/or carbon footprint as compared to the baseline material;
3. Assess compatibility with current high volume manufacturing processes and capability of joining to current production materials;
4. Evaluate weight reduction potential of the materials;
5. Include a plan to produce at least 20 kg of the novel lightweight material;
6. Provide a test and demonstration plan through which material properties necessary for use as an automotive structural material are validated (Must include strength, ductility, corrosion resistance, and fatigue life. May include impact resistance, energy absorption, appearance, and other assessments of durability); and
7. Include a plan to conduct a techno-economic analysis and life cycle assessment to validate the cost and carbon footprint reduction targets.

Teaming Arrangements

None.

Special Deliverables

In addition to the deliverables required in the Federal Assistance Reporting Requirements Checklist, VTO will require recipients to participate in the EERE Annual Merit Review (AMR) in Washington, D.C. and report on annual project accomplishments for inclusion in the VTO Annual Accomplishments Report.

Applications Discouraged

Development of a new alloy (steel, Al, or Mg) that does not significantly improve upon the state of the art.

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Area of Interest 10: Mobility System Approaches Supporting Public Transportation

Introduction

The Energy Efficient Mobility Systems (EEMS) Program supports VTO's mission to improve transportation energy efficiency through low-cost, secure, and clean energy technologies. EEMS conducts research and development (R&D) at the vehicle-, traveler-, and system-levels, creating knowledge, insights, tools, and technology solutions that increase mobility energy productivity for individuals and businesses. This multi-level approach is critical to understanding the opportunities that exist for optimizing the overall transportation system. The EEMS Program uses this approach to develop tools and capabilities to evaluate the systems-level energy impacts of new mobility solutions and to create new technologies that provide economic benefits to all Americans through enhanced mobility.

EEMS is particularly focused on better understanding how disruptive transportation technologies, services, and new mobility business models (such as connected and automated vehicles, car-sharing, first- and last-mile services, and ridesharing) can support transit, acknowledging transit's role in both low-carbon people movement and ensuring equitable mobility access.

While both government and the private sector have made significant progress in the development of new transportation technologies, many of these solutions have not fully considered connections to public transportation.

Additionally, the global COVID-19 pandemic has further disrupted and impacted mobility. Travel modes, transportation demand patterns, and commuting habits have all changed dramatically, and while some modes have bounced back to near pre-pandemic levels, other modes such as public transportation continue to struggle.

Objective

The objective of this area of interest is to develop and demonstrate mobility-system level approaches to improve the efficiency and convenience of public transportation, acknowledging its critical role in both low-carbon people movement and ensuring equitable mobility access. Proposed projects should take an innovative mobility system-level approach to enhance and integrate public transportation, influence traveler behaviors, and harness connections between housing hubs and destinations (jobs, grocery stores, health care, etc.). Of particular interest are proposals that include pilot and demonstration projects pairing self-driving technology (i.e., mobility system approaches that include any technology or technologies from the range of SAE Levels of Driving Automation scale) and connectivity technologies with zero-emission vehicles (potentially including but not limited to the transit vehicle).

Applicant teams must include a public transportation entity and a partner with expertise in mobility equity, and applications must include a real-world demonstration and/or pilot program

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and quantify the increase in transit ridership along with the greenhouse gas emissions reduction compared to a baseline case.

Requirements

1. Define project baseline ridership and greenhouse gas emissions and in what year (especially given COVID-19 disruptions to both time series);
2. Describe the classes of vehicles proposed and the powertrain technology;
3. Include and describe community engagement activities including partnerships that result in community-driven strategic plans that define community goals and strategies for increasing public transportation ridership and reducing mobility system carbon emissions (e.g., listening session, needs assessment, or strategic planning discussions);
4. Quantify the expected energy, mobility, and/or affordability benefits that would result from the deployment of the technology to be developed, supported by analysis, modeling, or simulation results as appropriate;
5. Describe how the project team will share the data on expected energy/mobility/affordability improvements with DOE and its National Laboratories;
6. Describe how data generated by the project will quantify the energy and mobility gains that result from the proposed technology, and how the project team will share this data with DOE and its National Laboratories;
7. Describe the project outreach plan to communicate results, including lessons learned, best practices, and case studies, to educate the broader transportation community;
8. Include a plan for participation in the Annual Merit Review held in Washington DC; and
9. Include plans to provide input to the VTO Annual Report.

Teaming Arrangements

1. Applicant teams must include a public transportation entity; and
2. Applicant teams are encouraged to include active participation, with clearly documented roles, responsibilities, and/or active participation by a partner with expertise in mobility equity.

Special Deliverables

1. Recipients will provide all testing and validation data produced in the project validation phase to the SMART Mobility National Lab Consortium (<https://www.energy.gov/eere/vehicles/energy-efficient-mobility-systems>) through the Livewire Data Platform (<https://livewire.energy.gov>) in a timely manner. Data that the project teams do not wish to be made public will be protected through a Non-Disclosure Agreement with the relevant laboratories in the Consortium;
2. Recipients must include a plan to participate in the VTO Annual Merit Review (AMR) in Washington, D.C.; and

3. Recipients must include a plan to provide report on annual project accomplishments for inclusion in the VTO Annual Accomplishments Report.

Applications Discouraged

Applications that are primarily about procurement or straightforward implementation of existing technologies.

1. Applications that do not clearly identify the mobility technology solution to be developed and implemented; and
2. Applications that do not clearly identify the public transportation system to be supported by the new mobility solution being developed.

Applications not of Interest

None.

Area of Interest 11: Reducing Soft Costs of Electric Vehicle Infrastructure to Enable Widespread Deployment

Introduction

The increase in electric vehicle (EV) adoption and advancements in charging equipment technology to support higher charging rates have accelerated the demand for new EV charging infrastructure at scale. This includes both residential chargers and commercial installations. As hardware costs decrease with higher volume and improved technology, the non hardware costs are becoming a bigger concern. These are called "soft costs". These soft costs include complex administrative and planning costs such as permitting, siting/construction drawing, installation, workforce, financing, future-proofing, the utility interconnection process, and delays to the site. In addition to cost increases, delays to new installations can also add more than a year to a project schedule. As one example, actual construction of a charging station can take just 4-8 weeks, but the entire process to bring a high-power charger into operation- including host engagement, utility engagement, and permitting to utility interconnection—currently takes an average of approximately 18 months¹⁰. Installation of residential charging can also face challenges that are costly for homeowners and smaller electrical contractors to overcome. Efforts to reduce soft costs are complicated by variations across the many thousands of local jurisdictions and electric utilities around the country, each of which has its own processes and procedures. No coordinated national efforts have been implemented to date to investigate and reduce soft costs of EV charging installations and help accelerate the deployment of EV charging infrastructure.

Development of processes to minimize soft costs of charging installations will enable swifter deployment and lower costs of the national charging infrastructure, including in underserved and disadvantaged communities. Research and development of best practices and tools to decrease soft costs of new installations have already been effectively demonstrated for solar PV installations by the Solar Energy Technologies Office (SETO). SETO's SolSmart program developed a streamlining permitting process for new residential PV installations, leading to an estimated reduction of soft cost by \$0.16/W and an increase in installations by 17% per month for participants.¹¹ ¹² Other tools developed through SETO that have shown effectiveness include the SolarAPP+ which reduces authorities having jurisdiction (AHJs) permitting backlogs, staff time spent on permitting, interconnection delays, while also improving efficiency of installers/workforce. It is estimated that the SolarAPP+ alone has accelerated PV permitting timelines for all new rooftop installations by a combined total of 40,000 days in 2021. ¹³

¹⁰ <https://site-assets.evgo.com/f/78437/x/0a6d0c7746/connect-the-watts-compendium.pdf>

¹¹ https://www.maine.gov/climateplan/sites/maine.gov.climateplan/files/inline-files/AfternoonWorkshop_RenewableEnergy.pdf

¹² <https://www.pnas.org/doi/epdf/10.1073/pnas.2106201119>

¹³ <https://www.nrel.gov/docs/fy22osti/83046.pdf>

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Objective

The objective of this AOI is to develop innovative and coordinated strategies, processes, or programs to significantly reduce the soft costs of new EV charging installations implemented across the national charging infrastructure. These programs should be applicable to residential and/or public locations such as workplaces, multi-unit dwellings, retail establishments or corridor locations, to include the soft costs for both AC level 2 charging and DC fast charging. Applications should also assess the impacts of the proposed approach to reducing the total cost, and timeline of new installations.

Applications must identify and detail the existing baseline for comparison and propose processes and procedures to significantly reduce soft costs. Applications should target only one of the following strategies for soft cost reduction:

1. A comprehensive nationwide recognition and technical assistance program for authorities having jurisdiction (AHJs) or municipalities aimed at streamlining the installation of electric vehicle supply equipment by reducing permitting, compliance processes or other soft cost barriers and thereby increasing deployment. The program should be compelling, enduring, simple and straightforward, accessible and expandable, robust and reliable, and highlight visible. Key objectives include:
 - a. To build strong ESVE markets by incentivizing communities across the country to implement transformative, locally-generated solutions for cutting red tape and building local EVSE markets;
 - b. To enable EVSE companies to grow their local EVSE workforces while more efficiently managing their labor, material and cash flows, and customer interactions by introducing process predictability and standardization at the local level;
 - c. To increase affordability and accessibility of EVSE to a range of consumers at various market scales; and
 - d. Enlist communities that represent over half of the US population participating in program.
2. A comprehensive national program focused on streamlining utility interconnection process related to EVs;
3. Other innovative approaches, such as:
 - a. Site design and future-proofing;
 - b. Customer acquisition;
 - c. Maintenance or uptime costs;
 - d. Innovative ownership and/or financing structures;
 - e. Site identification, planning and engineering;
 - f. Inspection and site commissioning;
 - g. Installation and construction; and
 - h. Reducing general and administrative overhead costs.

General Requirements

Applications ***must***:

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1. Clearly identify the targeted soft cost strategy from the list above (A, B, or C) and how the project will lead to a cost reduction and/or reduction in timeline to be installed and deployed;
 2. Demonstrate knowledge of the current processes, procedures, and cost structures of new EV charging installations in the US, as well as familiarity with EVSE soft costs topics;
 3. Describe the overall approach to reducing soft costs and the region(s) to be addressed in the project;
 4. Present detailed analysis to support the proposed approach and show it will have a significant impact on advancing the national charging infrastructure through reduction in soft costs;
 5. Identify the type(s) of charging infrastructure the proposed project will address (e.g. residential, destination/workplace/retail charging, and/or commercial DC fast charging);
 6. Identify the targeted soft cost category (or categories) and how the project will lead to a cost reduction and/or reduction in construction timelines including but not limited to:
 - a. Financing and Contracting
 - b. Permitting, Inspection, and Interconnection
 - c. Installation and Performance
 - d. Operations and Maintenance
 7. Describe the supporting requirements by stakeholders (localities, utilities, EVSE operators, etc.) to enable successful implementation (ex. common grid interconnection process, universal permitting process);
 8. Identify the specifications and/or limitations for a typical site(s) that the proposed approach to soft costs will be addressing (e.g. peak power demand, type of EVSE, and total number of EVSEs);
 9. Describe the approach to comply with applicable safety and codes and standards;
 10. Describe the partnership commitments required to implement the proposed cost-reduction strategies and demonstrate the impact of the program;
 11. Describe the specific team member roles and responsibilities and how their past experience connects to these project roles;
 12. Describe how the proposed effort builds on and coordinates with, if applicable, existing resources both nationally and regionally (if applicable);
 13. Detail how the proposed approach can provide widescale impacts and/or be scaled for greater utilization by key stakeholders (i.e., municipalities, utilities, EVSE owners/operators, etc.) at a national level (if applicable);
 14. Outline the potential path to deployment of the proposed soft costs reductions by describing market viability and key steps towards implementation;

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15. For applications that target strategy A (see above), provide a plan to coordinate with ongoing efforts to reduce soft costs for PV installations, specifically DOE's SolSmart program;¹⁴
 16. For applications that target strategy A (see above), provide a plan to establish a Designated Program Administrator that:
 - a. Establishes and convenes a Criteria Advisory Committee (CAC) that is a self-governing body of experts and EV market stakeholders to develop and maintain criteria for a designation on an ongoing basis. DOE will serve as ex-officio heads of the CAC and provide official validation of the criteria;
 - b. Establishes and administers the program, including working with DOE and relevant stakeholders to establish a strong identity and brand for the program and tracking metrics for participation, developing innovative ways to increase participation, education and outreach; and
 - c. Provides technical assistance, including establishing mechanisms for communities to request TA, determining eligibility to receive TA; provide TA on an on-demand basis based on eligibility and assessment, receive TA references from the DPA, and proactively seek communities who may benefit from (in terms of achieving eligibility for designation) TA; and organize peer-to-peer learning opportunities.
 17. For applications that target strategy B (see above), provide a plan to coordinate with ongoing efforts to reduce soft costs for utility interconnection and engagement, specifically the DOE Interconnection Innovation e-Xchange (i2X);¹⁵ and
 18. Provide an outreach plan for broadly disseminating the project resources and findings during the project period and at the conclusion of the project.

Teaming Arrangements

Teams are encouraged to include, or engage directly with, EVSE operators, electric utilities, site hosts, state governments, local governments, metropolitan transportation authorities and other authorities having jurisdiction (AHJ), non-governmental organizations (NGOs), and/or permitting or standards organizations, concerning EVSE deployment. Teams are also encouraged to include one or more Clean Cities coalitions (<https://cleancities.energy.gov/coalitions/locations/>).

Special Deliverables

- Successful applicants will be required to work with DOE and national laboratories to develop a comprehensive roadmap for reducing soft costs; and
- Successful applicants will work with national laboratories to implement innovative tools that can streamline the permitting and/or interconnection process.

¹⁴ <https://www.energy.gov/eere/solar/solsmart-funding-program>

¹⁵ <https://www.energy.gov/eere/i2x/about-interconnection-innovation-e-xchange-i2x>

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Applications Discouraged

Applications focused on hardware research and development solutions for EV service equipment (EVSE).

Applications that include costs for deploying EVSE hardware.

Area of Interest 12: Consumer Education Campaign for Electric Vehicles and Charging

Introduction

The Biden Administration and Automotive manufacturers have jointly set a target of 50% of EV sale shares in the U.S. by 2030.¹⁶ However, barriers to increasing EV sales include the lack of consumer awareness and understanding of how EV's and chargers work, the benefits of EVs, and in particular the availability of chargers. EV charging can be a confusing topic for the general public since there are various electric vehicle supply equipment (EVSE) standards, charging levels, charging networks, payment interfaces, pricing structures, and ownership models. As the availability of chargers grows rapidly in the next few years, it will also be important that consumer have awareness of the growing network and how to access it.

Automotive dealers are an important source of information as consumers are shopping, but the new nature of EVs and electric charging, as well as the rapidly changing landscape, make it difficult for automotive dealers to have up to date, easy to communicate, and authoritative information for consumers. A broad reaching consumer education campaign that consumers trust is needed to increase the general public's familiarity and comfort level with EVs and EV charging technology so as to accelerate EV market adoption.

Objective

The objective of this area of interest is to implement a high-impact, brand neutral, nationwide consumer education campaign targeting consumers in the process of shopping for a vehicle. This campaign should address core questions consumers have about EVs resulting in increased levels of consumer confidence and comfort in choosing to purchase an electric vehicle. DOE is interested in projects that have the greatest opportunity to increase the rate of consumer EV adoption due to increased familiarity with EVs and EV charging. A campaign that provides both the content consumers need and wide-reaching delivery mechanisms is of particular interest.

The campaign should achieve the following goals:

1. Ensure all consumers have accurate information from a trusted source;
2. Provide relevant information through easy to access and user-friendly mediums during key stages of the car buying process;
3. Increase consumer familiarity with EV technology in general and its benefits;
4. Increase consumer familiarity with EV charging technology and terminology, including how EV chargers work, electric vehicle charging equipment standards, charging levels, charging networks, payment interfaces, and pricing structures;
5. Increase consumer awareness of current EV charger availability;
6. Increase consumer awareness of anticipated future EV charger availability considering planned investments;

¹⁶ <https://www.whitehouse.gov/briefing-room/statements-releases/2021/12/13/fact-sheet-the-biden-harris-electric-vehicle-charging-action-plan/>

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7. Leverage existing EV and EV charger educational materials and tools through a scaled up approach; and
 8. Ensure at least 40% of the consumers reached are residents of Justice40 disadvantaged communities.

Example project activities include, but are not limited to:

1. Developing (or repackaging public domain) consumer information that helps increase consumer confidence in current and future EV charger capability and availability (both for longer trips and also around home);
2. Developing consumer information that addresses common “myths” or misunderstandings about EVs including the charging experience;
3. Utilizing traditional media and/or social media to reach consumers;
4. Creating informative tools for consumers to access while shopping for a vehicle online;
5. Creating informative tools that could be used in dealerships to answer consumers questions on how EVs and Charging work and how EVs differ from more familiar gasoline cars; and
6. Utilizing auto shows, technology showcases, and experiential events to reach consumers with brand neutral information about EVs and EV chargers.

Consumer education campaigns submitted for this area of interest should NOT:

1. Develop websites or software that compare different EV models (but it may refer consumers to existing resources such as FuelEconomy.gov); and
2. Include activities that promote or sell specific vehicle or charging station products.

Requirements

Applications ***must*** include:

1. A description of the target audience for each part of the proposed project
2. Descriptions of the geographic areas that will be impacted by the project;
3. A description of the proposed approaches to reach targeted audiences and a justification for the proposed approach;
4. A description of the consumer education campaign content and messaging as well as how that content can be kept up-to-date as time goes on;
5. The proposed duration of and longevity of the consumer education campaign to maximize the projects impact beyond the period of performance;
6. A description of how outreach products developed and/or used in this project will be made available for free for use by other entities including but not limited to the national network of Clean Cities coalitions;
7. Clearly documented roles, responsibilities, time commitments and budgets for project team members; and
8. Planned performance metrics that quantify the anticipated project outputs and outcomes including, but not limited to metrics on the number of consumers reached and the improvement in consumer comfort level purchasing an EV.

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Teaming Arrangements

Applicants are encouraged to propose a team which includes some or all of the following types of entities, each with clearly documented roles, responsibilities, and budgets:

1. Organizations with experience in developing consumer educational campaigns;
2. Organizations with the capability to deliver the proposed educational campaign to consumers;
3. Organizations involved in serving automotive consumers such as, but not limited to, automotive dealers, automotive associations, automotive manufacturers, etc; and
4. Organizations that consumer will see as credible information providers on EVs and EV charging such as:
 - a. Clean Cities coalitions (<https://cleancities.energy.gov/coalitions/locations/>), Local/regional/state governments;
 - b. Community-based organizations with expertise in identifying and serving the needs and perspectives of underserved communities;
 - c. Technology suppliers such as electric vehicle supply equipment manufacturers or charging network providers; and
 - d. Utility companies.

Special Deliverables

1. Recipients **must** provide an Outreach Report that documents the project's outreach strategies, methodologies and targets. The report will quantify the effectiveness of the outreach methodologies used during the project; and
2. Recipients **must** provide supplemental quarterly reporting data needed to calculate Justice40 Initiative metrics measuring the benefits that flow to disadvantaged communities.

Applications Discouraged

Applications that include the following are highly discouraged:

1. Projects that focus efforts on development of tools/resources that duplicate resources already available from DOE and/or DOE labs.

Applications not of Interest

Applications that include:

1. Purchase or lease of vehicles;
2. EV charging station purchase or installation;
3. Promotion of a specific brand, product, or invention;
4. Development of curriculum for educational institutions;
5. Subsidies for fuel cost;
6. Rebates or tax incentives;
7. Construction, build-out or renovation of real property; and
8. Purchase of land.

Area of Interest 13: Demonstration and Deployment – Open Topic**Introduction**

The Technology Integration Program and its Clean Cities coalition partners have a broad portfolio of potential technology options with the opportunity to address pressing transportation efficiency and equity needs.

Objective

The objective of this area of interest is to draw on this portfolio and explore novel solutions to transportation and related clean energy challenges through demonstration or deployment projects not otherwise addressed in this FOA. This area could include projects to address challenges unique to their geographic areas and solutions with potential for replication in other areas across the country, or other ways to accelerate clean transportation deployment. Projects of interest include but are not limited to:

1. Projects with innovative approaches to decarbonize transportation;
2. Projects that address mobility needs of local underserved regions or populations;
3. Implement transportation fuels, vehicles, systems, and technologies that have positive impact on greenhouse gas emissions, such as those that implement renewable fuels and renewable energy sources (ex: solar/wind power) into transportation systems;
4. Those which implement advanced technologies or alternative fuels in off-road, marine, rail, and other non-road applications. For example, ships and rail projects can have very high GGE reduction per vehicle by adopting alternative fuels, renewable blends and/or advanced technologies those which develop roadmaps for decarbonization in local Clean Cities regions;
5. Projects that focus on transitioning high-impact heavy-duty fleets to new fuels and technologies that reduce petroleum consumption and greenhouse gas and criteria emissions;
6. Projects which improve transportation affordability and reduce emissions by accelerating or enabling widespread access to affordable alternative and renewable fuels; and
7. Projects that holistically drive adoption of clean energy technologies across jurisdictions.

Requirements

1. Identify the specific challenge to be addressed and the target audience for the technical solution to be implemented;
2. Identify specific technologies, approaches, or activities that align with the AOI objectives described above;
3. Define project team roles and responsibilities as well as funding for specific tasks that Clean Cities coalitions and partners will undertake; and

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4. Address replicability through a project structure that produces results and insights useful to others across the country; project teams must provide for public release a final technical report that documents project information, analyses, and insights.

Teaming Arrangements

The project team must include at least one active and DOE designated Clean Cities coalition with a significant role (at least 25% of project budget). Active Coalitions can be found at: <https://cleancities.energy.gov/coalitions/locations/> .

VTO highly encourages project teams and strategic partners such as the following:

1. Clean Cities Coalitions;
2. Consortia comprised of multiple Clean Cities coalitions (<https://cleancities.energy.gov/coalitions/locations/>);
3. Local/regional/state governments, metropolitan planning organizations
Community-based organizations that focus on the needs and perspectives of underserved communities;
4. Transit;
5. Transportation network providers;
6. Vehicle, fuel, energy, and infrastructure providers;
7. Utility companies; and
8. Fleets and other end-user groups.

Applications Discouraged

Applications that include the following are highly discouraged:

1. Promotion of a specific brand, product, or invention;
Inclusion of novelty vehicles and recreational or sport vehicles;
2. Subsidies for fuel cost;
3. Rebates or tax incentives; and
4. Purchase of land.

Special Deliverables

None.

Area of Interest 14: Clean Cities Coalition Network Outreach, Education and Training**Introduction**

DOE's Technology Integration Program, including its Clean Cities activities, has encouraged robust local and regional partnerships to ease barriers and promote the use of new transportation technologies for 30 years. DOE-designated Clean Cities coalitions foster the nation's economic, environmental, and energy security by working locally to advance affordable, domestic transportation fuels, energy efficient mobility systems, and other fuel-saving technologies and practices. DOE is investing in a strategic framework for strengthening Clean Cities coalitions through four strategic pillars: 1. Strengthen the Clean Cities Mission, 2. Enhance Clean Cities Reputation and Role, 3. Revitalize and Active and Effective Coalition Framework, and 4. Grow Clean Cities to Serve All Communities.

DOE employs the following strategies in partnership with Clean Cities coalitions to advance affordable, efficient, and clean transportation fuels and technologies:

1. Evaluating transportation needs and energy choices to determine the most impactful and cost-effective vehicle options, fuels, technologies, and best practices that make sense for specific stakeholder applications;
2. Decarbonizing the transportation sector by shifting to vehicles, fuels, and technologies that reduce transportation greenhouse gas emissions;
3. Reducing transportation emissions that contribute to air pollution and harm public health;
4. Shifting to efficient and clean energy sources through the use of alternative and renewable fuels;
5. Improving fuel efficiency through state-of-the-art technologies and strategies including idle reduction;
6. Demonstrating and assessing new mobility choices that maximize the return on investment for mobility systems in terms of time, cost, energy, and opportunity'
7. Advancing energy and environmental justice priorities by maximizing project benefits that flow to underserved communities and minimize project burdens that affect underserved communities; and
8. Increasing equitable access to clean, affordable transportation.

Objective

The objective of this area of interest is to fund projects that foster broader adoption of clean vehicles and installation of supporting infrastructure and contribute the reductions in lifecycle greenhouse gases and other harmful air pollutants through outreach, education and training activities. The project budget cannot be used for technology demonstration or deployment.

Example eligible activities include but are not limited to:

1. Providing outreach, education, and/or technical assistance and facilitating community engagement for clean fuels and vehicles in underserved or

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- disadvantaged communities so those communities can benefit from the emissions reductions and public health benefits delivered by transportation decarbonization;
2. Conducting alternative fuel vehicle and infrastructure market development events, workshops, and meetings;
 3. Delivering direct information, technical assistance and/or coaching to fleets, end-users, potential end-users, and other appropriate stakeholders;
 4. Providing outreach, education and training in a way that facilitates and/or support the development or implementation of alternative fuel corridor plans or other alternative fuel and advanced vehicle technology deployment initiatives;
 5. Organizing and/or executing technical training and/or technical education sessions regarding AFVs, their appropriate use, infrastructure, and safety issues to fleet managers, decision makers, code officials, first responders, fire marshals and other appropriate audiences;
 6. Training for new or existing Clean Cities coalition staff to increase coalition abilities to provide outreach, education and/or training to new communities with little to no Clean Cities activities, including areas that do not have a currently DOE-designated Clean Cities coalition;
 7. Activities that involve multiple entities within a state or region working together to establish a structure that better enables state-level AFV outreach, visibility, and new opportunities for collaboration, capacity growth, and impact;
 8. Strengthening the capacity of existing statewide Clean Cities coalitions through training and coalition building activities, including potential new branch locations in underserved areas of the state; and
 9. Methods for collaborating among DOE-designated Clean Cities coalitions to provide novel outreach, education and/or training to potential or new stakeholders.

Requirements

1. To be eligible an applicant must have a minimum of 75% of the project budget allocated to DOE-designated Clean Cities coalitions or their host organizations; and
2. Applicants must provide table(s) describing planned performance metrics.

Teaming Arrangements

1. Project teams **must** include at least one DOE-designated Clean Cities coalition (<https://cleancities.energy.gov/coalitions/>);
2. Project teams involving multiple Clean Cities coalitions forming statewide partnerships, regional partnerships, or other strategic collaborations of Clean Cities coalitions are **strongly encouraged**; and
3. DOE-designated Clean Cities coalitions are encouraged to work with apprentice coalitions where appropriate as part of the strategic pillar to Grow Clean Cities to Serve All Communities.

Special Deliverables

None.

Applications Discouraged

Projects that focus efforts on development of tools/resources that duplicate resources already available from DOE and/or DOE labs.

All work under EERE funding agreements must be performed in the United States. See Section IV.I.iii. 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.A. and I.B. of the FOA; and
- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics).

AOI 1b

- Applications that include cathode development other than elemental sulfur.

AOI 2

- Lead acid batteries used or designed for energy storage grid application and uninterrupted power supply application; and
- Lead acid batteries for EV propulsion application.

AOI 3

- Applications which only focus on off-board charging systems; and
- Applications that do not integrate on-board charging and electric traction drive systems.

AOI 7

- Applications that propose metal matrix composites or ceramic matrix composites will not be considered.

AOI 8

- Applications that propose the use of synthetic brines for final validation or a larger ratio of synthetic brines during the scope of the work compared to real-world brines.

AOI 11

- Applications focused on hardware research and development solutions for EV service equipment (EVSE);
- Applications which include the purchase of vehicles or fueling/charging infrastructure/equipment as project costs;
- Applications that dedicate a substantial portion of project budget to modelling, analysis, or software development efforts;
- Projects that focus efforts on transportation studies and/or behavior studies;
- Applications that include rebates or tax incentives; and
- Applications that include the purchase of land.

D. R&D Community Benefits Plan

DOE is committed to investing in research and development (R&D) of innovations that deliver benefits to the American public and lead to commercialization of technologies and products that foster sustainable, resilient, and equitable access to clean energy. Further, DOE is committed to supporting the development of more diverse, equitable, inclusive, and accessible workplaces to help maintain the nation's leadership in science and technology.

To support the goal of building a clean and equitable energy economy, projects funded under this BIL FOA are expected to (1) advance diversity, equity, inclusion, and accessibility (DEIA); (2) contribute to energy equity; and (3) invest in America's workforce. To ensure these objectives are met, applications must include a Research and Development Community Benefits Plan (R&D Community Benefits Plan) that addresses the three objectives stated above. See Section IV.D.xiv. and Appendix H for the more information on the R&D Community Benefits Plan content requirements.

E. Authorizing Statutes

The activities supported by this FOA are authorized under Public Law (P.L.) 102-486, Energy Policy Act (EPA) of 1992, as amended by P.L. 109-58, EPA 2005, Section 911, as amended (codified at 42 U.S.C. § 16191) and Sections 801 and 805, as amended (codified at 42 U.S.C. § 16154), and P.L. 110-140, Energy Independence and Security Act of 2007 (EISA 2007), Section 131, as amended (codified at 42 U.S.C. § 17011). Additional citations for these authorities include the following:

- Title VII, Subtitles B, C, D of EPA 2005 (42 U.S.C. §§ 16061-16093)
- Sections 131-136 of EISA 2007 (42 U.S.C. §§ 17011-17013)
- Title VI, Subtitle A of EPA 1992 (42 U.S.C. §§ 13281-13286)
- Title VI, Section B of EPA 1992 (42 U.S.C. §§ 13291-13296)

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

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II. AWARD INFORMATION

A. Award Overview

i. Estimated Funding

EERE expects to make a total of approximately \$99.5M of federal funding available for new awards under this FOA, subject to the availability of appropriated funds. EERE anticipates making approximately 37 to 63 awards under this FOA.

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

Topic Area of Interest Number	Topic Area of Interest Title	Anticipated Number of Awards	Anticipated Minimum Award Size for Any One Individual Award (Fed Share)	Anticipated Maximum Award Size for Any One Individual Award (Fed Share)	Approximate Total Federal Funding Available for All Awards	Anticipated Period of Performance (months)
1a	High-Capacity, Long Cycle Life Lithium-Sulfur (Li-S) Batteries	3-4	\$3,000,000	\$4,000,000	\$12,000,000	36
1b	Mechanistic Modeling of Li-S Batteries	1-2	\$1,500,000	\$3,000,000	\$3,000,000	36
2	Improved 12-volt Lead Acid Batteries for Safety-critical Electric Vehicle Applications	2-3	1,000,000	2,000,000	\$5,000,000	36
3	Advanced Integrated On-board Charging System	2-3	\$3,333,333	\$5,000,000	\$10,000,000	36
4	Advanced Wireless Charging Concepts for Heavy -Duty Vehicles	1-2	\$2,500,000	\$5,000,000	\$5,000,000	36
5	Development and Demonstration of Dimethyl Ether Engine for Off-Road Applications	1	\$2,500,000	\$2,500,000	\$2,500,000	36
6	Hydrogen Combustion Engines	2-4	\$1,500,000	\$3,500,000	\$7,000,000	36
7	Circularity and Sustainability of Polymer Composites for Vehicle Lightweighting and Decarbonization	4-5	\$1,500,000	\$2,000,000	\$8,000,000	36

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8	Domestic Magnesium Production Research	2-4	\$1,000,000	\$2,000,000	\$4,000,000	36
9	Novel Lightweight Materials	3-4	\$750,000	\$1,000,000	\$3,000,000	36
10	Mobility System Approaches Supporting Public Transportation	3-5	\$2,000,000	\$3,333,333	\$10,000,000	36
11	Reducing Soft Costs of Electric Vehicle Infrastructure to Enable Widespread Deployment	2-4	\$3,750,000	\$7,000,000	\$15,000,000	36
12	Consumer Education Campaign for Electric Vehicles and Charging	1-2	\$2,000,000	\$5,000,000	\$5,000,000	24-36
13	Demonstration and Deployment (Open Topic)	5-10	\$500,000	\$1,000,000	\$5,000,000	24-36
14	Clean Cities Coalition Network Outreach, Education and Training	5-10	\$500,000	\$1,000,000	\$5,000,000	24-36

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. Before the expiration of the initial budget period(s), EERE may perform a down-select among different recipients and provide additional funding only to a subset of recipients.

ii. Period of Performance

EERE anticipates making awards that will run from 24 up to 36 months in length, comprised of one or more budget periods. Budget periods greater than 12 months may be established for compelling programmatic or administrative reasons, such as to allow for project phases not evenly divisible with 12-month increments or to provide program personnel with logical decision points to evaluate whether the project should proceed. Project continuation will be contingent upon several elements, including satisfactory performance and

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Go/No-Go decision review. For a complete list, see Section VI.B.xiv. At the Go/No-Go decision points, EERE will evaluate project performance, project schedule adherence, the extent milestone objectives are met, compliance with reporting requirements, and overall contribution to the program goals and objectives. As a result of this evaluation, EERE 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.

iii. New Applications Only

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

B. EERE Funding Agreements

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

i. Cooperative Agreements

EERE generally uses cooperative agreements to provide financial and other support to prime recipients.

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

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

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

In most cases, FFRDCs are funded independently of the remainder of the project team. The FFRDC then executes an agreement with any non-FFRDC project team members to arrange work structure, project execution, and any other matters.

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Regardless of these arrangements, the entity that applied as the prime recipient for the project will remain the prime recipient for the project. See Section III.E.i

III. ELIGIBILITY INFORMATION

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

A. Eligible Applicants

i. Restricted Eligibility

The National Energy Technology Laboratory and Idaho National Laboratory are ineligible to participate as a prime applicant or as a team member/sub-recipient on any application because of their roles in developing the requirements for this announcement.

ii. Individuals

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

iii. 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, have majority domestic ownership and control, and have a physical location for business operations in the United States are eligible to apply for funding as a prime recipient or subrecipient. Nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995 are not eligible to apply for funding.

State, local, and tribal government entities are eligible to apply for funding as a prime recipient or subrecipient.

DOE/NNSA FFRDCs are eligible to apply for funding as a subrecipient, but are not eligible to apply as a prime recipient.

DOE/NNSA FFRDCs are not eligible to apply for funding as a prime or subrecipient for AOI 1a and AOI 2.

Non-DOE/NNSA FFRDCs are eligible to apply for funding as a subrecipient, but are not eligible to apply as a prime recipient.

Non-DOE/NNSA FFRDCs are not eligible to apply for funding as prime or sub recipient for AOI 1a and AOI 2.

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.

iv. Foreign Entities

In limited circumstances, DOE may approve a waiver to allow a foreign entity to participate as a prime recipient or subrecipient. A foreign entity may submit a Full Application to this FOA, but the Full Application must be accompanied by an explicit written waiver request. Likewise, if the applicant seeks to include a foreign entity as a subrecipient, the applicant must submit a separate explicit written waiver request in the Full Application for each proposed foreign subrecipient.

Appendix C lists the information that must be included in a foreign entity waiver request. The applicant does not have the right to appeal DOE’s decision concerning a waiver request.

B. Cost Sharing

Topic Area of Interest Number	Topic Area of Interest Title	Minimum Cost Share Requirement (%)
1a	High-Capacity, Long Cycle Life Lithium-Sulfur (Li-S) Batteries	20
1b	Mechanistic Modeling of Li-S Batteries	20
2	Improved 12-volt Lead Acid Batteries for Safety-critical Electric Vehicle Applications	50
3	Advanced Integrated On-board Charging System	20
4	Advanced Wireless Charging Concepts for Heavy-Duty Vehicles	20 – R&D Phase 50 – Demonstration Phase
5	Development and Demonstration of Dimethyl Ether Engine for Non-Road Applications	20 – R&D Phase 50 – Demonstration Phase
6	Hydrogen Combustion Engines	20
7	Circularity and Sustainability of Polymer Composites for Vehicle Lightweighting and Decarbonization	20
8	Domestic Magnesium Production Research	20
9	Novel Lightweight Materials	20

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10	Mobility System Approaches Supporting Public Transportation	20
11	Reducing Soft Costs of Electric Vehicle Infrastructure to Enable Widespread Deployment	0
12	Consumer Education and Outreach for Electric Vehicle Charging	0
13	Demonstration and Deployment (Open topic)	50
14	Clean Cities Coalition Network Outreach, Education and Training	0

See 2 CFR 200.306 and 2 CFR 910.130 for the applicable cost sharing requirements.

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

i. Legal Responsibility

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

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

ii. Cost Share Allocation

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

iii. Cost Share Types and Allowability

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

Project teams may provide cost share in the form of cash or in-kind contributions. Cost share may be provided by the prime recipient, subrecipients, or third parties (entities that do not have a role in performing the scope of

work). Vendors/contractors may not provide cost share. Any partial donation of goods or services is considered a discount and is not allowable.

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

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

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.

DOE will consider data that is commercially available at an established market price to be an allowable cost under the project (either as DOE share or non-federal cost share) but DOE will not consider in-kind data (e.g., data, owned by an entity, that is not routinely sold commercially but is instead donated to the project and assigned a value) to be an allowable cost under the project, including as recipient cost share. Estimation methods used by the recipient to assign a value to in-kind data cannot be objectively verified by DOE and therefore will not be accepted by DOE as an allowable cost under any project selected from this FOA. Consequently, DOE will not recognize in-kind data costs in any resulting approved DOE budget.

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

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considered part of total project cost, the cost share dollars will be scrutinized under the same federal regulations as federal dollars to the project. Every cost share contribution must be reviewed and approved in advance by the Contracting Officer and incorporated into the project budget before the expenditures are incurred.

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

iv. Cost Share Contributions by FFRDCs

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

v. Cost Share Verification

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

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

vi. Cost Share Payment

EERE requires prime recipients to contribute the cost share amount incrementally over the life of the award. Specifically, the prime recipient's cost share for each billing period must always reflect the overall cost share ratio negotiated by the parties (i.e., the total amount of cost sharing on each invoice when considered cumulatively with previous invoices must reflect, at a minimum, the cost sharing percentage negotiated).

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.

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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 and Full Applications that were: submitted through means other than EERE eXCHANGE; submitted after the applicable deadline; and/or submitted incomplete. EERE will not extend the submission deadline for applicants that fail to submit required information by the applicable deadline due to server/connection congestion.

i. Compliance Criteria

i. Concept Papers

Concept Papers are deemed compliant if:

- The Concept Paper 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 this FOA.

ii. 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.E. 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.

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 FFRDCs and Non-DOE/NNSA FFRDCs are not eligible to apply for funding as a subrecipient for AOI 1a and AOI 2. For the remainder of AOIs, DOE/NNSA and non-DOE/NNSA FFRDCs may be proposed as a subrecipient on another entity’s application subject to the following guidelines:

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i. *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.

ii. *Authorization for DOE/NNSA FFRDCs*

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

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

iii. *Value/Funding*

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

iv. *Cost Share*

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

v. *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.

i. *Limit on FFRDC Effort*

The FFRDC effort, in aggregate, shall not exceed 75% of the total estimated cost of the project, including the applicant's and the FFRDC's portions of the effort.

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

An entity may submit more than one Concept Paper and Full Application to this FOA, provided that each application describes a unique, scientifically distinct project and provided that an eligible Concept Paper was submitted for each Full Application.

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, or incomplete submissions.** EERE will not extend deadlines for applicants who fail to submit required information and documents due to server/connection congestion.

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

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

- Each must be submitted in Adobe PDF format unless stated otherwise;
- Each must be written in English;
- All pages must be formatted to fit on 8.5 x 11 inch paper with margins not less than one inch on every side. Use Calibri typeface, a black font color, and a font size of 12 point or larger (except in figures or tables, which may be 10 point

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font). A symbol font may be used to insert Greek letters or special characters, but the font size requirement still applies. References must be included as footnotes or endnotes in a font size of 10 or larger. Footnotes and endnotes are counted toward the maximum page requirement;

- The Control Number must be prominently displayed on the upper right corner of the header of every page. Page numbers must be included in the footer of every page; and
- Each submission must not exceed the specified maximum page limit, including cover page, charts, graphs, maps, and photographs when printed using the formatting requirements set forth above and single spaced. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages.

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

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

i. Additional Information on EERE eXCHANGE

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

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

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:

TechnicalVolume_Part_1

TechnicalVolume_Part_2

C. Content and Form of the Concept Paper

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

i. Concept Paper Content Requirements

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

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

The Concept Paper must conform to the following content requirements:

AOIs 1a-10

Section	Page Limit	Description
Cover Page	1 page maximum	The cover page should include the project title, the specific announcement Topic AOI being addressed (if applicable), 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: <ul style="list-style-type: none"> 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);

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		<ul style="list-style-type: none"> • 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; and • Applicants may provide graphs, charts, or other data within the 3-page limit.
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AOIs 11-14

Section	Page Limit	Description
Cover Page	1 page maximum	The cover page should include the project title, the specific FOA Topic AOI being addressed (if applicable), both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Project Description and Impacts	3 pages maximum	Applicants are required to describe succinctly: <ul style="list-style-type: none"> • The problem being addressed by the project and the relevance of this problem to the AOI; • The project goal (i.e., what the project will accomplish) and what technologies will be used within the scope of that project; • The project’s approach to accomplishing the goal and its innovation; • The stakeholders/communities that will benefit from the project; • The potential impact that the proposed project would have on the problem being addressed; • How EERE funding is necessary to achieve the project objectives; • The project team’s qualifications, experience, and capabilities to successfully execute the proposed project; and • Applicants may provide graphs, charts, or other data within the 3-page limit.

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EERE makes an independent assessment of each Concept Paper based on the criteria in Section V.A.i. of the FOA. EERE will encourage a subset of applicants to submit Full Applications. Other applicants will be discouraged from submitting a Full Application. An applicant who receives a “discouraged” notification may still submit a Full Application. EERE will review all eligible Full Applications. However, by discouraging the submission of a Full Application, EERE intends to convey its lack of programmatic interest in the proposed project in an effort to save the applicant the time and expense of preparing an application that is unlikely to be selected for award negotiations.

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

D. Content and Form of the Full Application

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

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

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

i. Full Application Content Requirements

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

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

Component	File Format	Page Limit	File Name
Technical Volume	PDF	30	ControlNumber_LeadOrganization_TechnicalVolume
Resumes	PDF	3 pages each	ControlNumber_LeadOrganization_Resumes
Letters of Commitment	PDF	1 page each	ControlNumber_LeadOrganization_LOCs
Statement of Project Objectives (use the supplied template)	MS Word	7	ControlNumber_LeadOrganization_SOPO
SF-424	PDF	n/a	ControlNumber_LeadOrganization_App424
Budget Justification Workbook (use the supplied template)	MS Excel	n/a	ControlNumber_LeadOrganization_Budget_Justification
Summary/Abstract for Public Release	PDF	1	ControlNumber_LeadOrganization_Summary
Summary Slide (use the supplied template)	MS Powerpoint	1	ControlNumber_LeadOrganization_Slide
Subrecipient Budget Justification (use the supplied template)	MS Excel	n/a	ControlNumber_LeadOrganization_Subrecipient_Budget_Justification
DOE Work Proposal for FFRDC, if applicable (see DOE O 412.1A, Attachment 3)	PDF	n/a	ControlNumber_LeadOrganization_WP
Authorization from cognizant Contracting Officer for FFRDC	PDF	n/a	ControlNumber_LeadOrganization_FFRDCAuth
SF-LLL Disclosure of Lobbying Activities	PDF	n/a	ControlNumber_LeadOrganization_SF-LLL
Foreign Entity and Foreign Work Waivers	PDF	n/a	ControlNumber_LeadOrganization_Waiver
Community Benefits Plan	MS Word	5	ControlNumber_LeadOrganization_CBP
Current and Pending Support	PDF	n/a	ControlNumber_LeadOrganization_CPS
Transparency of Foreign Connections	PDF	n/a	ControlNumber_LeadOrganization_TFC
Potentially Duplicative Funding Notice	PDF	n/a	ControlNumber_LeadOrganization_PDFN

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:

TechnicalVolume_Part_1
TechnicalVolume_Part_2

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

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

ii. Technical Volume

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

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

The Technical Volume to the Full Application may not be more than 30 pages, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all of the information in the table below. The applicant should consider the weighting of each of the evaluation criteria (see Section V.A.ii. of the FOA) when preparing the Technical Volume.

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

AOIs 1a-10

SECTION/PAGE LIMIT	DESCRIPTION
Cover Page	The cover page should include the project title, the specific FOA Topic AOI being addressed (if applicable), both the technical and business points of contact, names of all team member organizations, names of the senior/key personnel and their organizations, and any statements regarding confidentiality.

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<p>Project Overview (Approximately 10% of the Technical Volume)</p>	<p>The Project Overview should contain the following information:</p> <ul style="list-style-type: none"> • Background: The applicant should discuss the background of their organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Full Application; • Project Goal: The applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal; and • 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.
<p>Technical Description, Innovation, and Impact (Approximately 30% of the Technical Volume)</p>	<p>The Technical Description should contain the following information:</p> <ul style="list-style-type: none"> • Relevance and Outcomes: The applicant should provide a detailed description of the technology, including the scientific and other principles and objectives that will be pursued during the project. This section should describe the relevance of the proposed project to the goals and objectives of the FOA, including the potential to meet specific DOE technical targets or other relevant performance targets. The applicant should clearly specify the expected outcomes of the project; • Feasibility: The applicant should demonstrate the technical feasibility of the proposed technology and capability of achieving the anticipated performance targets, including a description of previous work done and prior results; and • 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.
<p>Workplan and Market Transformation Plan (Approximately 40% of the Technical Volume)</p>	<p>The Workplan should include a summary of the Project Objectives, Technical Scope, Work Breakdown Structure (WBS), Milestones, Go/No-Go Decision Points, and Project Schedule. A detailed SOPO is separately requested. The Workplan should contain the following information:</p> <ul style="list-style-type: none"> • Project Objectives: The applicant should provide a clear and concise (high-level) statement of the goals and objectives of the project as well as the expected outcomes; • Technical Scope Summary: The applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). The overall work scope is to be divided by performance periods that are separated by discrete, approximately annual decision points (see below for more information on Go/No-

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	<p>Go decision points). The applicant should describe the specific expected end result of each performance period;</p> <ul style="list-style-type: none"> • WBS and Task Description Summary: The Workplan should describe the work to be accomplished and how the applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. The Workplan is to be structured with a hierarchy of performance period (approximately annual), task and subtasks, which is typical of a standard WBS for any project. The Workplan shall contain a concise description of the specific activities to be conducted over the life of the project. The description shall be a full explanation and disclosure of the project being proposed (i.e., a statement such as “we will then complete a proprietary process” is unacceptable). It is the applicant’s responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this FOA. The summary provided should be consistent with the SOPO. The SOPO will contain a more detailed description of the WBS and tasks; • Milestone Summary: The applicant should provide a summary of appropriate milestones throughout the project to demonstrate success. A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be Specific, Measurable, Achievable, Relevant, and Timely, and must demonstrate a technical achievement rather than simply completing a task. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one milestone per quarter for the duration of the project with at least one SMART technical milestone per year (depending on the project, more milestones may be necessary to comprehensively demonstrate progress). The applicant should also provide the means by which the milestone will be verified. The summary provided should be consistent with the Milestone Summary Table in the SOPO; • Go/No-Go Decision Points: The applicant should provide a summary of project-wide Go/No-Go decision points at appropriate points in the Workplan. A Go/No-Go decision point is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance, 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. At a minimum, 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. See Section VI.B.xiv. The applicant should also provide the specific technical criteria to be used to evaluate the project at the Go/No-Go decision point. The summary provided should be consistent with the SOPO. Go/No-Go decision points are
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	<p>considered “SMART” and can fulfill the requirement for an annual SMART milestone;</p> <ul style="list-style-type: none"> • End of Project Goal: The applicant should provide a summary of the end of project goal(s). At a minimum, 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; • Buy America Requirements for Infrastructure Projects: Within the first 2 pages of the Workplan, include a short statement on whether the project will involve the construction, alteration, and/or repair of infrastructure in the United States. See Appendix D for applicable definitions and other information to inform this statement; • Project Management: The applicant should discuss the team’s proposed management plan, including the following: <ul style="list-style-type: none"> ○ The overall approach to and organization for managing the work; ○ The roles of each project team member; ○ Any critical handoffs/interdependencies among project team members; ○ The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices; ○ The approach to project risk management; ○ A description of how project changes will be handled; ○ If applicable, the approach to Quality Assurance/Control; and ○ How communications will be maintained among project team members. • Market Transformation Plan: The applicant should provide a market transformation plan, including the following: <ul style="list-style-type: none"> ○ Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including a mitigation plan; and ○ Identification of a product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including
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	intellectual property, infrastructure requirements, data dissemination, and product distribution.
<p>Technical Qualifications and Resources (Approximately 20% of the Technical Volume)</p>	<p>The Technical Qualifications and Resources should contain the following information:</p> <ul style="list-style-type: none"> • Describe the project team’s unique qualifications and expertise, including those of key subrecipients; • Describe the project team’s existing equipment and facilities that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project; • This section should also include relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives; • Describe the time commitment of the key team members to support the project; • Describe the technical services to be provided by DOE/NNSA FFRDCs, if applicable; and • For multi-organizational or multi-investigator projects, describe succinctly: <ul style="list-style-type: none"> ○ The roles and the work to be performed by each PI and senior/key personnel; ○ Business agreements between the applicant and each PI and senior/key personnel; ○ How the various efforts will be integrated and managed; ○ Process for making decisions on scientific/technical direction; ○ Publication arrangements; ○ Intellectual Property issues; and ○ Communication plans.

AOIs 11 -14

SECTION/PAGE LIMIT	DESCRIPTION
Cover Page	<p>The cover page should include:</p> <ul style="list-style-type: none"> • Project title; • The specific FOA Topic AOI being addressed;

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	<ul style="list-style-type: none"> • The technical point of contact; • The business points of contact; • The names and locations (city, state, zip code) of all team member organizations; • Any additional locations (city, state, zip code) of project work; and • Statements regarding confidentiality.
<p>Project Overview (Approximately 10% of the Technical Volume)</p>	<p>The Project Overview section should contain a brief summary of the proposed project including the following information:</p> <p>Project Summary:</p> <ul style="list-style-type: none"> • Explanation of the project’s relevance to the AOI objectives; • The project’s end goal(s): Describe what the project will accomplish; • The project approach: Summarize the proposed project tasks to achieve the project’s end goal(s); • Project outcomes: Describe specific short-term results from the project activities; • Project outputs: Describe specific deliverables or tools to be produced; and • Project impacts: Describe expected long-term impacts resulting from the project activities. <p>Project Team and Qualifications</p> <ul style="list-style-type: none"> • Describe the team member organizations’ experience with this type of work and any special qualifications of key individuals in relation to the proposed work.
<p>Project Approach (Approximately 30% of the Technical Volume)</p>	<p>The Project Approach and Impact section should contain the following information:</p> <p>Project Approach and Impact Description</p> <ul style="list-style-type: none"> • Describe the problem being addressed, or the opportunity pursued by the project, using quantifiable metrics; • Describe the current state of the market sector applicable to the AOI (e.g., mobility accessibility, local knowledge and use of electric vehicles, availability of electric vehicle charging stations, market penetration, etc.). This should be specific to the geographic project area being proposed; • Using measurable/quantifiable elements, describe the expected change in the market sector as a result of the project activities. This should be specific to the geographic project area being proposed;

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	<ul style="list-style-type: none"> • The project approach: Describe the proposed project approach including what tasks and activities will be undertaken to achieve the project’s end goal(s); • Provide a detailed description of: <ul style="list-style-type: none"> ○ the technology or system to be demonstrated or deployed including quantity, type, location, specifications, etc. and/or ○ the outreach and education programs and activities to be developed/conducted and/or ○ the training to be developed/conducted. • Describe how community stakeholders affected by the project are involved in the design and implementation of the project activities; • The project’s end goal(s): Describe what the project will accomplish by the end of the project period; • Describe the project outcomes: the associated metrics and the approach to measuring their impact; • Project outputs: Describe specific deliverables or tools to be produced; and • Describe how the proposed project is innovative and replicable in other communities. <p>Justice 40 Considerations</p> <ul style="list-style-type: none"> • Describe how the project may directly or indirectly benefit disadvantaged communities.
<p>Market Transformation Plan (Approximately 5% of the Technical Volume)</p>	<p>The Market Transformation Plan section should include the following information</p> <p>Market Transformation Plan</p> <p>Describe the projects approach to ensuring long-term, market transforming impacts resulting from the project activities.</p> <ul style="list-style-type: none"> • Describe the long-term impacts from the project activities on the problem being addressed, including the alleviation of any market barriers; • Describe the approach for broadly disseminating project learnings, valuable insights, best practices and outcomes throughout the project period, in order to enable other communities to replicate project successes; and • Describe how project deployments, training programs, outreach and education programs would sustain themselves or expand after the completion the project period.

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<p>Workplan (Approximately 35% of the Technical Volume)</p>	<p>The Workplan should contain the following information:</p> <ul style="list-style-type: none"> • Project Summary by Budget Period: Provide a summary description of the work scope by budget periods. <ul style="list-style-type: none"> ○ Describe the specific expected outcome(s) of each budget period. • Project Schedule (Gantt Chart or similar): Provide a schedule for the entire project, including <ul style="list-style-type: none"> ○ Task and subtask durations; ○ Milestones; and ○ Go/No-Go decision points. • Work Breakdown Structure (WBS): Provide a WBS which: <ul style="list-style-type: none"> ○ Is structured with a hierarchy of budget periods (approximately annual), task and subtasks; ○ Contains a concise description of the specific activities to be conducted; ○ Describes how the team members will accomplish the work, achieve the milestones, and produce the deliverables in order to meet the final project goal(s); and ○ For each work package in the WBS, clearly indicates the responsible party and the location of the work. • Milestone Summary: Provide a summary of appropriate milestones throughout the project to demonstrate success. <p>A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be Specific, Measurable, Achievable, Relevant, and Timely, and must demonstrate a technical achievement rather than simply completing a task.</p> <p>Completion of a deliverable (a project output such as a technical report or tool) should be associated with an individual milestone.</p> <p>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).</p> <p>Include the following information</p> <ul style="list-style-type: none"> ○ Milestone Title; ○ Milestone description; ○ Associated task number;
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	<ul style="list-style-type: none"> ○ Timeframe for completion (e.g., project month or quarter); and ○ How the milestone will be verified. <ul style="list-style-type: none"> ● Go/No-Go Decision Points: 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, project 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. <ul style="list-style-type: none"> ○ Each project must have at least one project-wide Go/No-Go decision point for each budget period (ex: 12 to 15-month period) of the project. See Section VI.B.xiv; ○ Provide the specific criteria to be used to evaluate the project at the Go/No-Go decision point; and ○ Go/No-Go decision points are considered “SMART” and can fulfill the requirement for an annual SMART milestone. ● End of Project Goal: Provide a summary of the end of project goal(s). Each project must have at least one SMART end of project goal. ● Project data: Provide a description of: <ul style="list-style-type: none"> ○ The data to be collected from project related infrastructure, vehicles, or processes; market impact metrics; ○ The Justice 40 Initiative metrics the project will collect; and ○ The types and quantities of analyses to be performed to determine the project impact on market transformation and on underserved communities. ● Buy America Requirements for Infrastructure Projects: Within the first 2 pages of the Workplan, include a short statement on whether the project will involve the construction, alteration, and/or repair of infrastructure in the United States. See Appendix D for applicable definitions and other information to inform this statement. ● Project Management and Controls: Provide an overview of the team’s approach to project management and controls, including the following: <ul style="list-style-type: none"> ○ The overall approach to managing the work; ○ Financial management practices and systems used to track project costs, invoicing, and payments; ○ Project management practices and systems used to provide oversight of task progress, scope, schedule, and budget management; ○ Process for managing project changes;
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	<ul style="list-style-type: none"> ○ The involvement (responsible, accountable, consulted, or informed) of each project team organization in relation to the tasks, milestones and deliverables; ○ Describe the internal communication process among project team members; ○ Identification of project risks, mitigation strategies and risk management responsibilities; and ○ Quality Assurance/Control process to ensure the quality of services and products (including deliverables) generated by the team. <p>Note that a SOPO is required as a separate submission in the application (SOPO template is available in EERE Exchange). The tasks, milestones, and go/no-go decision points in the SOPO must be consistent with those proposed in the Workplan.</p>
<p>Project Team and Qualifications (Approximately 20% of the Technical Volume)</p>	<p>The Project Team and Qualifications section should contain the following information:</p> <ul style="list-style-type: none"> ● Describe the unique qualifications, expertise, and experience of the key individuals in the project team in relation to project and AOI objectives; ● Describe succinctly the roles and the work to be performed by each Principal Investigator (PI) and key participant in relation to their qualifications, expertise, and experience; ● Describe the time commitment of the PI and key participants to support the project; ● Describe the alignment between the team organizations’ missions/strategic goals with the objectives of the AOI and with the teaming arrangement encouraged or required by the AOI; ● Describe the technical services to be provided by DOE/NNSA FFRDCs, if applicable; and ● Describe how the project team’s financial and resource commitments to the project will facilitate the successful achievement of the project’s end goals.

iii. Resumes

A resume provides information that can be used by reviewers to evaluate the individual’s skills, experience, and potential for leadership within the scientific community. Applicants are required to submit three-page resumes for the Principal Investigator and all Senior/Key Personnel that include the following:

1. Contact Information;
2. Education and training: Provide institution, major/area, degree, and year for undergraduate, graduate, and postdoctoral training;

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3. Research and Professional Experience: Beginning with the current position, list professional/academic positions in chronological order with a brief description. List all current academic, professional, or institutional appointments, foreign or domestic, at the applicant institution or elsewhere, whether or not remuneration is received, and, whether full-time, part-time, or voluntary;
4. Awards and honors;
5. A list of up to 10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically. Patents, copyrights, and software systems developed may be provided in addition to or substituted for publications. An abbreviated style such as the Physical Review Letters (PRL) convention for citations (list only the first author) may be used for publications with more than 10 authors;
6. Synergistic Activities: List up to five professional and scholarly activities related to the proposed effort; and
7. There should be no lapses in time over the past ten years or since age 18, whichever time period is shorter.

Save the resumes in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Resumes".

In future FOAs, EERE may require a biographical sketch for the PI and senior/key personnel. In the meantime, in lieu of a resume, it is acceptable to use the biographical sketch format approved by the National Science Foundation (NSF). The biographical sketch format may be generated by the Science Experts Network Curriculum Vita (SciENCv), a cooperative venture maintained at <https://www.ncbi.nlm.nih.gov/sciencv/>, and is also available at <https://nsf.gov/bfa/dias/policy/nsfapprovedformats/biosketch.pdf>. The use of a format required by another agency is intended to reduce the administrative burden to researchers by promoting the use of common formats.

iv. Letters of Commitment

Submit letters of commitment from all subrecipient and third party cost share providers. If applicable, also include any letters of commitment from partners/end users (one-page maximum per letter). Letters should be addressed to the PI and clearly describe specific commitments to project activities and budget. Save the letters of commitment in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_LOCs".

Letters of support or endorsement for the project from entities that do not have a substantive role in the project are not accepted.

v. Statement of Project Objectives (SOPO)

Applicants are required to complete a SOPO. A SOPO template is available on EERE eXCHANGE at <https://eere-eXCHANGE.energy.gov/>. The SOPO, including the Milestone Table, must not exceed 7 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 (except in figures or tables, which may be 10 point font). Save the SOPO in a single Microsoft Word file using the following convention for the title "ControlNumber_LeadOrganization_SOPO".

vi. SF-424: Application for Federal Assistance

Applicants are required to complete the SF-424 Application for Federal Assistance. This form is available on EERE eXCHANGE at <https://eere-eXCHANGE.energy.gov/>. 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_424".

vii. Budget Justification Workbook

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

viii. 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".

ix. Summary Slide

Applicants are required to provide a single slide summarizing the proposed project. This slide is used during the evaluation process.

The Summary Slide template requires the following information:

- A technology summary;
- A description of the technology's impact;
- Proposed project goals;
- The project's key idea/takeaway;
- Topline Community Benefits;
- Locations of Project Work;
- Project title, prime recipient, Principal Investigator, and senior/key personnel information; and
- Requested EERE funds and proposed applicant cost share.

Save the Summary Slide in a single Microsoft Powerpoint file using the following convention for the title "ControlNumber_LeadOrganization_Slide".

x. Subrecipient Budget Justification (if applicable)

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

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xi. 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".

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

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

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

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

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

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

xiii. Waiver Requests: Foreign Entity and Foreign Work (if applicable)

i. Foreign Entity Participation:

As set forth in Section III.A.iv., 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.

ii. Performance of Work in the United States (Foreign Work Waiver)

As set forth in Section IV.I.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

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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 foreign work waiver request.

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

xiv. R&D Community Benefits Plan:

The R&D Community Benefits Plan must set forth the applicant’s approach to ensuring the federal investments advance the following three objectives: (1) DEIA; (2) energy equity; and (3) investing in America’s workforce. The below sections set forth the content requirements for the R&D Community Benefits Plan, which addresses each of these objectives. Applicants must address all three sections.

The applicant’s R&D Community Benefits Plan must include at least one Specific, Measurable, Assignable, Relevant, and Timely (SMART) milestone per budget period to measure progress on the proposed actions. The R&D Community Benefits Plan will be evaluated as part of the technical review process. If a project is selected, EERE will incorporate the R&D Community Benefits Plan into the award and the recipient must implement its R&D Community Benefits Plan when carrying out its project. EERE will evaluate the recipient’s progress throughout the life of the award, including as part of the Go/No-Go review process.

The plan should be specific to the proposed project and not a restatement of an organization’s policies. Applicants should describe the future implications or a milestone-based plan for identifying future implications of their research on energy equity, including, but not limited to, benefits for the U.S. workforce. These impacts may be uncertain, occur over a long period of time, and/or have many factors within and outside the specific proposed research. Applicants are encouraged to describe the influencing factors and the most likely workforce and energy equity implications of the proposed research if the research is successful. While some guidance and example activities are provided in Appendix H, applicants are encouraged to leverage promising practices and develop a plan tailored to their project.

The R&D Community Benefits Plan must not exceed five pages. It must be submitted in PDF format using the following convention name for the title: “ControlNumber_LeadOrganization_CBP.” This Plan must address the technical review criterion titled “R&D Community Benefits Plan.” See Section IV. of the FOA.

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The R&D Community Benefits Plan must address the following three sections:

1) Diversity, Equity, Inclusion, and Accessibility:

To building a clean and equitable energy economy, it is important that there are opportunities for people of all racial, ethnic, socioeconomic, and geographic backgrounds, sexual orientation, gender identity, persons with disabilities, and those re-entering the workforce from incarceration. This section of the plan must demonstrate how DEIA is incorporated in the technical project objectives. The plan must identify the specific action the applicant would take that integrates into the research goals and project teams. Submitting an institutional DEIA plan without specific integration into the project will be deemed insufficient.

2) Energy Equity:

This section must articulate the applicant's consideration of long-term equity implications of the research. It must identify how the specific project integrates equity considerations into the project design to support equitable outcomes if the innovation is successful. Like cost reductions and commercialization plans, the R&D Community Benefits Plan requires description of the equity implications of the innovation.

3) Workforce Implications:

This section must articulate the applicant's consideration of long-term workforce impacts and opportunities of the research. It must identify how the project is designed and executed to include an understanding of the future workforce needs if the innovation is successful.

See Appendix H for more guidance.

xv. Current and Pending Support

Current and pending support is intended to allow the identification of potential duplication, overcommitment, potential conflicts of interest or commitment, and all other sources of support. As part of the application, the principal investigator and senior/key personnel at the applicant and subrecipient level must provide a list of all sponsored activities, awards, and appointments, whether paid or unpaid; provided as a gift with terms or conditions or provided as a gift without terms or conditions; full-time, part-time, or voluntary; faculty, visiting, adjunct, or honorary; cash or in-kind; foreign or domestic; governmental or private-sector; directly supporting the individual's research or indirectly supporting the individual by supporting students, research staff, space, equipment, or other research expenses. All foreign government-sponsored talent recruitment programs must be identified in current and pending support.

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For every activity, list the following items:

- The sponsor of the activity or the source of funding;
- The award or other identifying number;
- The title of the award or activity. If the title of the award or activity is not descriptive, add a brief description of the research being performed that would identify any overlaps or synergies with the proposed research;
- The total cost or value of the award or activity, including direct and indirect costs and cost share. For pending proposals, provide the total amount of requested funding;
- The award period (start date – end date); and
- The person-months of effort per year being dedicated to the award or activity.

If required to identify overlap, duplication of effort, or synergistic efforts, append a description of the other award or activity to the current and pending support.

Details of any obligations, contractual or otherwise, to any program, entity, or organization sponsored by a foreign government must be provided on request to either the applicant institution or DOE.

PIs and senior/key personnel must provide a separate disclosure statement listing the required information above regarding current and pending support. Each individual must sign and date their respective disclosure statement and include the following certification statement:

I, [Full Name and Title], certify to the best of my knowledge and belief that the information contained in this Current and Pending Support Disclosure Statement is true, complete and accurate. I understand that any false, fictitious, or fraudulent information, misrepresentations, half-truths, or omissions of any material fact, may subject me to criminal, civil or administrative penalties for fraud, false statements, false claims or otherwise. (18 U.S.C. §§ 1001 and 287, and 31 U.S.C. 3729-3733 and 3801-3812). I further understand and agree that (1) the statements and representations made herein are material to DOE's funding decision, and (2) I have a responsibility to update the disclosures during the period of performance of the award should circumstances change which impact the responses provided above.

The information may be provided in the format approved by the National Science Foundation (NSF), which may be generated by the Science Experts Network Curriculum Vita (SciENCv), a cooperative venture maintained at <https://www.ncbi.nlm.nih.gov/sciencv/>, and is also available at <https://www.nsf.gov/bfa/dias/policy/nsfapprovedformats/cps.pdf>. The use of a format required by another agency is intended to reduce the administrative burden to researchers by promoting the use of common formats. If the NSF format is used, the individual must still include a signature, date, and a certification statement using the language included in the paragraph above.

Save the Current and Pending Support in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_CPS".

Definitions:

Current and pending support – (a) All resources made available, or expected to be made available, to an individual in support of the individual's RD&D efforts, regardless of (i) whether the source is foreign or domestic; (ii) whether the resource is made available through the entity applying for an award or directly to the individual; or (iii) whether the resource has monetary value; and (b) includes in-kind contributions requiring a commitment of time and directly supporting the individual's RD&D efforts, such as the provision of office or laboratory space, equipment, supplies, employees, or students. This term has the same meaning as the term Other Support as applied to researchers in NSPM-33: For researchers, Other Support includes all resources made available to a researcher in support of and/or related to all of their professional RD&D efforts, including resources provided directly to the individual or through the organization, and regardless of whether or not they have monetary value (e.g., even if the support received is only in-kind, such as office/laboratory space, equipment, supplies, or employees). This includes resource and/or financial support from all foreign and domestic entities, including but not limited to, gifts provided with terms or conditions, financial support for laboratory personnel, and participation of student and visiting researchers supported by other sources of funding.

Foreign Government-Sponsored Talent Recruitment Program – An effort directly or indirectly organized, managed, or funded by a foreign government, or a foreign government instrumentality or entity, to recruit science and technology professionals or students (regardless of citizenship or national origin, or whether having a full-time or part-time position). Some foreign government-sponsored talent recruitment programs operate with the intent to import or otherwise acquire from abroad, sometimes through illicit means, proprietary technology or software, unpublished data and methods, and intellectual property to further the military modernization goals and/or economic goals of a foreign

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government. Many, but not all, programs aim to incentivize the targeted individual to relocate physically to the foreign state for the above purpose. Some programs allow for or encourage continued employment at United States research facilities or receipt of federal research funds while concurrently working at and/or receiving compensation from a foreign institution, and some direct participants not to disclose their participation to United States entities. Compensation could take many forms including cash, research funding, complimentary foreign travel, honorific titles, career advancement opportunities, promised future compensation, or other types of remuneration or consideration, including in-kind compensation.

Senior/key personnel – an individual who contributes in a substantive, meaningful way to the scientific development or execution of a research, development and demonstration (RD&D) project proposed to be carried out with DOE award.¹⁷

xvi. Transparency of Foreign Connections

Applicants must provide the following information as it relates to the proposed recipient and subrecipients. Include a separate disclosure for the applicant and each proposed subrecipient. U.S. National Laboratories, domestic government entities, and institutions of higher education are only required to respond to items 1, 2 and 9, and if applying as to serve as the prime recipient, must provide complete responses for project team members that are not U.S. National Laboratories, domestic government entities, or institutions of higher education.

1. Entity name, website address and physical address;
2. The identity of all owners, principal investigators, project managers, and senior/key personnel who are a party to any *Foreign Government-Sponsored Talent Recruitment Program* of a foreign country of risk (i.e., China, Iran, North Korea, and Russia);
3. The existence of any joint venture or subsidiary that is based in, funded by, or has a foreign affiliation with any foreign country of risk;
4. Any current or pending contractual or financial obligation or other agreement specific to a business arrangement, or joint venture-like arrangement with an enterprise owned by a foreign state or any foreign entity;

¹⁷ Typically, these individuals have doctoral or other professional degrees, although individuals at the masters or baccalaureate level may be considered senior/key personnel if their involvement meets this definition. Consultants, graduate students, and those with a postdoctoral role also may be considered senior/key personnel if they meet this definition.

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5. Percentage, if any, that the proposed recipient or subrecipient has foreign ownership or control;
6. Percentage, if any, that the proposed recipient or subrecipient is wholly or partially owned by an entity in a foreign country of risk;
7. Percentage, if any, of venture capital or institutional investment by an entity that has a general partner or individual holding a leadership role in such entity who has a foreign affiliation with any foreign country of risk;
8. Any technology licensing or intellectual property sales to a foreign country of risk, during the 5-year period preceding submission of the proposal;
9. Any foreign business entity, offshore entity, or entity outside the United States related to the proposed recipient or subrecipient;
10. Complete list of all directors (and board observers), including their full name, citizenship and shareholder affiliation, date of appointment, duration of term, as well as a description of observer rights as applicable;
11. Complete capitalization table for your entity, including all equity interests (including LLC and partnership interests, as well as derivative securities). Include both the number of shares issued to each equity holder, as well as the percentage of that series and all equity on a fully diluted basis. Identify the principal place of incorporation (or organization) for each equity holder. If the equity holder is a natural person, identify the citizenship(s). If the recipient or subrecipient is a publicly traded company, provide the above information for shareholders with an interest greater than five percent;
12. A summary table identifying all rounds of financing, the purchase dates, the investors for each round, and all the associated governance and information rights obtained by investors during each round of financing; and
13. An organization chart to illustrate the relationship between your entity and the immediate parent, ultimate parent, and any intermediate parent, as well as any subsidiary or affiliates. Identify where each entity is incorporated.

DOE reserves the right to request additional or clarifying information based on the information submitted.

Save the Transparency of Foreign Connections information in a single PDF file using the following convention for the title “ControlNumber_LeadOrganization_TFC”.

xvii. Potentially Duplicative Funding Notice

If the applicant or project team member has other active awards of federal funds, the applicant must determine whether the activities of those awards potentially

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overlap with the activities set forth in its application to this FOA. If there is a potential overlap, the applicant must notify DOE in writing of the potential overlap and state how it will ensure any project funds (i.e., recipient cost share and federal funds) will not be used for identical cost items under multiple awards. Likewise, for projects that receive funding under this FOA, if a recipient or project team member receives any other award of federal funds for activities that potentially overlap with the activities funded under the DOE award, the recipient must promptly notify DOE in writing of the potential overlap and state whether project funds from any of those other federal awards have been, are being, or are to be used (in whole or in part) for one or more of the identical cost items under the DOE award. If there are identical cost items, the recipient must promptly notify the DOE Contracting Officer in writing of the potential duplication and eliminate any inappropriate duplication of funding.

Save the Potentially Duplicative Funding Notice in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_PDFN.pdf."

E. Post Selection Information Requests

If selected for award negotiations, EERE reserves the right to require that selected applicants provide additional or clarifying information regarding the application submissions, the project, the project team, the award requirements, and any other matters related to anticipated award. The following is a non-exhaustive list of examples of information that may be required:

- Personnel proposed to work on the project and collaborating organizations (See Section VI.B.xviii. Participants and Collaborating Organizations);
- Current and Pending Support (See Sections IV.D.xv and VI.B.xix. Current and Pending Support);
- A Data Management Plan (if applicable) describing how all research data displayed in publications resulting from the proposed work will be digitally accessible at the time of publications, in accordance with Section VI.B.xxi.;
- 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);
- Information for the DOE Office of Civil Rights to process assurance reviews under 10 CFR 1040;
- Representation of Limited Rights Data and Restricted Software, if applicable; and
- Environmental Questionnaire.

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F. Unique Entity Identifier (UEI) and System for Award Management (SAM)

Each applicant (unless the applicant is an individual or federal awarding agency that is excepted from those requirements under 2 CFR 25.110(b) or (c), or has an exception approved by the federal awarding agency under 2 CFR 25.110(d)) is required to: (1) Be registered in the SAM at <https://www.sam.gov> before submitting its application; (2) provide a valid UEI 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 UEI and SAM requirements and, if an applicant has not fully complied with the requirements by the time DOE is ready to make a federal award, the DOE will determine that the applicant is not qualified to receive a federal award and use that determination as a basis for making a federal award to another applicant.

NOTE: Due to the high demand of UEI requests and SAM registrations, entity legal business name and address validations are taking longer than expected to process. Entities should start the UEI and SAM registration process as soon as possible. If entities have technical difficulties with the UEI validation or SAM registration process they should utilize the [HELP](#) feature on [SAM.gov](#). SAM.gov will work entity service tickets in the order in which they are received and asks that entities not create multiple service tickets for the same request or technical issue. Additional entity validation resources can be found here: [GSAFSD Tier 0 Knowledge Base - Validating your Entity](#).

G. Submission Dates and Times

All required submissions must be submitted in EERE eXCHANGE no later than 5 p.m. Eastern Time on the dates provided on the cover page of this FOA.

H. Intergovernmental Review

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

I. Funding Restrictions

i. Allowable Costs

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

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

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

ii. **Pre-Award Costs**

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

Pre-award costs cannot be incurred prior to the Selection Official signing the Selection Statement and Analysis.

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

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 pre-award costs incurred prior to receiving written authorization from the Contracting Officer. If the applicant elects to undertake activities that DOE determines 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 for their project 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. Likewise, if an application is selected for negotiation

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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.

iii. Performance of Work in the United States (Foreign Work Waiver)

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 whether the work is performed by the prime recipient, subrecipients, contractors or other project partners.

3. Waiver

To seek a foreign work waiver, the applicant must submit a written waiver request to EERE. Appendix C lists the necessary information that must be included in a request for a foreign work waiver.

Save the waiver request(s) in a single PDF file. The applicant does not have the right to appeal EERE's decision concerning a waiver request.

iv. Construction

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

v. Foreign Travel

If international travel is proposed for your project, please note that your organization must comply with the International Air Transportation Fair Competitive Practices Act of 1974 (49 USC 40118), commonly referred to as the "Fly America Act," and implementing regulations at 41 CFR 301-10.131 through 301-10.143. The law and regulations require air transport of people or property

to, from, between, or within a country other than the United States, the cost of which is supported under this award, to be performed by or under a cost-sharing arrangement with a U.S. flag carrier, if service is available. Foreign travel costs are allowable only with the written prior approval of the Contracting Officer assigned to the award.

vi. Equipment and Supplies

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

Property disposition will be required at the end of a project if the current fair market value of property exceeds \$5,000. For-profit entity disposition requirements are set forth at 2 CFR 910.360. Property disposition requirements for other non-federal entities are set forth in 2 CFR 200.310 – 200.316.

vii. Buy America Requirements for Infrastructure Projects

Pursuant to the Build America Buy America Act, subtitle IX of BIL (Buy America, or “BABA”), federally assisted projects that involve infrastructure work, undertaken by applicable recipient types, require that:

- All iron, steel, and manufactured products used in the infrastructure work are produced in the United States; and
- All construction materials used in the infrastructure work are manufactured in the United States.

Whether a given project must apply this requirement is project-specific and dependent on several factors, such as the recipient’s entity type, whether the work involves “infrastructure,” as that term is defined in Section 70914 of the BIL, and whether the infrastructure in question is publicly owned or serves a public function.

Applicants are strongly encouraged to consult Appendix D of this FOA to determine whether their project may have to apply this requirement, both to make an early determination as to the need of a waiver, as well as to determine what impact, if any, this requirement may have on the proposed project’s budget.

Please note that, based on implementation guidance from the Office of Management and Budget (OMB) issued on April 18, 2022, the Buy America requirements of the BIL do not apply to DOE projects in which the prime recipient is a for-profit entity; the requirements only apply to projects whose prime recipient is a “non-Federal entity,” e.g., a State, local government, Indian

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tribe, Institution of Higher Education, or nonprofit organization. Subawards should conform to the terms of the prime award from which they flow; in other words, for-profit prime recipients are not required to flow down these Buy America requirements to subrecipients, even if those subrecipients are non-Federal entities as defined above. Conversely, prime recipients which are non-Federal entities must flow the Buy America requirements down to all subrecipients, even if those subrecipients are for-profit entities. Finally, for all applicants—both non-Federal entities and for-profit entities—DOE is including a Program Policy Factor that the Selection Official may consider in determining which Full Applications to select for award negotiations that considers whether the applicant has made a commitment to procure U.S. iron, steel, manufactured products, and construction materials in its project.

The DOE financial assistance agreement will require each recipient: (1) to fulfill the commitments made in its application regarding the procurement of U.S.-produced products and (2) to fulfill the commitments made in its application regarding the procurement of other key component metals and manufactured products domestically that are deemed available in sufficient and reasonably available quantities or of a satisfactory quality at the time of award negotiation. Applicants may seek waivers of these requirements in very limited circumstances and for good cause shown. Further details on requesting a waiver can be found in Appendix D and the terms and conditions of an award.

Applicants are strongly encouraged to consult Appendix D for more information.

viii. Lobbying

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

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

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

ix. Risk Assessment

Pursuant to 2 CFR 200.206, DOE will conduct an additional review of the risk posed by applications submitted under this FOA. Such risk assessment will consider:

1. Financial stability;
2. Quality of management systems and ability to meet the management standards prescribed in 2 CFR 200 as amended and adopted by 2 CFR 910;
3. History of performance;
4. Audit reports and findings; and
5. The applicant's ability to effectively implement statutory, regulatory, or other requirements imposed on non-federal entities.

DOE may make use of other publicly available information and the history of an applicant's performance under DOE or other federal agency awards.

Depending on the severity of the findings and whether the findings were resolved, DOE may elect not to fund the applicant.

In addition to this review, DOE must comply with the guidelines on government-wide suspension and debarment in 2 CFR Part 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.

Further, as DOE invests in critical infrastructure and funds critical and emerging technology areas, DOE also considers possible vectors of undue foreign influence in evaluating risk. If high risks are identified and cannot be sufficiently mitigated, DOE may elect to not fund the applicant.

x. 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;

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- UCC filing proof for equipment acquired with project funds by for-profit recipients and subrecipients;
- Explanation of cost share for invoicing period;
- Analogous information for some subrecipients; and
- Other items as required by DOE.

xi. Prohibition Related to Foreign Government-Sponsored Talent Recruitment Programs

a. Prohibition

Persons participating in a *Foreign Government-Sponsored Talent Recruitment Program of a Foreign Country of Risk* are prohibited from participating in projects selected for federal funding under this FOA. Should an award result from this FOA, the recipient must exercise ongoing due diligence to reasonably ensure that no individuals participating on the DOE-funded project are participating in a *Foreign Government-Sponsored Talent Recruitment Program of a Foreign Country of Risk*. Consequences for violations of this prohibition will be determined according to applicable law, regulations, and policy. Further, the recipient must notify DOE within five (5) business days upon learning that an individual on the project team is or is believed to be participating in a foreign government talent recruitment program of a foreign country of risk. DOE may modify and add requirements related to this prohibition to the extent required by law.

b. Definitions

- 1. Foreign Government-Sponsored Talent Recruitment Program.** An effort directly or indirectly organized, managed, or funded by a foreign government, or a foreign government instrumentality or entity, to recruit science and technology professionals or students (regardless of citizenship or national origin, or whether having a full-time or part-time position). Some foreign government-sponsored talent recruitment programs operate with the intent to import or otherwise acquire from abroad, sometimes through illicit means, proprietary technology or software, unpublished data and methods, and intellectual property to further the military modernization goals and/or economic goals of a foreign government. Many, but not all, programs aim to incentivize the targeted individual to relocate physically to the foreign state for the above purpose. Some programs allow for or encourage continued employment at United States research facilities or receipt of federal research funds while concurrently working at and/or receiving compensation from a foreign institution, and some direct participants not

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to disclose their participation to U.S. entities. Compensation could take many forms including cash, research funding, complimentary foreign travel, honorific titles, career advancement opportunities, promised future compensation, or other types of remuneration or consideration, including in-kind compensation.

2. **Foreign Country of Risk.** DOE has designated the following countries as foreign countries of risk: Iran, North Korea, Russia, and China. This list is subject to change.

xii. **Foreign Collaboration Considerations**

- a. Consideration of new collaborations with foreign entities and governments. The recipient will be required to provide DOE with advanced written notification of any potential collaboration with foreign entities or governments in connection with its DOE-funded award scope. The recipient will then be required to await further guidance from DOE prior to contacting the proposed foreign entity or government regarding the potential collaboration or negotiating the terms of any potential agreement.
- b. Existing collaborations with foreign entities and governments. The recipient will be required to provide DOE with a written list of all existing foreign collaborations in which has entered in connection with its DOE-funded award scope.
- c. Description of collaborations that should be reported: In general, a collaboration will involve some provision of a thing of value to, or from, the recipient. A thing of value includes but may not be limited to all resources made available to, or from, the recipient in support of and/or related to the DOE award, regardless of whether or not they have monetary value. Things of value also may include in-kind contributions (such as office/laboratory space, data, equipment, supplies, employees, students). In-kind contributions not intended for direct use on the DOE award but resulting in provision of a thing of value from or to the DOE award must also be reported. Collaborations do not include routine workshops, conferences, use of the recipient's services and facilities by foreign investigators resulting from its standard published process for evaluating requests for access, or the routine use of foreign facilities by awardee staff in accordance with the recipient's standard polies and procedures.

V. APPLICATION REVIEW INFORMATION

A. Technical Review Criteria

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i. Concept Papers

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

AOIs 1a-10**Concept Paper Criterion: Overall FOA Responsiveness and Viability of the Project (Weight: 100%)**

This criterion involves consideration of the following factors:

- The applicant clearly describes the proposed technology, 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.

AOIs 11 - 14**Concept Paper Criterion: Overall FOA Responsiveness and Viability of the Project (Weight: 100%)**

This criterion involves consideration of the following factors:

- The applicant clearly describes the problem being addressed by the project, the project goal, and what technologies will be used within the scope of the project;
- The applicant clearly describes how the project is unique and innovative;
- The applicant demonstrates adequate involvement from intended partnerships;
- The applicant has the qualifications, experience, capabilities and other resources necessary to complete the proposed project;
- The proposed project clearly meets the requirements of the FOA topic; and
- The proposed work, if successfully accomplished, would have a meaningful impact on the problem targeted by the FOA topic.

ii. Full Applications**AOIs 1a - 10**

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

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Criterion 1: Technical Merit, Innovation, and Impact (45%)

This criterion involves consideration of the following factors:

Technical Merit and Innovation

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

Impact of Technology Advancement

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

Criterion 2: Project Research and Market Transformation Plan (25%)

This criterion involves consideration of the following factors:

Research Approach, Workplan and SOPO

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

Identification of Technical Risks

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

Baseline, Metrics, and Deliverables

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

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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, and product distribution.

Criterion 3: Team and Resources (15%)

This criterion involves consideration of the following factors:

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

Criterion 4: Community Benefits Plan (15%)

This criterion involves consideration of the following factors:

Diversity, Equity, Inclusion, and Accessibility

- Clear articulation of the project's goals related to diversity, equity, inclusion, and accessibility;
- Quality of the project's DEIA goals, as measured by the goals' depth, breadth, likelihood of success, inclusion of appropriate and relevant SMART milestones, and overall project integration;
- Degree of commitment and ability to track progress toward meeting each of the DEIA goals; and
- Extent of engagement of organizations that represent DACs as a core element of their mission, including Minority Serving Institutions (MSIs), Minority Business Entities, and non-profit or community-based organizations.

Energy Equity

- Clear workplan tasks, staffing, research, and timeline for engaging energy equity stakeholders and/or evaluating the possible near- and long-term

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implications of the project for the benefit of the American public, including but not limited to public health and public prosperity benefits;

- Approach, methodology, and expertise articulated in the plan for addressing energy equity and justice issues associated with the technology innovation; and
- Likelihood that the plan will result in improved understanding of distributional public benefits and costs related to the innovation if successful.

Workforce Implications

- Clear and comprehensive workplan tasks, staffing, research, and timeline for engaging workforce stakeholders and/or evaluating the possible near- and long-term implications of the project for the U.S. workforce;
- Approach to document the knowledge, skills, and abilities of the workforce required for successful commercial deployment of innovations resulting from this research; and
- Likelihood that the plan will result in improved understanding of the workforce implications related to the innovation if successful.

AOIs 11 - 14

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

Criterion 1: Project Approach and Impact (30%)

This criterion involves consideration of the following factors:

- Extent to which the proposed approach is relevant to the Topic AOI objectives, demonstrates how DOE funding will impact the problem that is being addressed, and is innovative;
- Extent to which the application objectively describes the current state of the market sector using quantifiable metrics and how the project outcomes will measurably advance the state of the market sector;
- Extent to which the community which will be affected by the project is involved in the design and implementation of the project activities; and
- Extent to which the project includes activities to produce and share valuable insights and best practices that will effectively enable others to replicate the project successes.

Criterion 2: Project Plan (30%)

This criterion involves consideration of the following factors:

- Extent to which the workplan clearly defines the scope, tasks, milestones, and schedule of the project such that the parameters of the project are appropriately defined, the tasks are logically ordered, the task durations are

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reasonable, and that the overall plan will result in successful achievement of project outcomes and goals;

- Reasonableness of the approach to managing the work, including the extent to which the involvement of project team organizations/individuals are defined in relation to specific work tasks, milestones and deliverables, and of the structure of the plan for communication among team members;
- Reasonableness of the proposed plan for collecting, utilizing, analyzing, and publicly sharing project data; and
- Reasonableness of the allocation of project resources, including project budget and key personnel time commitment, to ensure the successful completion of the proposed work.

Criterion 3: Project Team and Qualifications (25%)

This criterion involves consideration of the following factors:

- Extent of key personnel qualifications, expertise, and experience, in relation to project and AOI objectives;
- Extent of the alignment between the team organizations' missions/strategic goals with the objectives of the AOI and with the teaming arrangement proposed by the AOI; and
- Appropriateness of the resource commitments proposed by project partners or other key participants as validated by letters of commitment.

Criterion 4: Community Benefits Plan (15%)

This criterion involves consideration of the following factors:

Diversity, Equity, Inclusion, and Accessibility

- Clear articulation of the project's goals related to diversity, equity, inclusion, and accessibility;
- Quality of the project's DEIA goals, as measured by the goals' depth, breadth, likelihood of success, inclusion of appropriate and relevant SMART milestones, and overall project integration;
- Degree of commitment and ability to track progress toward meeting each of the DEIA goals; and
- Extent of engagement of organizations that represent DACs as a core element of their mission, including Minority Serving Institutions (MSIs), Minority Business Entities, and non-profit or community-based organizations.

Energy Equity

- Clear workplan tasks, staffing, research, and timeline for engaging energy equity stakeholders and/or evaluating the possible near- and long-term

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implications of the project for the benefit of the American public, including but not limited to public health and public prosperity benefits;

- Approach, methodology, and expertise articulated in the plan for addressing energy equity and justice issues associated with the technology innovation; and
- Likelihood that the plan will result in improved understanding of distributional public benefits and costs related to the innovation if successful.

Workforce Implications

- Clear and comprehensive workplan tasks, staffing, research, and timeline for engaging workforce stakeholders and/or evaluating the possible near- and long-term implications of the project for the U.S. workforce;
- Approach to document the knowledge, skills, and abilities of the workforce required for successful commercial deployment of innovations resulting from this research; and
- Likelihood that the plan will result in improved understanding of the workforce implications related to the innovation if successful.

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 "DOE Merit Review Guide for Financial Assistance," effective September 2020, which is available at:

<https://energy.gov/management/downloads/merit-review-guide-financial-assistance-and-unsolicited-proposals-current>.

C. Other Selection Factors

i. Program Policy Factors

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

- The degree to which the proposed project exhibits technological diversity when compared to the existing DOE project portfolio and other projects selected from the subject FOA;
- The degree to which the proposed project, including proposed cost share, optimizes the use of available EERE funding to achieve programmatic objectives;
- The level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers;

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-
- 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;
 - The degree to which the proposed project, or group of projects, represent a desired geographic distribution (considering past awards and current applications);
 - The degree to which the proposed project incorporates diversity, equity, and inclusion elements, including but not limited to team members from Minority Serving Institutions (e.g. Historically Black Colleges and Universities (HBCUs)/Other Minority Institutions), Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses, Veteran Owned Businesses, or members within underserved communities; and
 - The degree to which the proposed project will employ procurement of U.S. iron, steel, manufactured products, and construction materials.

Diversity (other than technological)

- The degree to which the proposed project collectively represents diverse types and sizes of applicant organizations.

Optimize Funding

- The degree to which the proposed project avoids duplication/overlap with other publicly or privately funded work.

Complementary Efforts

- The degree to which the proposed project supports complementary efforts or projects, which, when taken together, will best achieve the research goals and objectives.

Market Impact

- The degree to which the proposed project enables new and expanding market segments.

EE/Deployment

- The degree to which the project's solution or strategy will maximize deployment or replication.

Tech Transfer

- The degree to which the project promotes increased coordination with nongovernmental entities for demonstration of technologies and research applications to facilitate technology transfer.

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D. Evaluation and Selection Process

i. Overview

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

ii. Pre-Selection 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.

iii. 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).

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subject line.*

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 CFR 200.206.

iv. Selection

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

E. Anticipated Notice of Selection and Award Negotiation Dates

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

VI. AWARD ADMINISTRATION INFORMATION

A. Award Notices

i. Ineligible Submissions

Ineligible Concept Papers and Full Applications will not be further reviewed or considered for award. The Contracting Officer will send a notification letter by email to the technical and administrative points of contact designated by the applicant in EERE eXCHANGE. The notification letter will state the basis upon which the Concept Paper or the Full Application is ineligible and not considered for further review.

ii. Concept Paper Notifications

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

Applicants may submit a Full Application even if they receive a notification discouraging them from doing so. By discouraging the submission of a Full Application, EERE intends to convey its lack of programmatic interest in the

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proposed project. Such assessments do not necessarily reflect judgments on the merits of the proposed project. The purpose of the Concept Paper phase is to save applicants the considerable time and expense of preparing a Full Application that is unlikely to be selected for award negotiations.

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

iii. Full Application Notifications

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

iv. Successful Applicants

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

The award negotiation process will take approximately 60 days. Applicants must designate a primary and a backup point-of-contact in EERE eXCHANGE with whom EERE will communicate to conduct award negotiations. The applicant must be responsive during award negotiations (i.e., provide requested documentation) 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.I.ii. of the FOA for guidance on pre-award costs.

v. Alternate Selection Determinations

In some instances, an applicant may receive a notification that its application was not selected for award and EERE designated the application to be an alternate. As an alternate, EERE may consider the Full Application for federal funding in the future. A notification letter stating the Full Application is

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designated as an alternate does not authorize the applicant to commence performance of the project. EERE may ultimately determine to select or not select the Full Application for award negotiations.

vi. Unsuccessful Applicants

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

B. Administrative and National Policy Requirements

i. Registration Requirements

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

1. EERE Funding Opportunity Exchange (eXCHANGE)

Register and create an account on EERE eXCHANGE at <https://eere-eXCHANGE.energy.gov>. This account will allow the user to apply to any open EERE FOAs that are currently in EERE eXCHANGE.

As of September 30, 2022, potential applicants will be required to have a Login.gov account to access [EERE eXCHANGE](#). As part of the eXCHANGE registration process, new users will be directed to create an account in Login.gov. Please note that the email address associated with Login.gov must match the email address associated with the eXCHANGE account. For more information, refer to the eXCHANGE Multi-Factor Authentication (MFA) Quick Guide in the [Manuals section](#) of 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 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. System for Award Management

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

NOTE: Due to the high demand of UEI requests and SAM registrations, entity legal business name and address validations are taking longer than expected to process. Entities should start the UEI and SAM registration process as soon as possible. If entities have technical difficulties with the UEI validation or SAM registration process they should utilize the HELP feature on SAM.gov. SAM.gov will work entity service tickets in the order in which they are received and asks that entities not create multiple service tickets for the same request or technical issue. Additional entity validation resources can be found here: [GSAFSD Tier 0 Knowledge Base - Validating your Entity](#).

3. FedConnect

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

4. 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.

5. Electronic Authorization of Applications and Award Documents

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

ii. Award Administrative Requirements

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

iii. Subaward and Executive Reporting

Additional administrative requirements necessary for DOE grants and cooperative agreements to comply with the Federal Funding and Transparency

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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.

iv. 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>.

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

EERE's decision whether and how to distribute federal funds under this FOA is subject to NEPA (42 U.S.C. 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 <https://www.energy.gov/nepa>.

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 recipient may be required to prepare the records and the costs to prepare the necessary records may be included as part of the project costs.

vi. Flood Resilience

Applications should indicate whether the proposed project location(s) is within a floodplain, how the floodplain was defined, and how future flooding will factor into the project's design. The base floodplain long used for planning has been the 100-year floodplain, that is, a floodplain with a 1.0 percent chance of flooding in any given year. As directed by Executive Order 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input (2015), Federal agencies, including DOE, continue to avoid development in a floodplain to the extent possible. When doing so is not possible, Federal agencies are directed to "expand management from the current base flood level to a higher vertical elevation and corresponding horizontal floodplain to address current and future flood risk and ensure that projects funded with taxpayer dollars last as long as intended." The higher flood elevation is based on one of three approaches: climate-informed

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science (preferred), freeboard value, or 0.2 percent annual flood change (500-year floodplain). EO 13690 and related information is available at <https://www.energy.gov/nepa/articles/eo-13690-establishing-federal-flood-risk-management-standard-and-process-further>.

vii. 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 contractors from lawfully reporting waste, fraud, or abuse to a designated investigative or

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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 Classified Information Nondisclosure Agreement (<https://fas.org/sgp/othergov/sf312.pdf>), Form 4414 Sensitive Compartmented Information Disclosure Agreement (<https://fas.org/sgp/othergov/intel/sf4414.pdf>), or any other form issued by a federal department or agency governing the nondisclosure of classified information.
 - (3)** Notwithstanding the provision listed in paragraph (a), a nondisclosure or confidentiality policy form or agreement that is to be executed by a person connected with the conduct of an intelligence or intelligence-related activity, other than an employee or officer of the United States government, may contain provisions appropriate to the particular activity for which such document is to be used. Such form or agreement shall, at a minimum, require that the person will not disclose any classified information received in the course of such activity unless specifically authorized to do so by the United States government. Such nondisclosure or confidentiality forms shall also make it clear that they do not bar disclosures to Congress, or to an authorized official of an executive agency or the Department of Justice, that are essential to reporting a substantial violation of law.

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viii. Statement of Federal Stewardship

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

ix. Statement of Substantial Involvement

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

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

x. Subject Invention Utilization Reporting

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

xi. Intellectual Property Provisions

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

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xii. Reporting

Reporting requirements are identified on the Federal Assistance Reporting Checklist, attached to the award agreement.

xiii. Go/No-Go Review

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

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

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

xiv. Conference Spending

The recipient shall not expend any funds on a conference not directly and programmatically related to the purpose for which the grant or cooperative agreement was awarded that would defray the cost to the United States government of a conference held by any Executive branch department, agency, board, commission, or office for which the cost to the United States government would otherwise exceed \$20,000, thereby circumventing the required

notification by the head of any such Executive Branch department, agency, board, commission, or office to the Inspector General (or senior ethics official for any entity without an Inspector General), of the date, location, and number of employees attending such conference.

xv. Uniform Commercial Code (UCC) Financing Statements

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

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

xvi. Implementation of Executive Order 13798, Promoting Free Speech and Religious Liberty

States, local governments, or other public entities may not condition sub-awards in a manner that would discriminate, or disadvantage sub-recipients based on their religious character.

xvii. Participants and Collaborating Organizations

If selected for award negotiations, the selected applicant must submit a list of personnel who are proposed to work on the project, both at the recipient and subrecipient level and a list of collaborating organizations within 30 days after the applicant is notified of the selection. Recipients will have an ongoing responsibility to notify DOE of changes to the personnel and collaborating organizations, and submit updated information during the life of the award.

xviii. Current and Pending Support

If selected for award negotiations, within 30 days of the selection notice, the selectee must submit 1) current and pending support disclosures and resumes for any new PIs or senior/key personnel and 2) updated disclosures if there have been any changes to the current and pending support submitted with the application. Throughout the life of the award, the Recipient has an ongoing responsibility to submit 1) current and pending support disclosure statements and resumes for any new PI and senior/key personnel and 2) updated disclosures if there are changes to the current and pending support previously submitted to DOE. Also See. Section VI.B.xix.

xix. U.S. Manufacturing Commitments

A primary objective of DOE's multi-billion dollar research, development and demonstration investments is to cultivate new research and development ecosystems, manufacturing capabilities, and supply chains for and by U.S. industry and labor. Therefore, in exchange for receiving taxpayer dollars to support an applicant's project, the applicant must agree to the following U.S. Competitiveness Provision as part of an award under this FOA.

U.S. Competitiveness

The Recipient agrees that any products embodying any subject invention or produced through the use of any subject invention will be manufactured substantially in the United States unless the Recipient can show to the satisfaction of DOE that it is not commercially feasible. In the event DOE agrees to foreign manufacture, there will be a requirement that the Government's support of the technology be recognized in some appropriate manner, e.g., alternative binding commitments to provide an overall net benefit to the U.S. economy. The Recipient agrees that it will not license, assign or otherwise transfer any subject invention to any entity, at any tier, unless that entity agrees to these same requirements. Should the Recipient or other such entity receiving rights in the invention(s): (1) undergo a change in ownership amounting to a controlling interest, or (2) sell, assign, or otherwise transfer title or exclusive rights in the invention(s), then the assignment, license, or other transfer of rights in the subject invention(s) is/are suspended until approved in writing by DOE. The Recipient and any successor assignee will convey to DOE, upon written request from DOE, title to any subject invention, upon a breach of this paragraph. The Recipient will include this paragraph in all subawards/contracts, regardless of tier, for experimental, developmental or research work.

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A subject invention is any invention conceived or first actually reduced in performance of work under an award. An invention is any invention or discovery which is or may be patentable. The recipient includes any awardee, recipient, sub-awardee, or sub-recipient.

As noted in the U.S. Competitiveness Provision, if an entity cannot meet the requirements of the U.S. Competitiveness Provision, the entity may request a modification or waiver of the U.S. Competitiveness Provision. For example, the entity may propose modifying the language of the U.S. Competitiveness Provision in order to change the scope of the requirements or to provide more specifics on the application of the requirements for a particular technology. As another example, the entity may request that the U.S. Competitiveness Provision be waived in lieu of a net benefits statement or U.S. manufacturing plan. The statement or plan would contain specific and enforceable commitments that would be beneficial to the U.S. economy and competitiveness. Commitments could include manufacturing specific products in the U.S., making a specific investment in a new or existing U.S. manufacturing facility, keeping certain activities based in the U.S. or supporting a certain number of jobs in the U.S. related to the technology. If DOE, in its sole discretion, determines that the proposed modification or waiver promotes commercialization and provides substantial U.S. economic benefits, DOE may grant the request and, if granted, modify the award terms and conditions for the requesting entity accordingly.

The U.S. Competitiveness Provision is implemented by DOE pursuant to a Determination of Exceptional Circumstances (DEC) under the Bayh-Dole Act and DOE Patent Waivers. See Section VIII.J. Title to Subject Inventions of this FOA for more information on the DEC and DOE Patent Waivers.

xx. Data Management Plan (DMP) (if applicable)

Each applicant whose Full Application is selected for award negotiations will be required to submit a DMP during the award negotiations phase. A DMP explains how, when appropriate, data generated in the course of the work performed under an EERE award will be shared and preserved in order to validate the results of the proposed work or how the results could be validated if the data is not shared or preserved. The DMP must provide a plan for making all research data displayed in publications resulting from the proposed work digitally accessible at the time of publications.

xxi. Fraud, Waste and Abuse

The mission of the DOE Office of Inspector General (OIG) is to strengthen the integrity, economy and efficiency of the Department's programs and operations including deterring and detecting fraud, waste, abuse and mismanagement. The

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OIG accomplishes this mission primarily through investigations, audits, and inspections of DOE activities to include grants, cooperative agreements, loans, and contracts.

The OIG maintains a Hotline for reporting allegations of fraud, waste, abuse, or mismanagement. To report such allegations, please visit <https://www.energy.gov/ig/ig-hotline>.

Additionally, recipients of DOE awards must be cognizant of the requirements of [2 CFR 200.113 Mandatory disclosures](#), which states:

The non-Federal entity or applicant for a Federal award must disclose, in a timely manner, in writing to the Federal awarding agency or pass-through entity all violations of Federal criminal law involving fraud, bribery, or gratuity violations potentially affecting the Federal award. Non-Federal entities that have received a Federal award including the term and condition outlined in appendix XII of 2 CFR Part 200 are required to report certain civil, criminal, or administrative proceedings to SAM (currently FAPIIS). Failure to make required disclosures can result in any of the remedies described in [2 CFR 200.339](#). (See also [2 CFR part 180](#), [31 U.S.C. § 3321](#), and [41 U.S.C. § 2313](#).) [[85 FR 49539](#), Aug. 13, 2020]

Applicants and subrecipients (if applicable) are encouraged to allocate sufficient costs in the project budget to cover the costs associated for personnel and data infrastructure needs to support performance management and program evaluation needs including but not limited to independent program and project audits to mitigate risks for fraud, waste, and abuse

xxii. Human Subjects Research

Research involving human subjects, biospecimens, or identifiable private information conducted with DOE funding is subject to the requirements of DOE Order 443.1C, Protection of Human Research Subjects, 45 CFR Part 46, Protection of Human Subjects (subpart A which is referred to as the “Common Rule”), and 10 CFR Part 745, Protection of Human Subjects. Additional information on the DOE Human Subjects Research Program can be found at: [HUMAN SUBJECTS Human Subjects Pr... | U.S. DOE Office of Science \(SC\) \(osti.gov\)](#).

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

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question and answer process as described below. Specifically, questions regarding the content of this FOA must be submitted to: DE-FOA-0002893@netl.doe.gov. Questions must be submitted not later than 3 business days prior to the application due date and time. Please note, feedback on individual concepts will not be provided through Q&A.

All questions and answers related to this FOA will be posted on EERE eXCHANGE at: <https://eere-exchange.energy.gov>. **Please note that you must first select this specific FOA Number in order to view the questions and answers specific to this FOA.** EERE will attempt to respond to a question within 5 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. Government Right to Reject or Negotiate

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

C. Commitment of Public Funds

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

D. Treatment of Application Information

Applicants should not include business sensitive (e.g., commercial or financial information that is privileged or confidential), trade secrets, proprietary, or otherwise confidential information 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. Applicants are advised to not include any critically sensitive proprietary detail.

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If an application includes business sensitive, trade secrets, proprietary or otherwise confidential information, it is furnished to the Government (government) in confidence with the understanding that the information shall be used or disclosed only for evaluation of the application. Such information will be withheld from public disclosure to the extent permitted by law, including the Freedom of Information Act. Without assuming any liability for inadvertent disclosure, EERE will seek to limit disclosure of such information to its employees and to outside reviewers when necessary for merit review of the application or as otherwise authorized by law. This restriction does not limit the Government's right to use the information if it is obtained from another source.

If an applicant chooses to submit business sensitive, trade secrets, proprietary, or otherwise confidential information, the applicant must provide **two copies** of the submission (e.g, Concept Paper, Full Application). The first copy should be marked, "non-confidential" with the information believed to be confidential deleted. The second copy should be marked "confidential" and must clearly and conspicuously identify the business sensitive, trade secrets, proprietary, or otherwise confidential information and must be marked as described below. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise. The government is not liable for the disclosure or use of unmarked information and may use or disclose such information for any purpose as authorized by law.

The cover sheet of the Full Application, and other applicant submission must be marked as follows and identify the specific pages containing business sensitive, trade secrets, proprietary, or otherwise confidential information:

Notice of Restriction on Disclosure and Use of Data:

Pages [list applicable pages] of this document may contain business sensitive, trade secrets, proprietary, or otherwise confidential information that 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]

In addition, (1) the header and footer of every page that contains business sensitive, trade secrets, proprietary, or otherwise confidential information must be marked as follows: "Contains Business Sensitive, Trade Secrets, Proprietary, or Otherwise Confidential Information Exempt from Public Disclosure," and (2) every line or paragraph containing such information must be clearly marked with double

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brackets or highlighting. EERE will make its own determination about the confidential status of the information and treat it according to its determination.

E. Evaluation and Administration by Non-Federal Personnel

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

F. Notice Regarding Eligible/Ineligible Activities

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

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

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

H. 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.

I. Retention of Submissions

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

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J. 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.

- Advance and Identified Waivers: For an applicant not covered by a Class Patent Waiver or the Bayh-Dole Act, the applicant 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.
- DEC: On June 07, 2021, DOE approved a DETERMINATION OF EXCEPTIONAL CIRCUMSTANCES (DEC) UNDER THE BAYH-DOLE ACT TO FURTHER PROMOTE DOMESTIC MANUFACTURE OF DOE SCIENCE AND ENERGY TECHNOLOGIES. In accordance with this DEC, all awards, including sub-awards, under this FOA shall include the U.S. Competitiveness Provision in accordance with Section VI.B.xx. U.S. Manufacturing Commitments of this FOA. A copy of the DEC can be found at <https://www.energy.gov/gc/determination-exceptional-circumstances-decs>. Pursuant to 37 CFR § 401.4, any nonprofit organization or small business firm as defined by 35 U.S.C. 201 affected by any DEC has the right to appeal it by

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providing written notice to DOE within 30 working days from the time it receives a copy of the determination.

- EERE may issue and publish on the website above further DEC's prior to the issuance of awards under this FOA. DOE may require additional submissions or requirements as authorized by any applicable DEC.

K. Government Rights in Subject Inventions

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

i. 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.

ii. 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.

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L. 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.

AOIs 1a-10

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.

AOIs 11-14

Government Rights in Technical Data Produced Under Awards: The U.S. government retains unlimited rights in technical data produced under government financial assistance awards, including the right to distribute to the public. One exception to the foregoing is that invention disclosures may be protected from public disclosure for a reasonable time in order to allow for filing a patent application.

M. 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.

N. Export Control

The United States government regulates the transfer of information, commodities, technology, and software considered to be strategically important to the United States to protect national security, foreign policy, and economic interests without

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imposing undue regulatory burdens on legitimate international trade. There is a network of federal agencies and regulations that govern exports that are collectively referred to as “Export Controls”. All recipients and subrecipients are responsible for ensuring compliance with all applicable United States Export Control laws and regulations relating to any work performed under a resulting award.

The recipient must immediately report to DOE any export control violations related to the project funded under the DOE award, at the recipient or subrecipient level, and provide the corrective action(s) to prevent future violations.

O. Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment

As set forth in 2 CFR 200.216, recipients and subrecipients are prohibited from obligating or expending project funds (federal funds and recipient cost share) to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that uses *covered telecommunications equipment or services* as a substantial or essential component of any system, or as critical technology as part of any system. As described in Section 889 of Public Law 115-232, *covered telecommunications equipment* is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

See Public Law 115-232, Section 889, 2 CFR 200.216, and 2 CFR 200.471 for additional information.

P. Personally Identifiable Information (PII)

All information provided by the applicant must to the greatest extent possible exclude PII. The term “PII” refers to information which can be used to distinguish or trace an individual's identity, such as their name, social security number, biometric records, alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother’s maiden name. (See OMB Memorandum M-17-12 dated January 3, 2017)

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

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Q. Annual Independent Audits

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

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

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

R. Interim Conflict of Interest Policy for Financial Assistance (February 2022)

The DOE interim Conflict of Interest Policy for Financial Assistance (COI Policy) can be found at: <https://www.energy.gov/management/department-energy-interim-conflict-interest-policy-requirements-financial-assistance>.

This policy is applicable to all non-Federal entities applying for, or that receive, DOE funding by means of a financial assistance award (e.g., a grant, cooperative agreement, or technology investment agreement) and, through the implementation of this policy by the entity, to each Investigator who is planning to participate in, or is participating in, the project funded wholly or in part under the DOE financial assistance award. The term "Investigator" means the PI and any other person, regardless of title or position, who is responsible for the purpose, design, conduct, or reporting of a project funded by DOE or proposed for funding by DOE. Recipients must flow down the requirements of the interim COI Policy to any subrecipient non-Federal entities. Further, for EERE funded projects, the recipient must include all financial conflicts of interest (FCOI) (i.e., managed and unmanaged/ unmanageable) in their initial and ongoing FCOI reports.

It is understood that non-Federal entities and individuals receiving DOE financial assistance awards will need sufficient time to come into full compliance with DOE's interim COI Policy. To provide some flexibility, EERE allows for a staggered implementation. Specifically, prior to award, applicants selected for award negotiations must: ensure all Investigators complete their significant financial disclosures; review the disclosures; determine whether a FCOI exists; develop and implement a management plan for FCOIs; and provide DOE with an initial FCOI

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report that includes all FCOIs (i.e., managed and unmanaged/ unmanageable). Recipients will have 180 days from the date of the award to come into full compliance with the other requirements set forth in DOE's interim COI Policy. Prior to award, the applicant must certify that it is, or will be within 180 days of the award, compliant with all requirements in the interim COI Policy.

S. Foreign National Participation (SEPTEMBER 2021)

All applicants selected for an award under this FOA and project participants (including subrecipients and contractors) who anticipate involving foreign nationals in the performance of an award, will be required to provide DOE with specific information about each foreign national to satisfy requirements for foreign national participation. A "foreign national" is defined as any person who is not a United States citizen by birth or naturalization. The volume and type of information collected may depend on various factors associated with the award. DOE concurrence may be required before a foreign national can participate in the performance of any work under an award.

Approval for foreign nationals from countries identified on the U.S. Department of State's list of State Sponsors of Terrorism must be obtained from DOE before they can participate in the performance of any work under an award.

APPENDIX A – COST SHARE INFORMATION

Cost Sharing or Cost Matching

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

How Cost Sharing Is Calculated

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

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

What Qualifies For Cost Sharing

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

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

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

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

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

General Cost Sharing Rules on a DOE Award

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

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accordance with the applicable cost principles prescribed in FAR Part 31 for For-Profit entities and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

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

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

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

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

(B) Valuing and documenting contributions

- (1)** Valuing recipient's property or services of recipient's employees. Values are established in accordance with the applicable cost principles, which mean that

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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

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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 document.

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)

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APPENDIX C – WAIVER REQUESTS AND APPROVAL PROCESSES

T. 1. Waiver for Foreign Entity Participation

Many of the technology areas DOE funds fall in the category of critical and emerging technologies (CETs). CETs are a subset of advanced technologies that are potentially significant to United States national and economy security.¹⁸ For projects selected under this FOA, all recipients and subrecipients must be organized, chartered or incorporated (or otherwise formed) under the laws of a state or territory of the United States; have majority domestic ownership and control; and have a physical location for business operations in the United States. To request a waiver of this requirement, an applicant must submit an explicit waiver request in the Full Application.

Waiver Criteria

Foreign entities seeking to participate in a project funded under this FOA must demonstrate to the satisfaction of DOE that:

- a. Its participation is in the best interest of the United States industry and United States economic development;
- b. The project team has appropriate measures in place to control sensitive information and protect against unauthorized transfer of scientific and technical information;
- c. Adequate protocols exist between the United States subsidiary and its foreign parent organization to comply with export control laws and any obligations to protect proprietary information from the foreign parent organization;
- d. The work is conducted within the United States and the entity acknowledges and demonstrates that it has the intent and ability to comply with the U.S. Competitiveness Provision (see Section VI.B.xxi.); and
- e. The foreign entity will satisfy other conditions that may be deemed necessary by DOE to protect United States government interests.

Content for Waiver Request

A Foreign Entity waiver request must include the following:

- a. Information about the entity: name, point of contact, physical address, and proposed type of involvement in the project;
- b. Country of incorporation, the extent of the ownership/level control by foreign entities, whether the entity is state owned or controlled, a summary of the ownership breakdown of the foreign entity and the percentage of

¹⁸ See, [Critical and Emerging Technologies List Update \(whitehouse.gov\)](https://www.whitehouse.gov).

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- ownership/control by foreign entities, foreign shareholders, foreign state or foreign individuals;
- c. The rationale for proposing a foreign entity participate (must address criteria above);
 - d. A description of the project's anticipated contributions to the United States economy;
 - How the project will benefit the United States, including manufacturing, contributions to employment in the United States and growth in new markets and jobs in the United States;
 - How the project will promote manufacturing of products and/or services in the United States;
 - e. A description of how the foreign entity's participation is essential to the project;
 - f. A description of the likelihood of Intellectual Property (IP) being created from the work and the treatment of any such IP; and
 - g. Countries where the work will be performed (Note: if any work is proposed to be conducted outside the United States, the applicant must also complete a separate request foreign work waiver).

DOE may also require:

- A risk assessment with respect to IP and data protection protocols that includes the export control risk based on the data protection protocols, the technology being developed and the foreign entity and country. These submissions could be prepared by the project lead (if not the prime recipient), but the prime recipient must make a representation to DOE as to whether it believes the data protection protocols are adequate and make a representation of the risk assessment – high, medium or low risk of data leakage to a foreign entity; and
- Additional language to be added to any agreement or subagreement to protect IP, mitigate risk or other related purposes.

DOE may require additional information before considering the waiver request.

DOE's decision concerning a waiver request is not appealable.

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

As set forth in Section IV.I.iii., all work under EERE funding agreements must be performed in 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.

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

- The rationale for performing the work outside the U.S. (“foreign work”);
- A description of the work proposed to be performed outside the U.S.;
- An explanation as to how the foreign work is essential to the project;
- A description of the anticipated benefits to be realized by the proposed foreign work and the anticipated contributions to the US economy;
- The associated benefits to be realized and the contribution to the project from the foreign work;
- How the foreign work will benefit U.S. research, development and manufacturing, including contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
- How the foreign work will promote domestic American manufacturing of products and/or services;
- A description of the likelihood of Intellectual Property (IP) being created from the foreign work and the treatment of any such IP;
- The total estimated cost (DOE and recipient cost share) of the proposed foreign work;
- The countries in which the foreign work is proposed to be performed; and
- The name of the entity(ies) 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 – REQUIRED USE OF AMERICAN IRON, STEEL, MANUFACTURED PRODUCTS, AND CONSTRUCTION MATERIALS BUY AMERICA REQUIREMENTS FOR INFRASTRUCTURE PROJECTS

A. Definitions

For purposes of the Buy America requirements, based both on the statute and OMB Guidance Document dated April 18, 2022, the following definitions apply:

Construction materials includes an article, material, or supply—other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives—that is or consists primarily of:

- non-ferrous metals;
- plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables);
- glass (including optic glass);
- lumber; or
- drywall.

Infrastructure includes, at a minimum, the structures, facilities, and equipment for, in the United States, roads, highways, and bridges; public transportation; dams, ports, harbors, and other maritime facilities; intercity passenger and freight railroads; freight and intermodal facilities; airports; water systems, including drinking water and wastewater systems; electrical transmission facilities and systems; utilities; broadband infrastructure; and buildings and real property. Infrastructure includes facilities that generate, transport, and distribute energy.

Moreover, according to the OMB guidance document:

When determining if a program has infrastructure expenditures, Federal agencies should interpret the term “infrastructure” broadly and consider the definition provided above as illustrative and not exhaustive. When determining if a particular construction project of a type not listed in the definition above constitutes “infrastructure,” agencies should consider whether the project will serve a public function, including whether the project is publicly owned and operated, privately operated on behalf of the public, or is a place of public accommodation, as opposed to a project that is privately owned and not open to the public. Projects with the former qualities have greater indicia of infrastructure, while projects with the latter quality have fewer. Projects consisting solely of the purchase, construction, or improvement of a private home for personal use, for example, would not constitute an infrastructure project.

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The Agency, not the applicant, will have the final say as to whether a given project includes infrastructure, as defined herein. Accordingly, in cases where the “public” nature of the infrastructure is unclear, but the other relevant criteria are met DOE strongly recommends that applicants complete their full application with the assumption that Buy America requirements will apply to the proposed project.

Project means the construction, alteration, maintenance, or repair of infrastructure in the United States.

B. Buy America Requirements for Infrastructure Projects (“Buy America” requirements)

In accordance with Section 70914 of the BIL, none of the project funds (includes federal share and recipient cost share) may be used for a project for infrastructure unless:

(1) all iron and steel used in the project are produced in the United States--this means all manufacturing processes, from the initial melting stage through the application of coatings, occurred in the United States;

(2) all manufactured products used in the project are produced in the United States—this means the manufactured product was manufactured in the United States; and the cost of the components of the manufactured product that are mined, produced, or manufactured in the United States is greater than 55 percent of the total cost of all components of the manufactured product, unless another standard for determining the minimum amount of domestic content of the manufactured product has been established under applicable law or regulation; and

(3) all construction materials are produced in the United States—this means that all manufacturing processes for the construction material occurred in the United States.

The Buy America requirements only apply to articles, materials, and supplies that are consumed in, incorporated into, or affixed to an infrastructure project. As such, it does not apply to tools, equipment, and supplies, such as temporary scaffolding, brought to the construction site and removed at or before the completion of the infrastructure project. Nor does the Buy America requirements apply to equipment and furnishings, such as movable chairs, desks, and portable computer equipment, that are used at or within the finished infrastructure project, but are not an integral part of the structure or permanently affixed to the infrastructure project.

These requirements must flow down to all sub-awards, all contracts, subcontracts, and purchase orders for work performed under the proposed project, except where the prime recipient is a for-profit entity. Based on guidance from the Office of Management and Budget (OMB), the Buy America requirements of the BIL do not apply to DOE projects in which the prime recipient is a for-profit entity; the requirements only apply to projects whose prime recipient is a State, local government, Indian tribe, Institution of Higher Education, or nonprofit organization.

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For additional information related to the application and implementation of these Buy America requirements, please see OMB Memorandum M-22-11, issued April 18, 2022:

<https://www.whitehouse.gov/wp-content/uploads/2022/04/M-22-11.pdf>

Note that for all applicants—both non-Federal entities and for-profit entities—DOE is including a Program Policy Factor that the Selection Official may consider in determining which Full Applications to select for award negotiations that considers whether the applicant has made a commitment to procure U.S. iron, steel, manufactured products, and construction materials in its project.

C. Waivers

The DOE financial assistance agreement will require each recipient: (1) to fulfill the commitments made in its application regarding the procurement of U.S.-produced products and (2) to fulfill the commitments made in its application regarding the procurement of other key component metals and manufactured products domestically that are deemed available in sufficient and reasonably available quantities or of a satisfactory quality at the time of award negotiation.

In limited circumstances, DOE may waive the application of the Buy America requirements where DOE determines that:

- (1) applying the Buy America requirements would be inconsistent with the public interest;
- (2) the types of iron, steel, manufactured products, or construction materials are not produced in the United States in sufficient and reasonably available quantities or of a satisfactory quality; or
- (3) the inclusion of iron, steel, manufactured products, or construction materials produced in the United States will increase the cost of the overall project by more than 25 percent.

If an applicant or recipient is seeking a waiver of the Buy America requirements, it may submit a waiver request after it has been notified of its selection for award negotiations. A waiver request must include:

- A detailed justification for the use of “non-domestic” iron, steel, manufactured products, or construction materials to include an explanation as to how the non-domestic item(s) is essential to the project
- A certification that the applicant or recipient made a good faith effort to solicit bids for domestic products supported by terms included in requests for proposals, contracts, and nonproprietary communications with potential suppliers

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- Applicant/Recipient name and Unique Entity Identifier (UEI)
 - Total estimated project cost, DOE and cost-share amounts
 - Project description and location (to the extent known)
 - List and description of iron or steel item(s), manufactured goods, and construction material(s) the applicant or recipient seeks to waive from Domestic Content Procurement Preference requirement, including name, cost, country(ies) of origin (if known), and relevant PSC and NAICS code for each
 - Waiver justification including due diligence performed (e.g., market research, industry outreach) by the applicant or recipient
 - Anticipated impact if no waiver is issued

DOE may require additional information before considering the waiver request.

Waiver requests are subject to public comment periods of no less than 15 days and must be reviewed by the Made in America Office. There may be instances where an award qualifies, in whole or in part, for an existing waiver described at [\[DOE Buy America Requirement Waiver Requests | Department of Energy\]](#).

DOE's decision concerning a waiver request is not appealable.

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APPENDIX E – GLOSSARY

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

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

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

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

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

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

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

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

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

APPENDIX F – DEFINITION OF TECHNOLOGY READINESS LEVELS

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

APPENDIX G – LIST OF ACRONYMS

COI	Conflict of Interest
DEC	Determination of Exceptional Circumstances
DEI	Diversity, Equity, and Inclusion
DMP	Data Management Plan
DOE	Department of Energy
DOI	Digital Object Identifier
EERE	Energy Efficiency and Renewable Energy
FAR	Federal Acquisition Regulation
FFATA	Federal Funding and Transparency Act of 2006
FOA	Funding Opportunity Announcement
FOIA	Freedom of Information Act
FFRDC	Federally Funded Research and Development Center
GAAP	Generally Accepted Accounting Principles
IPMP	Intellectual Property Management Plan
M&O	Management and Operating
MPIN	Marketing Partner ID Number
MSI	Minority-Serving institution
MYPP	Multi-Year Program Plan
NDA	Non-Disclosure Acknowledgement
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Agency
OMB	Office of Management and Budget
OSTI	Office of Scientific and Technical Information
PII	Personal Identifiable Information
R&D	Research and Development
RFI	Request for Information
RFP	Request for Proposal
SAM	System for Award Management
SOPO	Statement of Project Objectives
SPOC	Single Point of Contact
STEM	Science, Technology, Engineering, and Mathematics
TIA	Technology Investment Agreement
TRL	Technology Readiness Level
UCC	Uniform Commercial Code
UEI	Unique Entity Identifier
WBS	Work Breakdown Structure
WP	Work Proposal

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APPENDIX H – R&D COMMUNITY BENEFITS PLAN GUIDANCE

DOE is committed to pushing the frontiers of science and engineering; catalyzing high-quality domestic clean energy jobs through research, development, demonstration, and deployment; and ensuring energy equity and energy justice² for disadvantaged communities. Therefore, and in accordance with the Administration’s priority to empower workers and harness opportunities to create good union jobs as stated in EO 14008 (Executive Order on Tackling the Climate Crisis at Home and Abroad),³ it is important to consider the impacts of the successful commercial deployment of any innovations resulting from this FOA on the current and future workforce.

The goal of the R&D Community Benefits Plan is to allow the application to illustrate engagement in critical thought about implications of how the proposed work will benefit the American people and lead to broadly shared prosperity, including for workers and disadvantaged communities.⁴ The three sections of the R&D Community Benefits Plans are considered together because there may be significant overlap among audiences considered in workforce and disadvantaged communities.

Example DEIA, Energy Equity, and Workforce Plan Elements

Outlined below are examples of activities that applicants might consider when developing their R&D Community Benefits Plan. Applicants are not required to implement any of these specific examples and should propose activities that best fit their research goals, institutional environment, team composition, and other factors. Creativity is encouraged.

DEIA

DOE strongly encourages applicants to involve individuals and entities from disadvantaged communities (DACs). Tapping all the available talent requires intentional approaches and yields broad benefits.

Equity extends beyond diversity to equitable treatment. Equitable access to

² DOE defines energy justice as “the goal of achieving equity in both the social and economic participation in the energy system, while also remediating social, economic, and health burdens on those disproportionately harmed by the energy system” (Initiative for Energy Justice, 2019). Aligned with that definition, the remainder of this document refers to “energy equity” to encompass energy justice and DOE’s efforts related to Justice40. <https://www.energy.gov/diversity/articles/how-energy-justice-presidential-initiatives-and-executive-orders-shape-equity>

³ <https://www.federalregister.gov/documents/2021/02/01/2021-02177/tackling-the-climate-crisis-at-home-and-abroad>

⁴ See footnote 2 for guidance on the definition and tools to locate and identify disadvantaged communities.

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opportunity for members of the project team is paramount. This includes ensuring all members of the team, including students, are paid a living wage, provided appropriate working conditions, and provided appropriate benefits. In the execution of their project plan, applicants are asked to describe efforts in diversity, equity, inclusion, and accessibility. In this context, efforts toward DEIA are defined as:⁵

- 1) The practice of including the many communities, identities, races, ethnicities, backgrounds, abilities, cultures, and beliefs of the American people;
- 2) The consistent and systematic fair, just, and impartial treatment of all individuals, including protecting workers rights and adhering to Equal Employment Opportunity laws;
- 3) The recognition, appreciation, and use of the talents and skills of employees of all backgrounds; and
- 4) The provision of accommodations so that all people, including people with disabilities, can fully and independently access facilities, information and communication technology, programs, and services.

Successful plans will not only describe how the project team seeks to increase DEIA but also will describe the overall approaches to retention, engagement, professional development, and career advancement. Specifically, they will demonstrate clear approaches to ensure all team members' strengths are meaningfully leveraged, and all members are provided opportunities and paths for career development, especially including paths for interns and trainees to secure permanent positions. Diversity should be considered at all levels of the project team, not just leveraging early career individuals to meet diversity goals.

DOE strongly encourages applicants to consider partnerships to promote DEIA, justice, and workforce participation. Minority Serving Institutions, Minority Business Enterprises, minority-owned businesses, disability-owned businesses, women-owned businesses, Native American-owned businesses, veteran-owned businesses, or entities located in an underserved community that meet the eligibility requirements are encouraged to lead these partnerships as the prime applicant or participate on an application as a proposed partner to the prime applicant.

When crafting the DEIA section of the Plan, applicants should describe how

⁵ <https://www.whitehouse.gov/wp-content/uploads/2021/11/Strategic-Plan-to-Advance-Diversity-Equity-Inclusion-and-Accessibility-in-the-Federal-Workforce-11.23.21.pdf>

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they will act to promote each of the four DEIA efforts above into their investigation. It is important to note that diversity, equity, inclusion, and accessibility are four different but related concepts that should not be conflated. For instance, you can achieve diversity without equity; all four must be addressed. Applicants could discuss how the proposed investigation could contribute to training and developing a diverse scientific workforce. Applicants could describe the efforts they plan to take, or will continue to take, to create an inclusive workplace, free from retaliation, harassment, and discrimination. Applicants could outline any barriers to creating an equitable and inclusive workplace and address the ways in which the team will work to overcome these barriers within the bounds of the specific research project. The plan could detail specific efforts to inform project team members in any capacity of their labor rights and rights under Equal Employment Opportunity laws and their free and fair chance to join a union. Note that this inclusion of informing project team members is also incorporated into awards through the National Policy Assurances.

Equal treatment of workers, including students, is necessary, but overcoming institutional bias requires intentionally reducing sometimes hidden barriers to equal opportunity. Applicants could consider measures like childcare, flexible schedules, paid parental leave, pay transparency, and other supports to ensure that societal barriers do not hinder realization of DEIA intentions. Some of these considerations may result in common approaches in different sections of the plan, and that is acceptable as long as the submission is not a singular approach to all sections.

EERE especially encourages applicants to form partnerships with diverse and often underrepresented institutions, such as MSIs, labor unions, and community colleges that otherwise meet the eligibility requirements. Underrepresented institutions that meet the eligibility requirements are encouraged to lead these partnerships as the prime applicant. The DEIA section of the Plan could include engagement with underrepresented institutions to broaden the participation of DACs and/or with local stakeholders, such as residents and businesses, entities that carry out workforce development programs, labor unions, local government, and community-based organizations that represent, support, or work with DACs. Applicants should ensure there is transparency, accountability, and follow-through when engaging with community members and stakeholders.

Specific examples include:

- Building collaborations and partnerships with researchers and staff at MSIs;

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- Addressing barriers identified in climate surveys to remove inequities;
- Providing anti-bias training and education in the project design and implementation teams;
- Offering training, mentorship, education, and other support to students and early/mid-career professionals from DACs;
- Providing efforts toward improving a workplace culture of inclusion;
- Developing technology and technology integration innovations to meet the needs of DACs;
- Creating partnerships with local communities, especially under-resourced and DACs;
- Voluntary recognition of a union and informing employees of their rights, regardless of their classification;
- Making research products and engagement materials accessible in a greater variety of formats to increase accessibility of research outputs;
- Implementing training or distributing materials to reduce stigma towards individuals with disabilities;
- Designing technologies that strategically fit within the existing workforce for installation and maintenance of the potential innovation.

Energy Equity

The Energy Equity section should articulate how project proposals will drive equitable access to, participation in, and distribution of the benefits produced from successful technology innovations to disadvantaged communities and groups. Intentional inclusion of energy equity requires evaluating the anticipated long-term costs and benefits that will accrue to disadvantaged groups as a result of the project, and how research questions and project plans are designed for and support historically DACs' engagement in clean energy decisions. Similar to potential cost reductions or groundbreaking research findings resulting from the research, energy equity and justice benefits may be uncertain, occur over a long period of time, and have many factors within and outside the specific proposed research influencing them.

Applicants should describe the influencing factors and the most likely energy equity implications of the proposed research. Applicants should describe any long-term constraints the proposed technology may pose to communities' access to natural resources and Tribal cultural resources. There may be existing equity research available to use and cite in this description, or the

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applicant could describe milestone-based efforts toward developing that understanding through this innovation. These near- and long-term outcomes may include but are not limited to: a decrease in the percent of income a household spends on energy costs (energy burden);⁶ an increase in access to low-cost capital; a decrease in environmental exposure and burdens; increases in clean energy enterprise creation and contracting (e.g., women- or minority-owned business enterprises); increased parity in clean energy technology access and adoption; increases in energy democracy, including community ownership; and an increase in energy resilience.

Specific examples include:

- Describing how a successful innovation will support economic development in diverse geographic or demographic communities;
- Creating a plan to engage equity and justice stakeholders in evaluating the broader impacts of the innovation or in the development of the research methodology;
- Describing how the proposed research strategy and methodology was informed by input from a wide variety of stakeholders;
- Creating a literature review of the equity and justice implications of the outcomes of the specific research if the innovation is successful, or a plan with dedicated budget and expertise (staffing or subawardee) to evaluate the potential equity implications of successful innovation outcomes.

Workforce

The Workforce section of the R&D Community Benefits Plan should articulate the future workforce implications of the innovation or a milestone-driven plan for understanding those implications. This includes documenting the skills, knowledge, and abilities that would be required of workers installing, maintaining, and operating the technology that may be derivative of the applicant's research, as well as the training pathways and its accessibility for workers to acquire the necessary skills. There may be field-specific or relevant existing research that could be cited in this section. In addition, applicants could detail the process they will use to evaluate long-term impacts on jobs, including job growth or job loss, a change in job quality, disruptions to existing industry and resulting changes to relationships between employers and employees and improvements or reductions in the ability of workers to organize for collective representation, and anything else

⁶ Energy burden is defined as the percentage of gross household income spent on energy costs:
<https://www.energy.gov/eere/slsc/low-income-community-energy-solutions>

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that could result in changes to regional or national labor markets.

For additional support with developing the Workforce section of a R&D Community Benefits Plan, please refer to the DOE's Community Benefits Plan Frequently Asked Questions (FAQs) webpage (<https://www.energy.gov/bil/community-benefits-plan-frequently-asked-questions-faqs>). This new resource, though created primarily for BIL-funded demonstration and deployment projects, may be useful for R&D projects.

Applicants will find section 2 of the FAQ ("Investing in America's Workforce") particularly helpful for understanding key federal policies, terms, and concepts, as well as workforce development strategies relevant to examination of the workforce implications of applicants' proposed research.

Specific examples include:

- Outlining the challenges and opportunities for commercializing the technology in the United States;
- Creating a literature review of the workforce implications of the outcomes of the specific research if the innovation is successful, or a plan with dedicated budget and expertise (staffing or subawardee) to evaluate the potential equity implications of successful innovation outcomes;
- Creating a plan and milestones for assessing how a successful innovation will have implications for job savings or loss, either at the macroeconomic level or within specific industries;
- Describing how the project will support workforce training to address needs for successful innovation;
- Voluntary recognition of a union and informing employees of their rights, regardless of its classification;
- Creating a plan to evaluate how a successful innovation will result in potential workforce shifts between industries or geographies.

Inclusion of SMART milestones

EERE requires that the applicant's R&D Community Benefits Plan include one Specific, Measurable, Achievable, Realistic, and Time-based (SMART) milestone for each budget period. An exemplary SMART milestone clearly answers the following questions:

- What needs to be accomplished?
- What measures and deliverables will be used to track progress toward accomplishment?
- What evidence suggests that the accomplishment is achievable?

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- Why choose this milestone?
- When will the milestone be reached?