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

Fiscal Year 2018 Advanced Vehicle Technologies Research Funding Opportunity Announcement (FOA)

Funding Opportunity Announcement (FOA) Number: DE-FOA-0001919
FOA Type: Amendment 000001
CFDA Number: 81.086

FOA Issue Date:	05/01/2018
Amendment 000001	05/08/2018
Submission Deadline for Concept Papers:	05/29/2018 5:00pm ET
Anticipated Date of Concept Paper Notifications:	06/15/2018
Submission Deadline for Full Applications:	07/13/2018 5:00pm ET
Anticipated Date for EERE Selection Notifications:	September 2018
Anticipated Timeframe for Award Negotiations	September 2018

- 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.

AMENDMENTS

All changes to the Funding Opportunity Announcement as a result of this amendment are highlighted in yellow.

Amendment No.	Date	Description of Amendment
000001	05/08/2018	The purpose of this amendment is to clarify the minimum cost share requirements, refine wording for AOI 1b and amend AOIs 5a and 5b.

NOTE: REGISTRATION/SUBMISSION REQUIREMENTS

Registration Requirements

There are several one-time actions you must complete in order to submit an application in response to this Announcement (e.g., obtain a Dun and Bradstreet Data Universal Numbering System (DUNS) number, register with the System for Award Management (SAM), and register with EERE eXCHANGE.gov). Applicants who are not registered with SAM and Grants.gov, should allow at least 44 days to complete these requirements. It is suggested that the process be started as soon as possible.

Applicants must register through the EERE eXCHANGE.
EERE eXCHANGE website: https://eere-exchange.energy.gov/
Applicants must obtain a DUNS number.
DUNS website: http://fedgov.dnb.com/webform

Applicants must register with the SAM.
SAM website: http://www.sam.gov/ If you had an active registration in CCR, you should have an active registration in SAM. More information about SAM registration for applicants is found at: **https://www.sam.gov/sam/transcript/Quick_Guide_for_Grants_Registrations_v1.7.pdf.**

Applicants must register with Grants.gov.
Grants.gov website: http://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.

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 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 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-0001919@netl.doe.gov and shall be submitted not later than three business days before the Full Applications are due. 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. DOE will try to respond to questions within 5 business days, unless a similar question and answer have already been posted on the website. 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. Description/Background

The Office of Energy Efficiency and Renewable Energy (EERE) is issuing, on behalf of the Vehicle Technologies Office (VTO), a Funding Opportunity Announcement (FOA) entitled "Fiscal Year 2018 Advanced Vehicle Technologies Research Funding Opportunity Announcement."

Vehicles move our national economy. Annually, vehicles transport 11 billion tons of freight – more than $35 billion worth of goods each day[1] – and move people more than 3 trillion vehicle-miles.[2] Growing our economy requires transportation, and transportation requires energy. The average U.S. household spends nearly one-fifth of its total family expenditures on transportation, making it the most expensive spending category after housing.[3] The transportation sector accounts for 70 percent of U.S. petroleum use. The United States imports 25 percent of the petroleum it consumes – sending more than ten billion dollars per month[4] overseas for crude oil.

To support U.S. economic growth and offer consumers and businesses additional transportation choices, the Department of Energy (DOE)'s Vehicle Technologies Office invests in early-stage research to enable future private-sector development and commercialization of affordable, energy-efficient transportation technologies that can strengthen our energy security.

This FOA seeks research projects to address priorities in the following areas: batteries and electrification; materials; technology integration and energy efficient mobility systems; energy-efficient commercial off-road vehicle technologies; and co-optimized advanced engine and fuel technologies to improve fuel economy. Detailed technical descriptions of the specific areas of interest are provided in the sections that follow.

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[1] Bureau of Transportation Statistics, DOT, Freight Facts and Figures 2017 Table 2-1 and Table 2-2 https://www.bts.gov/sites/bts.dot.gov/files/docs/FFF_2017.pdf)

[2] Transportation Energy Data Book 36th Edition, ORNL, 2017. Table 3.7 Shares of Highway Vehicle-Miles Traveled by Vehicle Type, 1970-2015.

[3] Bureau of Labor Statistics, Consumer Expenditure Survey, 2015. Average annual expenditures and characteristics of all consumer units, 2013-2015. https://www.bls.gov/cex/2015/standard/multiyr.pdf

[4] Transportation Energy Data Book Edition 34, ORNL, Table 1.7 and Table 10.3; Overseas includes countries and territories outside the 50 States and the District of Columbia

The VTO is collaborating with both the U.S. Army Tank Automotive Research Development and Engineering Center (TARDEC) and the EERE Bioenergy Technologies Office (BETO) on research of mutual interest.

B. Topic Areas/Technical Areas of Interest

One or more projects awarded may be managed collaboratively with TARDEC and BETO. A separate agreement with TARDEC will not be required.

AOI Number	Area of Interest (AOI)
Batteries & Electrification	
1a	Developing Low-Cobalt Active Cathode Materials for Next-generation Li-ion Batteries
1b	Plug-In Electric Drive Vehicle Extreme Fast Charging Research
1c	Electric Vehicle Charging Infrastructure Cybersecurity
Materials	
2a	Predictive Modeling of Corrosion in Dissimilar Material Joints
2b	Modeling of Corrosion/Oxidation of Materials in High-Temperature Engines
Technology Integration	
3a	High Performance Computing for Transportation Hubs
3b	First/Last Mile for People/Goods Movement
3c	System-Level Data for Energy Efficient Mobility
3d	Fuel Efficient Platooning
3e	Multi-Unit Dwelling and Curbside Residential Charging Infrastructure Innovations
3f	Open Topic
Off-Road R&D	
4a	Energy Efficient Commercial Off-Road Vehicles
Co-Optimization of Engines & Fuels	
5a	Multi-Mode Optimized Fuel/Engine System Development
5b	Bioblendstocks to Optimize Mixing Controlled Compression Ignition Engines

Area of Interest 1a: Developing Low-Cobalt Active Cathode Materials for Next-Generation Lithium-ion Batteries

Efforts to develop "next generation" battery cells and modules that reduce battery cost, increase battery life, and improve performance are essential for the wide spread adoption of electric drive vehicles. Research that focuses on reducing the cost of batteries through the reduction of prohibitively high-cost materials is key for any development strategy. The price of cobalt, a key element within an lithium-ion batteries (LiB) for stability, has nearly tripled over the past few years due to increased demand from the cell phone industry, a current materials shortage, and speculation for a future global shortage. Given the increase in cost and the future outlook, lithium-ion battery (LiB) research focused on the reduction or the elimination of cobalt within a LiB is therefore essential for reducing the cost and assuring the sustainability of future EVs.

The objective of this AOI is to research, develop, and test next generation LiBs capable of achieving the cell performance identified in the table below:

Performance Targets for Next-generation Li-ion Batteries

Beginning of Life Characteristics at 30°C	Cell Level	Cathode Level
Useable Specific Energy @ C/3		≥600 Wh/kg
Calendar Life (<. energy fade)	15 Years	
Cycle Life (C/3 deep discharge with <20% energy fade)	1,000	
Cobalt Loading	≤50mg/Whr	
Cost	≤$100/kWh	

For the purposes of this AOI, next generation active cathode material (ACM) is confined to transition metal oxide (TMO) intercalation materials. Possible materials approaches could include (but are not limited to): high-nickel TMO stabilized for high voltage operation, non-traditional oxygen moiety stabilization in the crystal lattice, anion substitution in the lattice, and compositionally and crystallographically heterogenous ACM particles.

AOI 1a Teaming Arrangements

Integrated teams that include corporations and small businesses, academic research institutions, battery original equipment manufacturers, and National Laboratories are highly encouraged.

AOI 1a General Requirements

Applications must:

- Include plans to demonstrate equivalent low-cobalt next generation LiB full cell performance improvements compared to current state-of-the-art full cells.
- Address the use of characterization and measurement technologies to evolve understanding of performance and life issues for the targeted active cathode materials.
- Identify the cell components' composition/construction with a focus on the ACM, but also describe and justify the choice of anode material(s) and electrolyte solution(s) composition. The cathode composition/construction must be described.
- Describe the materials and component optimization pathway that achieves cell performance requirements.
- Demonstrate an understanding of the major issues and barriers impeding the use of the proposed cell chemistry, and how the particular barrier(s) will be overcome during the proposed project.
- Describe the testing and diagnostics to be performed to understand the causes of the issues being addressed.
- Include plans to fabricate thirty Project Progress Cells (PPCs). Fifteen (15) of these cells will be delivered to DOE for testing and evaluation and 15 retained by the applicant for testing prior to conclusion of the first budget period. An assessment of the PPC cell test results must be included in the Go/No-Go decision point at the completion of the first budget period.
- Include plans to fabricate thirty (30) Project Completion Cells (PCCs) that will be delivered to DOE for testing and evaluation at the conclusion of the project.
- Include plans to annually participate in the VTO Annual Merit Review in Washington, DC and an annual U.S. DRIVE Electrochemical Energy Storage Technical Team Meeting in Southfield, MI.
- Include plans to obtain at least 30 days of cycle life and calendar life (30^{o}C and 50^{o}C) test data from the retained cells prior to shipment of the deliverable cells to DOE.
- For both the PPCs and PCCs, the cells delivered to DOE will be tested according to the protocol provided below.

Cell Testing Protocol

Number of Cells	Test Type	Test Protocol
3	Cycle Life	C/3 cycle life
3	Thermal Cycling*	TBD
3	Calendar Life	Calendar life testing at 30 °C
3	Calendar Life	Calendar life testing at 50 °C

*The thermal cycling protocol will be specified by the applicant in consultation with DOE.

AOI 1a Special Deliverables

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

1. Fifteen (15) PPCs of ≥2 Ahr delivered to a to-be-designated DOE testing laboratory for performance testing prior to the end of the first budget period.
2. Thirty (30) PCCs of ≥2 Ahr delivered to a to-be-designated DOE testing laboratory for performance testing at the end of the project.
3. Report and associated data resulting from at least thirty (30) days of PPC retained cell testing following test protocols approved by the DOE. This data will be shared with the testing lab.
4. Report and associated data resulting from at least thirty (30) days of PCC retained cell testing following test protocols approved by the DOE. This data will be shared with the testing lab.
5. For those projects receiving United States Army Tank Automotive Research, Development and Engineering Center (TARDEC) funds, additional annual reports and short quarterly reports will be required.

All deliverable cells shall be provided to DOE for validation testing at a 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 Statement of Project Objectives (SOPO) for the cooperative agreement and therefore should not be addressed in the SOPO nor included in the total estimated project costs associated with the application. Test procedures for the delivered cells will be agreed to between the Applicant, the test lab, and the government. 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 end item manufacturer. 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, temperature recommendations, number of test sequences, and/or other relevant test conditions as appropriate. The results of the DOE national laboratory testing may be shared with TARDEC and 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, and delivered to, DOE (Vehicle Technologies Office) and end item manufacturer. 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 Applicant or the project.

Area of Interest 1b: Plug-In Electric Drive Vehicle Extreme Fast Charging Research

The objective of this AOI is to develop and demonstrate innovative approaches to reduce the impact on the grid from multiple vehicles charging at extreme fast charging (XFC) rates. Power levels for XFC 350 KW or higher are substantial, especially considering that multiple vehicles could be charging simultaneously at a charging station. Effectively controlling these high and variable loads that fall outside of traditional vehicle charging will require novel solutions to avoid significant negative impacts to the nation's electric grid. Solutions may incorporate localized energy storage or electricity generation schemes, but should strive to keep both installation and operations costs low. Projects are encouraged to use a direct connection to the medium voltage distribution grid and avoid the use of step down transformers. Consideration should be given to local grid infrastructure costs as well as power quality issues that a charging station may cause.

Projects to support the development of plug-in electric vehicle charging technology that can recharge multiple vehicles rapidly at high power levels are desired. Developing these systems should allow plug-in electric vehicles to be charged much faster than current vehicle charging, enabling the greater use of electricity for transportation and encouraging the widespread use of plug-in vehicles that lower transportation costs.

AOI 1b Teaming Arrangements

The successful adoption of XFC will require strong and diverse partnerships. Therefore, these projects must include and describe in detail partnerships with one or more of the following: state governments, local governments, metropolitan transportation authorities, air pollution control districts, private or nonprofit entities, and component and/or subcomponent suppliers integrated within the project team to support the overall system design and demonstration effort. Projects must also include a

partnership with at least one utility that is involved with supplying power to the demonstration equipment.

AOI 1b General Requirements

Applications must:

1. Identify a charging station concept and describe how the proposed project will lead to a functional demonstration of charging multiple vehicles or representative high voltage direct current loads at a combined power level of at least 1 MW while minimizing grid impacts and operation costs.
2. Identify the vehicle(s) or comparable load(s) to be used in the demonstration, their connection to the charge station, and how these will achieve XFC charging power ratings of 350 KW or higher.
3. Describe planned charging station location(s), including infrastructure requirements, and approach to mitigate potential grid impacts at these sites.
4. Include and describe partnerships with the following organizations/entities:
    a. State governments, local governments, metropolitan transportation authorities, air pollution control districts, private or nonprofit entities, and component and/or subcomponent suppliers integrated within the project team to support the overall system design and demonstration effort.
    b. Include a utility partner that will be providing grid service for the demonstration.
5. Address how this XFC capability and demonstration will encourage the widespread use of plug-in electric vehicles in the United States.

Area of interest 1c: Electric Vehicle Charging Infrastructure Cybersecurity

While plug-in electric vehicles (EVs) can improve national energy security and lower operating costs by utilizing electricity from the electric grid instead of petroleum, they also present a new cybersecurity vulnerability to the U.S. transportation sector and the electricity grid. Replenishing the charge in EV battery packs requires connection to the electricity grid, with either conductive or inductive charging equipment. Vulnerability is created by the need for data sharing between the EV, the recharging or Electric Vehicle Supply Equipment (EVSE), and the electric grid. Although much work has been done by government and industry to address cybersecurity issues associated with conventional and autonomous vehicles, little has been done to address cybersecurity issues associated with charging EVs. With charging power levels that will reach 350 KW or higher in the next few years, the potential for negative grid impacts resulting from compromised EV charging will become even more critical.

The objective of this AOI is to research, develop, and test technologies and approaches that identify, minimize, or eliminate critical cybersecurity vulnerabilities resulting from the transition of EV charging to power levels above 200kW. These vulnerabilities result from the need for increased levels of data sharing from the vehicle to the charging station and to the electricity grid and not only present a threat to the EV in the U.S. transportation sector, but also to the network of stations required to recharge them and to the operation and resilience of the U.S. electricity grid.

The cybersecurity tools and technologies developed in awarded projects must address cybersecurity for both EVs and eXtreme Fast Charging (XFC) equipment capable of charge power levels above 200kW. Solutions that also address cybersecurity for the electricity grid and charging network operators are encouraged.

AOI 1c Teaming Arrangements

Teams are encouraged to include a utility, EVSE manufacturer or network operator, and a vehicle manufacturer.

AOI 1c General Requirements

Applications must:

1. Identify the XFC system, either conductive, inductive, or both, that will be the focus of the project, including the power level and the charging protocol or standards used.
2. Identify the specific vehicle type(s) (including light, medium, or heavy duty vehicles) to be used for testing.
3. Address cyber and physical security vulnerabilities for both EVs and EVSE at a minimum.
4. Indicate any additional systems and equipment, beyond the Electric Vehicle and EVSE, that the proposed solution will protect, e.g., charging networks, grid services aggregators, electric distribution networks, etc.
5. Identify the vulnerabilities and cyber pathways that will be addressed.
6. Describe the planned method for evaluating the proposed solution.
7. The proposed solution must address personal data, financial data, vehicle data, and other data that could be compromised or used to harm the vehicle operator, charging equipment, charging network operator, or the electric grid.
8. Indicate the backwards compatibility of the technology or tool proposed to be retro fit or uploaded to legacy vehicles and EVSE.
9. Indicate how the solution proposed would be updated to address future threats that arise, e.g. Over the Air Updates (OTAU), hardware replacement, etc.

Materials

Area of Interest 2a: Predictive Modeling of Corrosion in Dissimilar Material Joints

The use of lightweight multi-material systems in automobiles provides an opportunity for significant fuel economy improvements. However, multi-material systems (specifically, joints between dissimilar materials) are a significant challenge for corrosion prevention. Atmospheric corrosion becomes more severe in tight spaces, and materials with different galvanic potentials can form an electrical circuit when in contact, which greatly accelerates corrosion of the less noble material. Although protective coatings provide some protection, joining processes such as resistance spot welding, friction stir welding, and fasteners pierce through or degrade the coatings, eliminating their effectiveness. Additionally, the amount of time spent by the automobile industry to validate that corrosion has been successfully mitigated is extensive, making the use of lightweight materials less attractive. Computational methods for predicting corrosion, processing effects from joining, and failure mechanisms can provide information that will eliminate barriers to the use of these materials in vehicle mass production.

The objective of this AOI is to develop and validate computational models capable of predicting the location and extent of corrosion, and the resulting mechanical performance of dissimilar lightweight material joints when exposed to typical vehicle moisture, temperature, and salt environments. The model should be able to predict joint strength and fatigue life after corrosion within ≤10% of experimental measurements.

The modeled joints must use joining methods relevant to high volume automotive manufacturing including solid state welding (friction stir welding, ultrasonic welding, or impact welding), mechanical joining (fasteners and in-situ mechanical interlocking), and fusion welding (resistance spot welding, laser welding, and arc welding). The joints modeled must be dissimilar material combinations of the following:

- Aluminum (5000, 6000, or 7000 series alloys)
- Steel (Mild, High Strength Low Alloy (HSLA), Advanced High Strength Steel (AHSS), or Boron automotive alloy)
- Magnesium (cast, sheet, or extrusion, any alloy)
- Carbon Fiber Polymer Composites (continuous or chopped fibers, thermoplastics or thermosets)

AOI 2a General Requirements

Applications must include:

- Joining method, material combination(s), and geometry to be modeled
- Consideration of all relevant types of corrosion (general, crevice, galvanic, stress corrosion cracking, environmentally assisted cracking, etc.)
- Current model maturity level
- List of existing models to be used along with models to be developed under the project
- Minimum number and description of experiments required to validate the model
- Source of multi-material joint samples to be used for model validation
- Applicability of model to additional material combinations, joint processing conditions, and/or geometries beyond those validated

AOI 2a Special Deliverables

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

Recipients will be required to provide all public data and code produced in the project (such as technical data used to support published journal articles or research code used for simulations) to the LightMat DataHUB for curation and hosting. This will include:

- Any experimental measurements or materials properties and sample characteristics; and
- Models and related code, unless the models and code contain proprietary or business sensitive information, or the implementation is made commercially available.

AOI 2a Teaming Arrangements

Applicant teams are highly encouraged to include an automotive OEM, tier 1 supplier, or automotive joining equipment manufacturer to provide performance and manufacturing requirements for the proposed technology in the specified application. Teams are also encouraged to include research partners from universities or National Laboratories to encourage different perspectives from the joining and corrosion research community. Participation of commercial software vendors is also encouraged to enable broad dissemination of the developed model(s).

Area of Interest 2b: Modeling of Corrosion/Oxidation of Materials in High-Temperature Engines

The existing materials used for high temperature applications, such as engine components (pistons, exhaust valves, exhaust valve seats, turbocharger turbines, and turbocharger housings), are near their operational limit with the primary failure mechanisms being loss of strength, oxidation fatigue cracking, and corrosion. Physical testing of oxidation/corrosion resistance of new alloys in realistic exhaust gas chemistries and temperatures requires specialized equipment and takes weeks to complete, hindering the adoption of high efficiency technologies.

The objective of this AOI is to develop and validate computational models capable of predicting the location and extent of high temperature corrosion/oxidation of materials in Advanced Combustion Engine and Emission Control (ACEC) gas compositions (Stoichiometric Gasoline, Lean Gasoline, Clean Diesel, and Low Temperature Combustion). The model should be able to predict the corrosion/oxidation performance of materials exposed to high temperatures and realistic combustion gasses to within 10% of experimental measurements.

Success will be measured by the acceleration (measured in years) of new materials solutions through the application of high power computing and materials science.

The modeled high temperature materials must use representative component materials for evaluation, but should be able to predict the performance of new material solutions in representative environments. Examples of component materials include:

- Aluminum (hypereutectic alloys, aluminum alloys used in cast/forged piston, cast cylinder head alloys such as 319 or 356)
- Steels; (Low Nickel (<65%) Alloys, 21-2N or 21-4N stainless steel, 751 Inconel, or other exhaust valve material)
- Cast Iron; (Ni-resist or cast iron currently found in exhaust systems)
- Other materials of interest; materials used in commercial pistons, exhaust valves, or materials used in other high temperature components with exposure to engine exhaust gas.

AOI 2b General Requirements

Applications must include:

- Material combination(s) and geometry to be modeled
- Gas compositions and temperatures to be modeled
- Consideration of all relevant types of corrosion/oxidation

- Current model maturity level
- List of High Power Computing resources that will be utilized in the project
- List of existing models to be used along with models to be developed under the project
- Source of high temperature alloys to be used for model validation
- Applicability of model to additional material combinations, high temperature conditions, and/or geometries beyond those validated
- Detailed description of the methods of modeling techniques to be performed.
- Detailed description of the methods of validation for the modeling techniques.
- Description of the final output of the project upon completion and metrics for success.

AOI 2b Special Deliverables

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

Recipients will be required to provide all public data and code produced in the project (such as technical data used to support published journal articles or research code used for simulations) to the LightMat DataHUB for curation and hosting. This will include:

- Any experimental measurements or materials properties and sample characteristics; and
- Models and related code, unless the models and code contain proprietary or business sensitive information, or the implementation is made commercially available.

AOI 2b Teaming Arrangements

Applicant teams are highly encouraged to include an automotive OEM, tier 1 supplier, or automotive powertrain component manufacturer to provide performance, manufacturing, and environmental requirements for the proposed technology in the specified application(s). Teams are also encouraged to include research partners from universities or National Laboratories to encourage different perspectives from the oxidation/corrosion in harsh environments research community. Participation of commercial software vendors is also encouraged to enable broad dissemination of the developed model(s).

Technology Integration

For areas of interest 3a – 3f, partnerships with Clean Cities Coalitions are highly encouraged.

Area of Interest 3a: High Performance Computing for Transportation Hubs

Transportation hubs represent complex nodes within the mobility system and have a wealth of data generated by multiple modes of transportation. They facilitate the movement of both people and goods and are often a central component to the regions that they serve. The rapid change in mobility technology, increasing amount of data being generated, and anticipated future growth will lead to major changes and potential disruption for these transportation hubs. There are opportunities to develop and utilize data to yield potentially significant mobility energy productivity gains and optimize the overall system.

The objective of this AOI is to conduct research that uses data and high-performance computing (HPC) to optimize the mobility service provided, the energy needed, and the costs required to move people and goods at and around transportation hubs. Projects will use HPC to analyze mobility data – including data from service providers such as shared mobility partners, transportation network companies (TNCs), taxi companies, freight providers, transit agencies, transportation hub operators, airlines, shipping companies, rental car companies, or other organizations – to optimize efficiency and reduce the cost of both passenger and freight movement. Applicants are encouraged to consider future transportation technology solutions such as electrification, other alternative fuels, and automation. Results will help transportation hubs prepare for and adapt to rapid changes in mobility.

AOI 3a General Requirements

Applications must:

- Identify the transportation hub and the nodes of the system to be studied.
- Describe current mobility/cost/energy inefficiencies in and around the transportation hub.
- Identify all mobility data streams to be generated and/or obtained.
- Identify if the project will address the movement of goods, people or both.
- Utilize HPC and/or artificial intelligence (AI) tools to create insights or systems-level optimization from the data that improves mobility/cost/energy efficiency at and around transportation hubs.
- Explain how the insights generated from the HPC/AI tools will be validated, including testing, simulation or other means.

- Identify if the project will focus on solutions meant to be implemented in a real-time operating environment, or if the solutions will be used for longer-term strategic planning to optimize the hub's operations, systems, and infrastructure.

Data Collection and Analysis: Projects must obtain data and quantify the energy efficiency and mobility gains that result from the use of data, technologies, or applications to improve the affordability, convenience, and/or accessibility of a transportation hub. Applicants are encouraged to provide data that is generated under this award to DOE and the national laboratories that comprise DOE's SMART Mobility Laboratory Consortium. Proposals should clearly identify the level of data sharing planned.

Model and/or Technology Validation and Proof of Concept: To improve and validate VTO mobility modeling, simulation, and proof of concept development, projects should implement emerging hardware, software, algorithms, and/or other systems that will inform and improve the research being conducted through VTO.

Replicability: Projects must be structured to produce results and insights that are replicable in other areas across the country. Applicants will produce a final technical report that documents project information, analyses, and insights that support project replicability. Reports, analyses, and other deliverables that are developed under this award must be publicly releasable.

AOI 3a Teaming Arrangements

FFRDCs/National Laboratories with high performance computing (HPC) resources and capabilities are highly encouraged to play a role. Project teams are anticipated to include partners such as:

- Clean Cities Coalitions
- Shared Mobility Partners, Transportation Network Companies, Taxi Companies, Rental Car Companies, Airlines, Freight Shipping Companies, Freight Providers
- Transit Agencies, Transportation Hub Operators, Ports, Airports
- Metropolitan Planning Organizations, Local Governments
- National Labs, Academic Institutions

Applications that include the following are highly discouraged:

- Applications that promote a specific brand.
- Projects that include the purchase of vehicles and/or fueling or charging infrastructure as a project cost.

Area of interest 3b: First/Last Mile for People/Goods Movement

Fundamental shifts in mobility preferences are enabling a new on-demand goods and services economy and novel shared use mobility platforms. These changes expose new opportunities for efficiencies in the movement of people and goods from a transportation hub to a final destination or first/last mile people and goods movement, but the potential energy productivity gains are not fully understood. The objective of this AOI is to research how data and technology can be used to improve the mobility, energy impact, and affordability of new first/last mile solutions for people and/or goods movement. Projects should include technology and operation innovations such as the use of advanced technology vehicles, shared mobility, vehicle right-sizing, connected and automated vehicles, consolidated shipments, curbside management, and off-hour deliveries. Proposals may address the movement of people, the movement of goods, or both.

AOI 3b General Requirements

Applications must:

- Identify the first/last mile movement to be studied and if the solutions will focus on people, goods, or both.
- Describe current mobility/cost/energy inefficiencies of the first/last mile people/goods movement scenario.
- Identify all mobility data streams to be generated and/or obtained.
- Describe the magnitude of energy reduction, cost savings, or increased mobility that the proposed solutions could deliver if implemented.
- Describe the technology and operation innovations that will be used to expose new opportunities for mobility/cost/energy efficiencies of the first/last mile people/goods movement scenario.

Data Collection and Analysis: Projects must obtain data and quantify the energy efficiency and mobility gains that result from the use of data, technologies, or applications to improve the affordability, convenience, and/or accessibility of a transportation system. Applicants are encouraged to provide data that is generated under this award to DOE and the national laboratories that comprise DOE's SMART Mobility Laboratory Consortium. Proposals should clearly identify the level of data sharing planned.

Model and/or Technology Validation and Proof of Concept: To improve and validate VTO's mobility modeling, simulation, and proof of concept development, projects are encouraged to implement emerging hardware, software, algorithms, and/or other systems that will inform and improve the research being conducted in VTO.

Replicability: Projects must be structured to produce results and insights that are replicable in other areas across the country. Applicants will produce a final technical report that documents project information, analyses, and insights that support project replicability. Reports, analyses, and other deliverables that are developed under this award must be publicly releasable.

AOI 3b Teaming Arrangements

Project teams that include the following partners are highly encouraged:

- Clean Cities Coalitions
- Shared Mobility Partners, Transportation Network Companies, Taxi Companies, Rental Car Companies, Airlines, Freight Shipping Companies, Freight Providers
- Transit Agencies, Transportation Hub Operators, Ports, Airports
- Metropolitan Planning Organizations, Local Governments
- National Labs or Academic Institutions

Applications that include the following are highly discouraged:

- Applications that promote a specific brand.
- Projects that include the purchase of vehicles and/or fueling or charging infrastructure as a project cost.
- Conversions or re-powers of vehicles.
- Applications that include novelty vehicles and other off-road recreational or sport vehicles.

Area of Interest 3c: System-Level Data for Energy Efficient Mobility

As transportation systems evolve, communities have access to an increasing amount of mobility data but may lack awareness of and opportunities to harness the power of this data to yield potentially significant mobility energy productivity gains. The objective of this AOI is to conduct research to accelerate the understanding of how communities can use system-level data for energy efficient mobility. Projects will integrate data feeds that are critical to understanding the energy efficiency of a region's mobility system within new or existing openly-accessible data management frameworks and identify opportunities to improve mobility while also increasing energy efficiency and transportation affordability. Successful mobility data management first requires a clear objective of how the mobility system is trying to be improved. This objective defines what data is needed to solve the problem. Projects will identify, obtain, manage, and use datasets that are critical to solving specific mobility problems in a community and will result in an increase in a community's mobility energy productivity. Projects will also provide replicable examples for other communities and may also be used to inform connected and automated vehicle planning efforts.

AOI 3c General Requirements

Applications must:

- Identify the community mobility system to be studied.
- Describe current mobility/cost/energy inefficiencies in the community mobility system and how efficiency can be improved.
- Identify all community mobility data streams that are needed, how those data streams will be generated and/or obtained, and the analytical methods that will be used to overcome the identified mobility/cost/energy inefficiencies.
- Identify the new or existing openly accessible data management framework into which the data streams will be integrated.

Data Collection and Analysis: Projects must obtain data and quantify the energy efficiency and mobility gains that result from the use of data, technologies, or applications to improve the affordability, convenience, and/or accessibility of a transportation system. Applicants are encouraged to provide data that is generated under this award to DOE and the national laboratories that comprise DOE's SMART Mobility Laboratory Consortium. Proposals should clearly identify the level of data sharing planned.

Model and/or Technology Validation and Proof of Concept: To improve and validate VTO's mobility modeling, simulation, and proof of concept development, projects should implement emerging hardware, software, algorithms, and/or other systems that will inform and improve the research being conducted through VTO.

Replicability: Projects must be structured to produce results and insights that are replicable in other areas across the country. Applicants will produce a final technical report that documents project information, analyses, and insights that support project replicability. Reports, analyses, and other deliverables that are developed under this award must be publicly releasable.

AOI 3c Teaming Arrangements

Local government(s) are required as partners under this AOI. Project teams that also include the following partners are highly encouraged:

- Clean Cities Coalitions
- Academic Institutions
- Metropolitan Planning Organizations

Applications that include the following are highly discouraged:

- Applications that promote a specific brand.

- Projects which include the purchase of vehicles and/or fueling or charging infrastructure as a project cost.

Area of Interest 3d: Fuel Efficient Platooning

Truck platooning can improve safety, increase energy efficiency, and reduce costs. Much research to date has been on tracks and in ideal environmental conditions; real world testing is needed to identify technology solutions, actual fuel savings potential, and real-world challenges that need to be overcome for the benefits of platooning to be achieved. The objective of this AOI is to execute field evaluations of multi-truck platoon proof of concepts that assess both the potential fuel savings and barriers that need to be overcome for platooning to be effective. Projects should focus on connected and/or partially automated platooning of class 7/8 tractors and trailers. Projects should research factors such as vehicle weight, aerodynamics, road/environment variability, the impact of non-platooning vehicles on the platoon, issues with forming and leaving a platoon, and distances between trucks and other vehicles on the road. Projects should include observations of truck platoon challenges that cannot be identified through modeling alone and identify new software and hardware technologies needed to address truck platoon barriers.

AOI 3d General Requirements

Applications must:

- Describe the field evaluation of multi-truck class 7/8 tractor and trailer platoon and the fuel efficiency related factors to be conducted.
- Identify all platoon data streams to be generated and/or obtained.
- Describe how barriers to truck platooning in a real-world environment will identified and measured, particularly barriers that cannot be identified through modeling alone.
- Identify how factors such as the following will be addressed in the project: vehicle weight, aerodynamics, road/environment variability, impact of non-platooning vehicles on the platoon, issues with forming and leaving a platoon, and distances between trucks and other vehicles on the road.
- Identify new software and hardware technologies needed to address truck platoon barriers.

Data Collection and Analysis: Projects must obtain data and quantify the energy efficiency and mobility gains that result from the use of data, technologies, or applications to improve the affordability, convenience, and/or accessibility of a transportation system. Applicants are encouraged to provide data that is generated under this award to DOE and the national laboratories that comprise DOE's SMART

Mobility Laboratory Consortium. Proposals should clearly identify the level of data sharing planned.

Model and/or Technology Validation and Proof of Concept: To improve and validate VTO's mobility modeling, simulation, and proof of concept development, projects are encouraged to implement emerging hardware, software, algorithms, and/or other systems that will inform and improve the research being conducted through VTO.

Replicability: Projects must be structured to produce results and insights that are replicable in other areas across the country. Applicants will produce a final technical report that documents project information, analyses, and insights that support project replicability. Reports, analyses, and other deliverables that are developed under this award must be publicly releasable.

AOI 3d Teaming Arrangements

Project teams that include the following partners are highly encouraged.:

- Clean Cities Coalitions
- Freight Shipping Companies
- Technology and/or Vehicle Providers
- State Governments
- National Labs, Academic Institutions or Mobility Research Centers

Applications that include the following are highly discouraged:

- Applications that promote a specific brand.
- Applications that include low speed vehicles, novelty vehicles, and other off road recreational or sport vehicles.
- Projects that include the purchase of vehicles, fueling or charging infrastructure, and/or platooning equipment as a project cost.

Area of Interest 3e: Multi-Unit Dwelling and Curbside Residential Charging Infrastructure Innovations

Studies have found that the ability to charge electric vehicles (EVs) at home is important to drivers and that nearly 90% of charging needs can be met by home charging. Individuals without dedicated off-street parking lack this opportunity and need alternative primary charging solutions that are affordable. The objective of this AOI is to conduct research that will identify new software, hardware technology, or other innovative solutions to expand access to multi-unit dwelling and curbside residential EV charging infrastructure. Projects will demonstrate, validate, and collect data on

innovative models and technologies such as mobile charging, pairing charging with street lighting, or residential charging hubs.

AOI 3e General Requirements

Applications must:

- Describe the current barriers of multi-unit dwellings and/or curbside residential EV charging that will be addressed by the project.
- Identify what analysis will be done to quantify the size of the problem and how much the proposed solution could address the problem.
- Identify the multi-unit dwelling and/or curbside residential software, hardware, or innovative approaches to charging EVs that will studied.
- Identify how the project will test and validate the proposed charging solutions, and what data will be gathered as part of that testing.

Replicability: Projects must be structured to produce results and insights that are replicable in other areas across the country. Applicants will produce a final technical report that documents project information, analyses, and insights that support project replicability. Reports, analyses, and other deliverables that are developed under this award must be publicly releasable.

AOI 3e Teaming Arrangements

Project teams that include the following partners are highly encouraged:

- Clean Cities Coalitions
- EVSE Companies
- Electric Utilities
- Multi-Unit Dwelling Stakeholders
- Local Governments

Applications that include the following are highly discouraged:

- Applications that promote a specific brand.
- Projects which include the purchase of vehicles and/or fueling or charging infrastructure as project costs.

Area of Interest 3f: Open Topic

The objective of this AOI is to allow for maximum innovation from stakeholders and identify innovative technologies or approaches and data sets that can significantly improve domestic energy security and efficiency, provide mobility gains, and/or enable more widespread access to affordable advanced fuels, highly efficient vehicles and mobility systems. This includes high-impact, specialized applications or end-user groups that may be underserved by these new technologies. The open topic allows

stakeholders the opportunity to explore novel solutions to transportation and energy mobility challenges that have not been addressed above.

AOI 3f General Requirements

Applications must:

- Identify innovative technologies or approaches and data sets that can result in significant improvements to domestic energy security and efficiency, provide mobility gains and/or enable more widespread access to affordable advanced fuels, highly efficient vehicles, and mobility systems.

- Replicability: Projects must be structured to produce results and insights that are replicable in other areas across the country. Applicants will produce a final technical report that documents project information, analyses, and insights that support project replicability. Reports, analyses, and other deliverables that are developed under this award must be publicly releasable.

AOI 3f Teaming Arrangements

Project teams that include the following partners are highly encouraged:

- One or more Clean Cities Coalitions
- Local/Regional/State Governments, Transit Agencies, Metropolitan Planning Organizations
- National Labs, Academic Institutions
- Fuel & Infrastructure Providers, Utility Companies
- Transportation Network Providers
- Fleets & End-user Groups with related field experience
- Relevant Industry Trade Associations

Applications that include the following are highly discouraged:

- Applications that "promote" a specific brand, product, or invention.
- Applications that include novelty vehicles, restricted use low-speed vehicles, and other off road recreational or sport vehicles.
- Projects whose primary purpose is to subsidize the cost of vehicles, infrastructure, construction, hardware, and equipment.

Off-Road R&D

Area of Interest 4a: Energy Efficient Commercial Off-Road Vehicles

Off-road vehicles account for 8% of the total energy consumed in the U.S. transportation sector and are a substantial source of harmful emissions, including nitrogen oxides and fine particulate matter. Construction and agriculture equipment represent the majority of energy consumption in off-road vehicles. Improving the efficiency of these vehicles can provide decreased operating costs for these key domestic industries.

Off-road vehicles experience unique challenges to increasing energy efficiency and meeting emissions requirements. This sector includes a wide diversity of vehicles for different vocations, and vehicles experience highly variable, vocation-dependent duty cycles, including significant time at high-load and idle. Therefore, technologies must be applicable to a wide range of applications to make their development costs economically viable. The engine and aftertreatment technology must be compact and able to fit in a variety of equipment envelopes. Furthermore, the off-road market demands a high level of durability and reliability. Technologies must be able to perform in harsh environments where they encounter high levels of vibration, shock, dust/debris laden air, and due to operating at low speeds, a lack of ram air for cooling purposes.

The objective of this AOI is to research, develop, and evaluate technologies that can significantly improve the energy efficiency of commercial off-road vehicles and are cost-effective, meet emissions standards, and maintain the durability needed for these vehicles. This may be accomplished by reducing engine-out emissions to decrease the cost and energy penalty associated with emission control. Technologies may include, but are not limited to, advanced engine and emission control technologies, waste heat recovery, and hybridization. Teams should consider the use of liquid and gaseous fuels that are widely available in today's marketplace. Technologies should address common sources of inefficiencies that can curb fuel consumption across the entire sector to the greatest extent possible. Teams are encouraged to include a manufacturer of off-road vehicles with engines sized >75 hp.

AOI 4a General Requirements

Applications must:

- Include plans to design, build, and validate technology in laboratory setting.
- Include plans to demonstrate the work-specific energy-efficiency benefit of the developed technology in a laboratory setting that closely simulates how the technology will function in the vehicle application (e.g., on an engine dynamometer).

- Include an analysis that demonstrates the technology could result in a payback of less than 3 years given the savings in fuel and/or emission control costs.
- Include an analysis of how much energy can be saved across the off-road sector with the proposed technology.

Co-Optimization of Engines & Fuels

Area of Interest 5a: Multi-Mode Optimized Fuel/Engine System Development

The objective of this AOI is to develop a co-optimized (engine and fuel) prototype light-duty, multi-cylinder reciprocating engine (minimum 150 hp). The engine should operate in a spark-ignition/compression ignition multimode combustion regime over a broad range of engine operating conditions with a suitable co-optimized liquid fuel. The engine and fuel combination should demonstrate an ability to meet Tier 3/LEV III emissions standards. The goal is to achieve a 10% improvement in modeled vehicle fuel economy by co-optimizing the engine and fuel, relative to a comparable engine operating on 87 AKI gasoline, over the FTP-75 cycle.

If the co-optimized fuel does not include a bio-component, the application shall include a preliminary techno-economic analysis for producing a relevant biomass component and a plan to demonstrate chemical equivalence to a biomass pathway-derived product through a fuel property analysis.

Applications for projects that include as a deliverable an engine mesh suitable for use at a national laboratory participating in the Co-Optima initiative to model the engine, along with appropriate documentation and support, are highly encouraged. This is needed to assure the national lab can accurately model the engine and simulate fuel property variation impacts.

Applications for projects that include an option for the engine to be installed and operated at a national laboratory involved in the Co-Optima initiative at the conclusion of the project are highly encouraged.

AOI 5a General Requirements

Applications must:

- Include plans to provide a working multi-cylinder engine designed to benefit from optimized fuels to improve efficiency and analyze, model, or simulate results which support the developed engine.

- Include plans to document the co-optimized fuel properties, including autoignition, thermophysical and any other relevant properties.
- Include an engine test plan that would adequately demonstrate the ability to switch between combustion modes with reasonable combustion stability and noise.
- Include analysis and/or testing data showing how co-optimized fuel impacts engine design and operating parameters.
- Include analysis of anticipated fuel economy improvement that occurs due to fuel property changes (vs. operation on 87 AKI gasoline) and engine characteristic changes relative to an engine optimized for 87 AKI gasoline.
- Include plans to design, build and validate the engine in a laboratory setting.
- Include a plan to validate the performance of the developed engine on an engine dynamometer.
- In the case where the co-optimized fuel does not include a component with a published biomass pathway-derived route, the application should specify plans to develop and verify the biomass pathway-derived route.

AOI 5a Teaming Arrangements

Applicant teams must include: 1) a vehicle or engine manufacturer which has produced at least 20,000 vehicles, or a Tier I supplier which has provide major componentry for at least 20,000 engines; and, 2) a fuel manufacturer or fuel supplier.

Area of Interest 5b: Bioblendstocks to optimize Mixing Controlled Compression Ignition (MCCI) engines

For medium- and heavy-duty vehicles, the Co-Optima approach is to focus on reducing engine-out emissions while maintaining or improving efficiency in MCCI engines and potentially advanced compression ignition engines. The objective of this AOI is to develop and demonstrate single component or multicomponent liquid bioblendstocks for use in medium- and heavy-duty mixing controlled, compression ignition engines blended into a base diesel fuel at no less than 5% by volume. The bioblendstock must achieve lifecycle greenhouse gas reductions of at least 50% compared to conventional petroleum-derived diesel.

The bioblendstocks should improve at least **two** of the following properties of the finished fuel:

- energy density;
- sooting propensity;
- cetane number; and
- cold weather behavior (pourpoint, cloudpoint).

Applications that include bio-derived liquid fuel components that reduce the energy penalty of operating the diesel aftertreatment systems and confer a system-level energy efficiency benefit are highly encouraged.

Applications that propose the use of Commercially available blendstocks (e.g., fatty acid methyl ester (FAME) and hydroprocessed esters and fatty acid (HEFA)) from conventional feedstocks (e.g. FOG, soy oil, and other food plant oils) are discouraged.

Bio-blendstocks that are commonly classified as aromatics, polyaromatics, aldehydes, or acids are discouraged.

Fuels that are gaseous at standard temperature and pressure, such as natural gas, propane, DME, or ammonia, are not eligible.

Acceptable feedstocks are those defined in EPACT 2005 Section 932(a)(1) and (2) and include lignocellulosic biomass, algal biomass, post-sorted MSW, and wet waste.[5] The lignocellulosic biomass sources include agricultural residues such as corn stover, other grain straws, bagasse, soybean matter and wood residues.

Applications that demonstrate how a finished fuel containing the proposed bioblendstock could meet the ASTM D975 standard are encouraged but not required.

Note that successful applicants will be assigned a mentor from the National Lab Co-Optima project team to facilitate collaboration.

AOI 5b General Requirements

Applications must:

- Include plans for full fuel composition analysis. This analysis should include all of the fuel tests required to meet ASTM D975.
- Describe why the proposed bio-derived blendstock is expected to have a positive effect on the finished fuel properties of interest (energy density; sooting propensity; cetane number; and/or cold weather behavior (pourpoint, cloudpoint)) and provide relevant, supportive data.
- Include a deliverable that documents the impact of bio-derived blendstocks on finished fuel energy density; sooting propensity; cetane number; and cold weather behavior (pourpoint, cloudpoint).

[5] No plant based material that is generally intended for use as food may be used as a feedstock under this FOA. Hence, sugars derived from sugarcane, sweet sorghum, or beets and oils derived from soy, canola, sunflower, peanut, and other such food sources normally recovered using conventional food processing methods are not eligible as feedstocks under this FOA. Applications proposing to process fiber from wet and dry-grind corn refineries, distillers dried grains and solubles, or other food related biomass will be considered non-responsive and will NOT be considered for funding under this FOA.

- Include plans to provide a minimum of 500 ml of bioblendstock to the national laboratory Co-Optima team to facilitate independent verification of fuel properties and performance.
- Include a techno-economic analysis (TEA) and a Life-Cycle Assessment (LCA) of the biofuel production pathway(s) for candidate bio-blendstocks.

Applications may:

- Include plans for single or multi-cylinder engine testing in partnership with a vehicle or engine manufacturer or independent testing entity.
- Include plans to provide up to 10 gallons of bioblendstock to the national laboratory Co-Optima team to facilitate independent verification of fuel properties.

AOI 5b Teaming Arrangements

Applicant teams should include university and/or industry participants and could include a vehicle or engine manufacturer.

C. Applications Specifically Not of Interest

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

- Applications that fall outside the technical parameters specified in Section I.B of the FOA, including but not limited to:
    - Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics).
    - AOI 1b
        - Applications for AOI 1b that do not meet the specified teaming arrangements.
    - AOI 3c
        - Applications for AOI 3c that do not meet the specified teaming arrangements.
    - AOI 5a
        - Applications for AOI 5a that do not meet the specified teaming arrangements.
    - AOI 5b
        - Applications for AOI 5b that do not meet the specified feedstock requirements.

D. Authorizing Statutes

The programmatic authorizing statute is Public Law 102-486, Energy Policy Act (EPAct) of 1992, amended by Public Law 109-58, EPACT 2005.

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

II. Award Information

A. Award Overview

i. Estimated Funding

EERE expects to make approximately $68,300,000 of Federal funding available for new awards under this FOA, subject to the availability of appropriated funds. EERE anticipates making approximately 26-51 awards under this FOA. EERE may issue one, multiple, or no awards under each area of interest. Individual awards may vary between $500,000 and $5,000,000.

The anticipated total Federal funding and the approximate maximum and minimum Federal Share for any one individual award made under this announcement are set forth in the table below. EERE may issue awards in one, multiple, or none of the following areas of interest:

AOI Number	**Area of Interest**	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
Batteries & Electrification				
1a	Developing Low-Cobalt Active Cathode Materials for Next-generation Li-ion Batteries	$1,500,000	$2,500,000	$11,800,000
1b	Plug-In Electric Drive Vehicle Extreme Fast Charging Research	$3,000,000	$5,000,000	$10,000,000

1c	Electric Vehicle Charging Infrastructure Cybersecurity	$1,000,000	$2,500,000	$5,000,000
Materials				
2a	Predictive Modeling of Corrosion in Dissimilar Material Joints	$1,000,000	$1,500,000	$3,000,000
2b	Modeling of Corrosion/Oxidation of Materials in High-Temperature Engines	$1,000,000	$1,500,000	$3,000,000
Technology Integration				
3a	High Performance Computing for Transportation Hubs	$2,000,000	$5,000,000	$5,000,000
3b	First/Last Mile for People/Goods Movement	$1,500,000	$2,500,000	$4,500,000
3c	System-Level Data for Energy Efficient Mobility	$500,000	$1,000,000	$1,500,000
3d	Fuel Efficient Platooning	$2,000,000	$5,000,000	$5,000,000
3e	Multi-Unit Dwelling and Curbside Residential Charging Infrastructure Innovations	$1,000,000	$1,500,000	$3,000,000
3f	Open Topic	$500,000	$1,000,000	$1,000,000
Off-Road R&D				
4a	Energy Efficient Commercial Off-Road Vehicles	$1,500,000	$3,500,000	$3,500,000
Co-Optimization of Engines & Fuels				
5a	Multi-Mode Optimized Fuel/Engine System Development	$1,500,000	$3,000,000	$6,000,000
5b	Bioblendstocks to optimize Mixing Controlled Compression Ignition engines	$750,000	$2,000,000	$6,000,000

ii. Period of Performance

EERE anticipates making awards up to 36 months in length, comprised of one or more 12-month budget periods. Funding for all budget periods, including

the initial budget period, is not guaranteed. Project continuation will be contingent upon satisfactory performance and go/no-go decision review. At the go/no-go decision points, EERE will evaluate project performance, project schedule adherence, meeting milestone objectives, compliance with reporting requirements, and overall contribution to the program goals and objectives. As a result of this evaluation, EERE will make a determination to continue the project, re-direct the project, or discontinue funding the project.

AOI Number	**Area of Interest**	Anticipated Number of Awards	Anticipated Period of Performance
Batteries & Electrification			
1a	Developing Low-Cobalt Active Cathode Materials for Next-generation Li-ion Batteries	5 - 7	24-36 months
1b	Plug-In Electric Drive Vehicle Extreme Fast Charging Research	2 - 3	24-36 months
1c	Electric Vehicle Charging Infrastructure Cybersecurity	3 - 5	12-24 months
Materials			
2a	Predictive Modeling of Corrosion in Dissimilar Material Joints	2 - 3	36 Months
2b	Modeling of Corrosion/Oxidation of Materials in High-Temperature Engines	2 - 3	36 Months
Technology Integration			
3a	High Performance Computing for Transportation Hubs	1 - 2	24-36 Months
3b	First/Last Mile for People/Goods Movement	2 - 3	24-36 Months
3c	System-Level Data for Energy Efficient Mobility	2 - 4	24-36 Months
3d	Fuel Efficient Platooning	1 - 2	24-36 Months

3e	Multi-Unit Dwelling and Curbside Residential Charging Infrastructure Innovations	2 - 3	24-36 Months
3f	Open Topic	0 - 4	24-36 Months
Off-Road R&D			
4a	Energy Efficient Commercial Off-Road Vehicles	1 - 3	24-36 Months
Co-Optimization of Engines & Fuels			
5a	Multi-Mode Optimized Fuel/Engine System Development	1 - 3	24-36 Months
5b	Bioblendstocks to optimize Mixing Controlled Compression Ignition engines	2 - 6	24-36 Months

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 FFRDCs

In most cases, Federally Funded Research and Development Centers (FFRDC) are funded independently of the remainder of the Project Team. The FFRDC then executes an agreement with any non-FFRDC Project Team members to arrange work structure, project execution, and any other matters. Regardless of these arrangements, the entity that applied as the Prime Recipient for the project will remain the Prime Recipient for the project.

III. Eligibility Information

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

A. Eligible Applicants

The National Energy Technology Laboratory and U.S. Army Tank Automotive Research Development and Engineering Center (TARDEC) are ineligible to participate as a prime applicant or as a team member/sub-recipient on any application because of each entity's role in developing the requirements for this announcement.

i. Individuals

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

ii. Domestic Entities

For-profit entities, educational institutions, and nonprofits that are incorporated (or otherwise formed) under the laws of a particular State or territory of the United States are eligible to apply for funding as a Prime Recipient or Subrecipient. Nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995, are not eligible to apply for funding.

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

DOE/NNSA Federally Funded Research and Development Centers (FFRDCs) are eligible as follows:

AOI Number	DOE/NNSA FFRDC allowed as Recipient	DOE/NNSA FFRDC allowed as Subrecipient
1a	**YES**	**Yes**
1b	No	**Yes**
1c	No	**Yes**
2a	No	**Yes**
2b	**Yes**	**Yes**
3a	**Yes**	**Yes**
3b	No	**Yes**
3c	No	**Yes**
3d	No	**Yes**
3e	No	**Yes**
3f	No	**Yes**
4a	No	**Yes**
5a	No	No
5b	No	No

For AOIs 5a and 5b, DOE/NNSA FFRDCs/National Laboratories are ineligible to participate as a prime applicant or as a team member/sub-recipient on another entity's application because of their ongoing role in shaping the Co-Optimization of Fuels and Engines Program and in developing the requirements for this Funding Opportunity Announcement

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

Federal agencies and instrumentalities (other than DOE) are eligible to apply for funding as a Subrecipient, but are not eligible to apply as a Prime Recipient.

iii. Foreign Entities

Other than as provided in the "Individuals" or "Domestic Entities" sections above, all Prime Recipients receiving funding under this FOA must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. If a foreign entity applies for funding as a Prime Recipient, it must designate in the Full Application a subsidiary or affiliate incorporated

(or otherwise formed) under the laws of a State or territory of the United States to be the Prime Recipient. The Full Application must state the nature of the corporate relationship between the foreign entity and domestic subsidiary or affiliate.

A foreign entity may receive funding as a Subrecipient.

iv. Incorporated Consortia

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

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

v. Unincorporated Consortia

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

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

- Management structure;
- Method of making payments to consortium members;
- Means of ensuring and overseeing members' efforts on the project;
- Provisions for members' cost sharing contributions; and

- Provisions for ownership and rights in intellectual property developed previously or under the agreement.

B. Cost Sharing

The cost share must be at the required percentages identified in the table below and is calculated based on the total allowable costs (i.e., the sum of the Government share, including FFRDC costs if applicable, and the recipient share of allowable costs equals the total allowable cost of the project) and must come from non-Federal sources unless otherwise allowed by law. (See 2 CFR 200.306 and 2 CFR 910.130 for the applicable cost sharing requirements.)

AOI Number	Area of Interest	Minimum Cost Share Requirements
Batteries & Electrification		
1a	Developing Low-Cobalt Active Cathode Materials for Next-generation Li-ion Batteries	≥20%
1b	Plug-In Electric Drive Vehicle Extreme Fast Charging Research	≥50%
1c	Electric Vehicle Charging Infrastructure Cybersecurity	≥20%
Materials		
2a	Predictive Modeling of Corrosion in Dissimilar Material Joints	≥20%
2b	Modeling of Corrosion/Oxidation of Materials in High-Temperature Engines	≥20%
Technology Integration		
3a	High Performance Computing for Transportation Hubs	≥20%
3b	First/Last Mile for People/Goods Movement	≥20%
3c	System-Level Data for Energy Efficient Mobility	≥20%
3d	Fuel Efficient Platooning	≥50%
3e	Multi-Unit Dwelling and Curbside Residential Charging Infrastructure Innovations	≥50%

3f	Open Topic	≥50%
Off-Road R&D		
4a	Energy Efficient Commercial Off-Road Vehicles	≥50%
Co-Optimization of Engines & Fuels		
5a	Multi-Mode Optimized Fuel/Engine System Development	≥50%
5b	Bioblendstocks to optimize Mixing Controlled Compression Ignition engines	≥20%

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. The Prime Recipient's cost share obligation is expressed in the Assistance Agreement as a static amount in U.S. dollars (cost share amount) and as a percentage of the Total Project Cost (cost share percentage). If the funding agreement is terminated prior to the end of the project period, the Prime Recipient is required to contribute at least the cost share percentage of total expenditures incurred through the date of termination.

The Prime Recipient is solely responsible for managing cost share contributions by the Project Team and enforcing cost share obligation assumed by Project Team members in subawards or related agreements.

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.

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

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

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

Cost share contributions must be specified in the project budget, verifiable from the Prime Recipient's records, and necessary and reasonable for proper and efficient accomplishment of the project. As all sources of cost share are considered part of total project cost, the cost share dollars will be scrutinized under the same Federal regulations as Federal dollars to the project. Every cost share contribution must be reviewed and approved in advance by the

Contracting Officer and incorporated into the project budget before the expenditures are incurred.

Applicants are encouraged to refer to 2 CFR 200.306 as amended by 2 CFR 910.130 & 10 CFR 603.525-555 for additional guidance on cost sharing.

iv. Cost Share Contributions by FFRDCs

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

v. Cost Share Verification

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

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

vi. Cost Share Payment

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

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

demonstrate that the Prime Recipient has complied with its cost share obligations to date. The Contracting Officer must approve all such requests before they go into effect.

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 due to server/connection congestion.

i. Compliance Criteria

1. Concept Papers

Concept Papers are deemed compliant if:

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

2. Full Applications

Full Applications are deemed compliant if:

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

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 for a technical merit review of the Full Application.

E. Other Eligibility Requirements

i. Requirements for DOE/NNSA Federally Funded Research and Development Centers (FFRDC) Listed as the Applicant

A DOE/NNSA FFRDC is eligible to apply for funding under this FOA if its cognizant Contracting Officer provides written authorization and this authorization is submitted with the application. If a DOE/NNSA FFRDC is selected for award negotiation, the proposed work will be authorized under the DOE work authorization process and performed under the laboratory's Management and Operating (M&O) contract.

The following wording is acceptable for the authorization:

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

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

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

1. **Authorization for non-DOE/NNSA FFRDCs**
   The Federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with its authority under its award.

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

   "Authorization is granted for the [Enter Laboratory Name] Laboratory to participate in the proposed project. The work

proposed for the laboratory is consistent with or complementary to the missions of the laboratory, and will not adversely impact execution of the DOE assigned programs at the laboratory."

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

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

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

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

Applicants may submit more than one Full Concept Paper and one Full Application to this FOA, provided that each concept paper/application describes a unique, scientifically distinct project, and includes a separate concept paper for each application. All concept papers and applications must be for a stand-alone project that is not dependent or contingent upon another application submitted to this or any other FOA.

G. Questions Regarding Eligibility

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

IV. Application and Submission Information

A. Application Process

The application process will include two phases: a Concept Paper phase and a Full Application phase. **Only applicants who have submitted an eligible Concept Paper will be eligible to submit a Full Application**. At each phase, EERE performs an initial eligibility review of the applicant submissions to determine whether they meet the eligibility requirements of Section III of the FOA. EERE will not review or consider submissions that do not meet the eligibility requirements of Section III. All submissions must conform to the following form and content requirements, including maximum page lengths (described below) and must be submitted via EERE Exchange at https://eere-exchange.energy.gov/, unless specifically stated otherwise. **EERE will not review or consider submissions submitted through means other than EERE Exchange, submissions submitted after the applicable deadline, and incomplete submissions**. EERE will not extend deadlines for applicants who fail to submit required information and documents due to server/connection congestion. A control number will be issued when an applicant begins the EERE Exchange application process. This control number must be included with all Application documents, as described below.

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

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

review only the authorized number of pages and disregard any additional pages.

Applicants are responsible for meeting each submission deadline. **Applicants are strongly encouraged to submit their Concept Papers and Full Applications at least 48 hours in advance of the submission deadline**. Under normal conditions (i.e., at least 48 hours in advance of the submission deadline), applicants should allow at least 1 hour to submit a Concept Paper 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, the applicant must resubmit the Concept Paper and Full Application before the applicable deadline.
EERE urges applicants to carefully review their Concept Papers and Full Applications and to allow sufficient time for the submission of required information and documents. All Full Applications that pass the initial eligibility review will undergo comprehensive technical merit review according to the criteria identified in Section V.A.ii of the FOA.

i. Additional Information on EERE Exchange

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

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

Applicants that experience issue with submissions that result in late submissions: In the event that an applicant experiences technical difficulties so severe that they are unable to submit their application by the deadline, the applicant should contact the EERE Exchange helpdesk for assistance (EERE-ExchangeSupport@hq.doe.gov). The EERE Exchange helpdesk and/or the EERE Exchange system administrators will assist the applicant in resolving all issues (including finalizing submission on behalf of and with the applicant's concurrence). PLEASE NOTE, however, those applicants who are unable to submit their application on time due to their waiting until the last

minute when network traffic is at its heaviest to submit their materials will not be able to use this process.

B. Application Forms

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

Note: The maximum file size that can be uploaded to the EERE Exchange website is 10MB. Files in excess of 10MB cannot be uploaded, and hence cannot be submitted for review. If a file exceeds 10MB but is still within the maximum page limit specified in the FOA, it must be broken into parts and denoted to that effect. For example:
ControlNumber_LeadOrganization_Project_Part_1
ControlNumber_LeadOrganization_Project_Part_2, etc.

C. Content and Form of the Concept Paper

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

i. Concept Paper Content Requirements

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

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

The Concept Paper must conform to the following content requirements:

Section	Page Limit	Description
Cover Page	1 page maximum	The cover page should include the project title, the specific FOA Area of Interest being addressed (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:

		• The proposed technology, including its basic operating principles and how it is unique and innovative; • The proposed technology's target level of performance (applicants should provide technical data or other support to show how the proposed target could be met); • The current state-of-the-art in the relevant field and application, including key shortcomings, limitations, and challenges; • How the proposed technology will overcome the shortcomings, limitations, and challenges in the relevant field and application; • The potential impact that the proposed project would have on the relevant field and application; • The key technical risks/issues associated with the proposed technology development plan; and • The impact that EERE funding would have on the proposed project. • Whether the Principal Investigator (PI) and Project Team have the skill and expertise needed to successfully execute the project plan; • Whether the applicant has prior experience which demonstrates an ability to perform tasks of similar risk and complexity; • Whether the applicant has adequate access to equipment and facilities necessary to accomplish the effort. Applicants may provide graphs, charts, or other data to supplement their Technology Description.

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

EERE may include general comments provided from reviewers on an applicant's Concept Paper in the encourage/discourage notification.

While the content and form of the Concept Paper does not require proposing a cost share amount during this concept paper submission phase, the EERE Exchange system will require entering a proposed cost share as a step in the submission process. Any proposed cost share at the Concept Paper stage of the application process can be updated or amended at the time of full application submission.

D. Content and Form of the Full Application

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

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

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

i. Full Application Content Requirements

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

Each Full Application shall be limited to a single concept or technology. Unrelated concepts and technologies shall not be consolidated in a single Full Application.

Full Applications must conform to the following requirements:

Submission	Components	File Name
Full Application (PDF, unless stated otherwise)	Technical Volume (See Chart in Section IV.D.ii) (30 page limit)	ControlNumber_LeadOrganization_TechnicalVolume
	Statement of Project Objectives (Microsoft Word format) (10 page limit)	ControlNumber_LeadOrganization_SOPO
	SF-424 (Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_App424
	Budget Justification (EERE 335) (Microsoft Excel format. See instructions below)	ControlNumber_LeadOrganization_Budget_Justification
	Summary/Abstract for Public Release (1 page limit)	ControlNumber_LeadOrganization_Summary
	Summary Slide (1 page limit, Microsoft PowerPoint format)	ControlNumber_LeadOrganization_Slide
	Subrecipient Budget Justification, if applicable (EERE 335) (Microsoft Excel format. See instructions below)	ControlNumber_LeadOrganization_Subrecipient_Budget_Justification
	Budget for FFRDC, if applicable	ControlNumber_LeadOrganization_FWP
	Authorization from cognizant Contracting Officer for FFRDC, if applicable	ControlNumber_LeadOrganization_FFRDCAuth
	SF-LLL Disclosure of Lobbying Activities (Applicants must use the template in EERE Exchange)	ControlNumber_LeadOrganization_SF-LLL
	Performance of Work in the United States waiver requests, if applicable	ControlNumber_LeadOrganization_Waiver
	Cost Share Commitment Letters, if applicable, (Adobe PDF format)	ControlNumber_LeadOrganization_LOC
	U.S. Manufacturing Plans	ControlNumber_LeadOrganization_USMP
	Environmental Questionnaire (Applicants must use the template in EERE Exchange)	ControlNumber_LeadOrganization_EQ

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

ControlNumber_LeadOrganization_TechnicalVolume_Part_1
ControlNumber_LeadOrganization_TechnicalVolume_Part_2, etc.

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

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

ii. Technical Volume

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

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

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 page limitation does not include the Statement of Project Objectives, which is a separate document and not included as part of the Technical Volume. 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.

SECTION/PAGE LIMIT	DESCRIPTION
Cover Page (1 Page)	The cover page should include the project title, the specific FOA Area of Interest being addressed (if applicable), both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.

Project Overview (Approximately 10% of the Technical Volume)	The Project Overview should contain the following information: • Background: The applicant should discuss the background of their organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Full Application. • Project Goal: The applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal. • DOE Impact: The applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.
Technical Description, Innovation, and Impact (Approximately 30% of the Technical Volume)	The Technical Description should contain the following information: • Relevance and Outcomes: The applicant should provide a detailed description of the technology, including the scientific and other principles and objectives that will be pursued during the project. This section should describe the relevance of the proposed project to the goals and objectives of the FOA, including the potential to meet specific DOE technical targets or other relevant performance targets. The applicant should clearly specify the expected outcomes of the project. • Feasibility: The applicant should demonstrate the technical feasibility of the proposed technology and capability of achieving the anticipated performance targets, including a description of previous work done and prior results. • Innovation and Impacts: The applicant should describe the current state of the art in the applicable field, the specific innovation of the proposed technology, the advantages of proposed technology over current and emerging technologies, and the overall impact on advancing the state of the art/technical baseline if the project is successful.
Workplan and Market Transformation Plan (Approximately 40% of the Technical Volume)	The Workplan should include a summary of the Project Objectives, Technical Scope, Work Breakdown Structure, Milestones, Go/No-Go Decision Points, and Project Schedule. A detailed Statement of Project Objectives (SOPO) is separately requested. The Workplan should contain the following information: • Project Objectives: The applicant should provide a clear and concise (high-level) statement of the goals and objectives of the project as well as the expected outcomes. • Technical Scope Summary: The applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). The overall work scope is to be divided by performance periods that are separated by

	discrete, approximately annual decision points (see below for more information on go/no-go decision points). The applicant should describe the specific expected end result of each performance period. • Work Breakdown Structure (WBS) and Task Description Summary: The Workplan should describe the work to be accomplished and how the applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. The Workplan is to be structured with a hierarchy of performance period (approximately annual), task and subtasks, which is typical of a standard work breakdown structure (WBS) for any project. The Workplan shall contain a concise description of the specific activities to be conducted over the life of the project. The description shall be a full explanation and disclosure of the project being proposed (i.e., a statement such as "we will then complete a proprietary process" is unacceptable). It is the applicant's responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this FOA. The summary provided should be consistent with the SOPO. The SOPO will contain a more detailed description of the WBS and tasks. • Milestone Summary: The applicant should provide a summary of appropriate milestones throughout the project to demonstrate success. A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be **S**pecific, **M**easurable, **A**chievable, **R**elevant, and **T**imely, and must demonstrate a technical achievement rather than simply completing a task. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one milestone per quarter for the duration of the project with at least one SMART technical milestone per year (depending on the project, more milestones may be necessary to comprehensively demonstrate progress). The applicant should also provide the means by which the milestone will be verified. The summary provided should be consistent with the Milestone Summary Table in the SOPO. • Go/No-Go Decision Points: The applicant should provide a summary of project-wide go/no-go decision points at appropriate points in the Workplan. A go/no-go decision point is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance, technical success is definitively achieved and potential for success in future phases or periods of performance is evaluated, prior to actually beginning the execution of future phases. Unless otherwise specified in the

	FOA, the minimum requirement is that each project must have at least one project-wide go/no-go decision point for each budget period (12 to 18-month period) of the project. The Applicant should also provide the specific technical criteria to be used to make the go/no-go decision. The summary provided should be consistent with the SOPO. Go/no-go decision points are considered "SMART" and can fulfill the requirement for an annual SMART milestone. • End of Project Goal: The applicant should provide a summary of the end of project goal(s). Unless otherwise specified in the FOA, the minimum requirement is that each project must have one SMART end of project goal. The summary provided should be consistent with the SOPO. • Project Schedule (Gantt Chart or similar): The applicant should provide a schedule for the entire project, including task and subtask durations, milestones, and go/no-go decision points. • Project Management: The applicant should discuss the team's proposed management plan, including the following: o The overall approach to and organization for managing the work o The roles of each Project Team member o Any critical handoffs/interdependencies among Project Team members o The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices o The approach to project risk management o A description of how project changes will be handled o If applicable, the approach to Quality Assurance/Control o How communications will be maintained among Project Team members • Technology Transfer Plan: The applicant should provide a technology transfer plan, including the following: o Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including a mitigation plan o Identification of a product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, data dissemination, U.S. manufacturing plan etc., and product distribution.

Technical Qualifications and Resources (Approximately 20% of the Technical Volume)	The Technical Qualifications and Resources should contain the following information: • Describe the Project Team's unique qualifications and expertise, including those of key Subrecipients. • Describe the Project Team's existing equipment and facilities that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project. • This section should also include relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives. • Describe the time commitment of the key team members to support the project. • Attach one-page resumes for key participating team members as an appendix. Resumes do not count towards the page limit. Multi-page resumes are not allowed. Describe the technical services to be provided by DOE/NNSA FFRDCs, if applicable. For multi-organizational or multi-investigator projects, describe succinctly: • The roles and the work to be performed by each PI and Key Participant; • Business agreements between the applicant and each PI and Key Participant; • How the various efforts will be integrated and managed; • Process for making decisions on scientific/technical direction; • Publication arrangements; • Intellectual Property issues; and Communication plans

iii. Statement of Project Objectives

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

iv. SF-424: Application for Federal Assistance

Complete all required fields in accordance with the instructions on the form. The list of certifications and assurances in Field 21 can be found at http://energy.gov/management/office-management/operational-

management/financial-assistance/financial-assistance-forms, under Certifications and Assurances. Note: The dates and dollar amounts on the SF-424 are for the complete project period and not just the first project year, first phase or other subset of the project period. Save the SF-424 in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_App424".

v. Budget Justification Workbook (EERE 335)

Applicants are required to provide a detailed budget justification. While the data requested is mandatory, the use of the Budget Justification Workbook is optional. This form is available on EERE Exchange at https://eere-Exchange.energy.gov/. Prime Recipients must complete each tab of the Budget Justification Workbook for the project as a whole, including all work to be performed by the Prime Recipient and its Subrecipients and Contractors, and provide all requested documentation (e.g., a Federally-approved rate agreement, vendor quotes). Applicants should include costs associated with required annual audits and incurred cost proposals in their proposed budget documents. The "Instructions and Summary" included with the Budget Justification Workbook will auto-populate as the applicant enters information into the Workbook. Applicants must carefully read the "Instructions and Summary" tab provided within the Budget Justification Workbook. Save the Budget Justification Workbook in a single Microsoft Excel file using the following convention for the title "ControlNumber_LeadOrganization_Budget_Justification".

vi. Summary/Abstract for Public Release

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

vii. Summary Slide

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

The Summary Slide template requires the following information:

- Proposed objectives;
- A description of the technology's impact and key takeaways;
- Key deliverables and anticipated accomplishments;
- Project title, Prime Recipient, Principal Investigator, and Key Participant information; and
- Requested EERE funds and proposed applicant cost share(s).

viii. Subrecipient Budget Justification (EERE 335) (if applicable)

Applicants must provide a separate budget justification (i.e., budget justification for each budget year and a cumulative budget) for each subrecipient that is expected to perform work estimated to be more than $100,000 or 10 percent of the total work effort (whichever is less). While the data requested is mandatory, the use of the Budget Justification Workbook is optional. 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".

If selected for negotiations potentially leading to award, applicants may be required to submit additional subrecipient budget documentation in addition to that described here.

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

If a DOE/NNSA FFRDC contractor is to perform a portion of the work, the applicant must provide a DOE Field Work Proposal (FWP) in accordance with the requirements in DOE Order 412.1, Work Authorization System. DOE Order 412.1 and DOE O 412.1 (Field Work Proposal form) area available at the following link, under "DOE Budget Forms": https://www.directives.doe.gov/directives-documents/400-series/0412.1-BOrder-a-admchg1/@@images/file. Save the FWP in a single PDF file using

the following convention for the title "ControlNumber_LeadOrganization_FWP".

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

The Federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with the contractor's authority under its award. Save the Authorization in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_FFRDCAuth".

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

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

Prime Recipients and Subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities" (see EERE Exchange for the document or 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 your application:

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

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

xii. Waiver Request: Performance of Work in the United States (if applicable)

Performance of Work in the United States

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 purchases of these items. However, the Prime Recipient should make every effort to purchase supplies and equipment within the

United States. Appendix C lists the necessary information that must be included in a request to waive the Performance of Work in the United States requirement.

xiii. Cost Share Commitment Letters

You must have a letter from each third party contributing cost share (i.e., a party other than the organization submitting the application) stating that the third party is committed to providing a specific minimum dollar amount of cost share. Identify the following information for each third party contributing cost share: (1) the name of the organization; (2) the proposed dollar amount to be provided; (3) the amount as a percentage of the total project cost; and (4) the proposed type of cost share – cash, services, or property.

Please combine each individual Cost Share Commitment Letter into a single PDF file and save the letters using the following convention for the title "ControlNumber_LeadOrganization_LOC".

xiv. U.S. Manufacturing Commitments

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

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

When an applicant that is a domestic small business, domestic educational institution, or nonprofit organization is selected for an award, the U.S. Manufacturing Plan submitted by the applicant becomes part of the terms and conditions of the award. The applicant/awardee may request a waiver or modification of the U.S. Manufacturing Plan from DOE upon a showing that the original U.S. Manufacturing Plan is no longer economically feasible.

When an applicant that is a domestic large business is selected for an award, a class patent waiver applies as set forth in Section VIII.K. Under this class patent waiver, domestic large businesses may elect title to their subject inventions similar to the right provided to the domestic small businesses, educational institutions, and nonprofits by law. In order to avail itself of the class patent waiver, a domestic large business must agree that any products embodying or produced through the use of an invention conceived or first actually reduced to practice under the award will be substantially manufactured in the United States, unless DOE agrees that the commitments proposed in the U.S. Manufacturing Plan are sufficient.

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

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

xv. Environmental Questionnaire

You must complete the Environmental Questionnaire. This form is available on EERE Exchange at https://eere-Exchange.energy.gov/.
Save the Environmental Questionnaire in a single PDF file using the following convention for the title "Control Number_LeadOrganization_EQ."

E. Post-Award Information Requests

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

- Indirect cost information
- Other budget information
- Updated Commitment Letters from Third Parties Contributing to Cost Share, if applicable

- Name and phone number of the Designated Responsible Employee for complying with national policies prohibiting discrimination (See 10 CFR 1040.5)
- Representation of Limited Rights Data and Restricted Software, if applicable
- Foreign National Involvement
- Updated Environmental Questionnaire
- Data Management Plan

  Applicants who receive an award will be required to submit a Data Management Plan within ninety (90) days of receiving the award. The Data Management Plan is a document that outlines the proposed plan for data sharing or preservation. Information regarding the content of the Data Management Plan is shown in Appendix D and will also be provided in the Federal Assistance Requirements Reporting Checklist upon receipt of award.

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

Each applicant (unless the applicant is an individual or Federal awarding agency that is excepted from those requirements under 2 CFR §25.110(b) or (c), or has an exception approved by the Federal awarding agency under 2 CFR §25.110(d)) is required to: (1) Be registered in the System for Award Management (SAM) at https://www.sam.gov before submitting its application; (2) provide a valid Dun and Bradstreet Universal Numbering System (DUNS) number in its application; and (3) continue to maintain an active SAM registration with current information at all times during which it has an active Federal award or an application or plan under consideration by a Federal awarding agency.

DOE may not make a Federal award to an applicant until the applicant has complied with all applicable DUNS and SAM requirements and, if an applicant has not fully complied with the requirements by the time DOE is ready to make a Federal award, the DOE may determine that the applicant is not qualified to receive a Federal award and use that determination as a basis for making a Federal award to another applicant.

G. Submission Dates and Times

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

H. Intergovernmental Review

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

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:

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

ii. Pre-Award Costs

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

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

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

1. **Pre-Award Costs Related to National Environmental Policy Act (NEPA) Requirements**
   EERE's decision whether and how to distribute Federal funds under this FOA is subject to NEPA. Applicants should carefully consider and should seek legal counsel or other expert advice before taking any action related to the proposed project that would have an adverse effect on the environment or limit the choice of reasonable alternatives prior to EERE completing the NEPA review process.

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

iii. Performance of Work in the United States

1. **Requirement**
   All work performed under EERE Awards must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment; however, the Prime Recipient should make every effort to purchase supplies and equipment within the United States. The Prime Recipient must flow down this requirement to its Subrecipients.

2. **Failure to Comply**
   If the Prime Recipient fails to comply with the Performance of Work in the United States requirement, EERE may deny reimbursement for the work conducted outside the United States and such costs may not be

recognized as allowable recipient cost share. The Prime Recipient is responsible should any work under this Award be performed outside the United States, absent a waiver, regardless of if the work is performed by the Prime Recipient, Subrecipients, contractors or other project partners.

3. **Waiver**

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

The applicant must demonstrate to the satisfaction of EERE that a waiver would further the purposes of the FOA and is in the economic interests of the United States. EERE may require additional information before considering a waiver request. Save the waiver request(s) in a single PDF file titled "ControlNumber_PerformanceofWork_Waiver". The applicant does not have the right to appeal EERE's decision concerning a waiver request.

iv. Construction

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

v. Foreign Travel

Foreign travel costs may be necessary to conduct the research and may be allowable (case-by-case basis) only with the written prior approval of the Contracting Officer assigned to the award.

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.

vi. Equipment and Supplies

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

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

vii. Lobbying

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

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

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

viii. Risk Assessment

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

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

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

ix. Invoice Review and Approval

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

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

V. Application Review Information

A. Technical Review Criteria

i. Concept Papers

Concept Papers will be evaluated against the criteria shown below. All sub-criteria are of equal weight.

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

- Extent to which the concept paper describes the proposed technology, how the technology is unique and innovative, and how the technology will overcome barriers to advance the current state-of-the-art or baseline technology;
- Extent to which the concept paper identifies risks, technical barriers, challenges, and possible mitigation strategies, and demonstrates the impact that the proposed project would have on the relevant field and application;

- Extent to which the proposed project team has the qualifications, relevant experience, capabilities, equipment, and facilities to successfully complete the proposed project;
- Extent to which the proposed project, if successfully accomplished, would meet the objectives as stated in the FOA.

ii. Full Applications

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

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

- Extent to which the applicant demonstrates knowledge of the current state-of-the-art (SOA) or baseline technology and how the proposed project will move the state-of-the-art;
- Extent to which the proposed project will likely achieve prescribed goals, targets, or requirements as described in the area of interest; and
- Extent to which the proposed project is technically sound, viable, and is supported by relevant data, calculations, technical assumptions, design rationale, alternatives, discussion of prior work, and references to literature.

Criterion 2: Project Plan (Weight 40%)

- Extent to which the approach comprehensively and logically addresses research, development, validation, technology integration, risks, and risk mitigation strategies as well as provides tasks and detailed task descriptions;
- Extent to which the project schedule includes all required tasks, reasonable task durations, logical predecessor and successor task ordering, and a defined critical path;
- Extent to which the baseline performance is defined, performance metrics quantify interim performance progress, appropriately scheduled SMART milestones demonstrate project advancement based upon significant project outcomes, and appropriately scheduled SMART Go/No Go Decision Points represent decisions regarding project continuation; and
- Extent to which the Technology Transfer Plan/Manufacturing Plan demonstrates knowledge of the target market(s), distribution channels, required licensing, and competitors as well as the risks and risk mitigation strategies associated with each.

Criterion 3: Team and Resources (Weight 15%)

- Extent to which the qualifications, relevant experience, and time commitment of the individuals on the proposed project team are aligned and integrated for successful completion of the proposed project;
- Extent to which existing equipment and facilities, along with proposed acquisition of equipment, support successful completion of the proposed project; and
- Extent and appropriateness of resource commitment to the proposed project by project partners or other key participants validated by letters of commitment.

B. Standards for Application Evaluation

Applications that are determined to be eligible will be evaluated in accordance with this FOA, by the standards set forth in EERE's Notice of Objective Merit Review Procedure (76 Fed. Reg. 17846, March 31, 2011) and the guidance provided in the "Department of Energy Merit Review Guide for Financial Assistance," which is available at: 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 proposed project exhibits technological diversity when compared to the existing DOE project portfolio and other projects selected from the subject FOA;
- The proposed project, including proposed cost share, optimizes the use of available EERE funding to achieve programmatic objectives;
- The level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers;
- The proposed project is likely to lead to increased employment and manufacturing in the United States;
- 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 proposed project collectively represents diverse types and sizes of applicant organizations while not being detrimental to the overall objectives of the program;
- The proposed project represents diverse technology concepts and applications, as well as technical approaches, while not being detrimental to the overall objectives of the program; and
- The proposed project has significant potential to impact the market while not being detrimental to the overall objectives of the program.

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).

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

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

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 Dates

EERE anticipates notifying applicants selected for negotiation of award and making awards by the dates indicated on the FOA cover page.

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

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

A notification encouraging the submission of a Full Application does not authorize the applicant to commence performance of the project. Please refer to Section IV.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 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 Exchange**
   Register and create an account on EERE Exchange at https://eere-Exchange.energy.gov.
   This account will then allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission. Applicants should also designate backup points of contact so they may be easily contacted if deemed necessary. **This step is required to apply to this FOA.**

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

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

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

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

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

6. **Electronic Authorization of Applications and Award Documents**
   Submission of an application and supplemental information under this FOA through electronic systems used by the Department of Energy, including EERE Exchange and FedConnect.net, constitutes the authorized representative's approval and electronic signature.

ii. Award Administrative Requirements

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

iii. Foreign National Access to DOE Sites

All applicants, except institutions of higher education, selected for an award under this FOA may be required to provide information to the Department of Energy (DOE) in order to satisfy requirements for foreign nationals' access to DOE sites, information, technologies, equipment, programs, and personnel. A foreign national is any person who was born outside the jurisdiction of the United States, is a citizen of a foreign government, and has not been naturalized under U.S. law. If a selected applicant (including any of its subrecipients or subcontractors) anticipates involving foreign nationals in the performance of its award, the selected applicant may be required to provide to DOE with specific information about each foreign national to ensure compliance with the requirements for access approval. Access approval for foreign nationals from countries identified on the U.S. Department of State's list of State Sponsors of Terrorism https://www.state.gov/j/ct/list/c14151.htm receive final approval authority from the Secretary of Energy before they can commence any work under the award.

iv. Subaward and Executive Reporting

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

v. National Policy Requirements

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

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

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

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

Applicants selected for award negotiations will be required to enter their environmental questionnaire electronically at https://www.eere-pmc.energy.gov/

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 contactors from lawfully reporting waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

b. It **does not and will not** use any Federal funds to implement or enforce any nondisclosure and/or confidentiality policy, form, or agreement it uses unless it contains the following provisions:

(1) *''These provisions are consistent with and do not supersede, conflict with, or otherwise alter the employee obligations, rights, or liabilities created by existing statute or Executive order relating to (1) classified information, (2) communications to Congress, (3) the reporting to an Inspector General of a violation of any law, rule, or regulation, or mismanagement, a gross waste of funds, an abuse of authority, or a substantial and specific danger to public health or safety, or (4) any other whistleblower protection. The definitions, requirements, obligations, rights, sanctions, and liabilities created by controlling Executive orders and statutory provisions are incorporated into this agreement and are controlling.''*

(2) The limitation above shall not contravene requirements applicable to Standard Form 312, Form 4414, or any other form issued by a Federal department or agency governing the nondisclosure of classified information.

(3) Notwithstanding the provision listed in paragraph (a), a nondisclosure or confidentiality policy form or agreement that is to be executed by a person connected with the conduct of an intelligence or intelligence-related activity, other than an employee or officer of the United States Government, may contain provisions appropriate to the particular activity for which such document is to be used. Such form or agreement shall, at a minimum, require that the person will not disclose any classified information received in the course of such activity unless specifically authorized to do so by the United States Government. Such nondisclosure or confidentiality forms shall also make it clear that they do not bar disclosures to Congress, or to an authorized official of an executive agency or the Department of Justice, that are essential to reporting a substantial violation of law.

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 usual circumstances to correct deficiencies that develop during the project; assuring compliance with terms and conditions; and reviewing technical performance after project completion to ensure that the project objectives have been accomplished.

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

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

x. Subject Invention Utilization Reporting

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

xi. Intellectual Property Provisions

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

xii. Reporting

Reporting requirements are identified on the Federal Assistance Reporting Checklist, attached to the award agreement. The checklist can be accessed at https://www.energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms

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. Federal funding beyond the Go/No Go decision point (continuation funding), is contingent on (1) the

availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) meeting the objectives, milestones, deliverables, and decision point criteria of recipient's approved project and obtaining approval from EERE to continue work on the project; and (3) the submittal of required reports in accordance with the Statement of Project Objectives.

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

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

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. 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.

VII. Questions/Agency Contacts

Upon the issuance of a FOA, EERE personnel are prohibited from communicating (in writing or otherwise) with applicants regarding the FOA except through the established question and answer process as described below.

Specifically, questions regarding the content of this FOA must be submitted to: DE-FOA-0001919@netl.doe.gov. Questions must be submitted not later than 5 business days prior to the application due date and time.

All questions and answers related to this FOA will be posted on EERE Exchange at: https://eere-exchange.energy.gov. **Please note that you must first select this specific FOA Number in order to view the questions and answers specific to this FOA**. EERE will attempt to respond to a question within 3 business days, unless a similar question and answer has already been posted on the website. All questions submitted must clearly identify the Area of Interest (AOI) to insure a timely and accurate response. Failure to identify the AOI, or not being as specific as possible with a question, may result in additional time to address the question or require further correspondence for further clarification regarding the submitted questions.

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

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

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

The use of protective markings such as "Do Not Publicly Release – Trade Secret" or "Do Not Publicly Release – Confidential Business Information" is encouraged. However, applicants should be aware that the use of protective markings is not dispositive as to whether information will be publicly released pursuant to the Freedom of Information Act, 5 U.S.C. §552, et. seq., as amended by the OPEN Government Act of 2007, Pub. L. No. 110-175. (See Section VIII.H. of this

document, “Notice of Potential Disclosure Under the Freedom of Information Act (FOIA)” for additional information regarding the public release of information under the Freedom of Information Act.

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

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

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

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

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

E. Evaluation and Administration by Non-Federal Personnel

In conducting the merit review evaluation and Peer Review, the Government may seek the advice of qualified non-Federal personnel as reviewers. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The applicant, by submitting its application, consents to the use of non-Federal reviewers/administrators. Non-Federal reviewers must sign conflict of interest and non-disclosure agreements prior to reviewing an application. Non-Federal personnel conducting administrative activities must sign a non-disclosure agreement.

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

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

I. Requirement for Full and Complete Disclosure

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

- The termination of award negotiations;
- The modification, suspension, and/or termination of a funding agreement;

- The initiation of debarment proceedings, debarment, and/or a declaration of ineligibility for receipt of Federal contracts, subcontracts, and financial assistance and benefits; and
- Civil and/or criminal penalties.

J. Retention of Submissions

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

K. Title to Subject Inventions

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

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

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

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

- Advance and Identified Waivers: Applicants may request a patent waiver that will cover subject inventions that may be invented under the award, in advance of or within 30 days after the effective date of the award. Even if an advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver for identified inventions, i.e., individual subject inventions that are disclosed to EERE

within the timeframes set forth in the award's intellectual property terms and conditions. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784.

- Determination of Exceptional Circumstances (DEC): Each applicant is required to submit a U.S. Manufacturing Plan as part of its application. If selected, the U.S. Manufacturing Plan shall be incorporated into the award terms and conditions for domestic small businesses and nonprofit organizations. DOE has determined that exceptional circumstances exist that warrants the modification of the standard patent rights clause for small businesses and non-profit awardees under Bayh-Dole to the extent necessary to implement and enforce the U.S. Manufacturing Plan. For example, the commitments and enforcement of a U.S. Manufacturing Plan may be tied to subject inventions. Any Bayh-Dole entity (domestic small business or nonprofit organization) affected by this DEC has the right to appeal it.

L. 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.

M. Rights in Technical Data

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

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

Government rights in Technical Data Produced Under Awards: The U.S. Government normally retains unlimited rights in technical data produced under Government financial assistance awards, including the right to distribute to the public. However, 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"). Data protection is available to all AOIs except for AOIs 3a through 3f. For awards permitting Protected Data, the protected data must be marked as set forth in the awards intellectual property terms and conditions and a listing of unlimited rights data (i.e., non-protected data) must be inserted into the data clause in the award. In addition, invention disclosures may be protected from public disclosure for a reasonable time in order to allow for filing a patent application.

N. Copyright

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

O. Personally Identifiable Information (PII)

All information provided by the Applicant must to the greatest extent possible exclude Personally Identifiable Information (PII). The term "personally identifiable information" refers to information which can be used to distinguish or trace an individual's identity, such as their name, social security number, biometric records, etc. alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother's maiden name, etc. (See OMB Memorandum M-07-16 dated May 22, 2007, found at: https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2007/m07-16.pdf

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

P. Annual Independent Audits

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

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

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

Appendix A – Cost Share Information

Cost Sharing or Cost Matching

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

How Cost Sharing Is Calculated

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

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

- Formula: Total Project Cost ($) minus Federal share ($) = Non-federal share ($)
  Example: $1,250,000 minus $1,000,000 = $250,000

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

What Qualifies For Cost Sharing

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

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

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

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

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

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, etc. 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, etc. 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 (EERE 335). 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 (EERE 335).

3. Funds from other Federal sources MAY NOT be counted as cost share. This prohibition includes FFRDC sub-recipients. Non-Federal sources include any source not originally derived from Federal funds. Cost sharing commitment letters from subrecipients must be provided with the original application.

4. Fee or profit, including foregone fee or profit, are not allowable as project costs (including cost share) under any resulting award. The project may only incur those costs that are allowable and allocable to the project (including cost share) as determined in accordance with the applicable cost principles prescribed in FAR Part 31 for For-Profit entities and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

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

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

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

(1) They are verifiable from the recipient's records.

(2) They are not included as contributions for any other federally-assisted project or program.

(3) They are necessary and reasonable for the proper and efficient accomplishment of project or program objectives.

(4) They are allowable under the cost principles applicable to the type of entity incurring the cost as follows:

a. For-profit organizations. Allowability of costs incurred by for-profit organizations and those nonprofit organizations listed in Attachment C to OMB Circular A–122 is determined in accordance with the for-profit cost principles in 48 CFR Part 31 in the Federal Acquisition Regulation, except that patent prosecution costs are not allowable unless specifically authorized in the award document. (v) Commercial Organizations. FAR Subpart 31.2—Contracts with Commercial Organizations

b. Other types of organizations. For all other non-federal entities, allowability of costs is determined in accordance with 2 CFR Part 200 Subpart E.

(5) They are not paid by the Federal Government under another award unless authorized by Federal statute to be used for cost sharing or matching.

(6) They are provided for in the approved budget.

(B) Valuing and documenting contributions

(1) Valuing recipient's property or services of recipient's employees. Values are established in accordance with the applicable cost principles, which mean that amounts chargeable to the project are determined on the basis of costs incurred. For real property or equipment used on the project, the cost principles authorize depreciation or use charges. The full value of the item may be applied when the item will be consumed in the performance of the award or fully depreciated by the end of the award. In cases where the full value of a donated capital asset is to be applied as cost sharing or matching, that full value must be the lesser or the following:

a. The certified value of the remaining life of the property recorded in the recipient's accounting records at the time of donation; or
b. The current fair market value. If there is sufficient justification, the Contracting Officer may approve the use of the current fair market value of the donated property, even if it exceeds the certified value at the time of donation to the project. The Contracting Officer may accept the use of any reasonable basis for determining the fair market value of the property.

(2) Valuing services of others' employees. If an employer other than the recipient furnishes the services of an employee, those services are valued at the employee's regular rate of pay, provided these services are for the same skill level for which the employee is normally paid.

(3) Valuing volunteer services. Volunteer services furnished by professional and technical personnel, consultants, and other skilled and unskilled labor may be counted as cost sharing or matching if the service is an integral and necessary part of an approved project or program. Rates for volunteer services must be consistent with those paid for similar work in the recipient's organization. In those markets in which the required skills are not found in the recipient organization, rates must be consistent with those paid for similar work in the labor market in which the recipient competes for the kind of services involved. In either case, paid fringe benefits that are reasonable, allowable, and allocable may be included in the valuation.

(4) Valuing property donated by third parties.

a. Donated supplies may include such items as office supplies or laboratory supplies. Value assessed to donated supplies included in the cost sharing or matching share must be reasonable and must not exceed the fair market value of the property at the time of the donation.

b. Normally only depreciation or use charges for equipment and buildings may be applied. However, the fair rental charges for land and the full value of equipment or other capital assets may be allowed, when they will be consumed in the performance of the award or fully depreciated by the end of the award, provided that the Contracting Officer has approved the charges. When use charges are applied, values must be determined in accordance with the usual accounting policies of the recipient, with the following qualifications:

    i. The value of donated space must not exceed the fair rental value of comparable space as established by an independent appraisal of comparable space and facilities in a privately-owned building in the same locality.
    ii. The value of loaned equipment must not exceed its fair rental value.

(5) Documentation. The following requirements pertain to the recipient's supporting records for in-kind contributions from third parties:

a. Volunteer services must be documented and, to the extent feasible, supported by the same methods used by the recipient for its own employees.

b. The basis for determining the valuation for personal services and property must be documented.

Appendix B – Sample Cost Share Calculation for Blended Cost Share Percentage

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

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

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

Each task must be calculated individually as follows:

Task 1
$1,000,000 divided by 80% = $1,250,000 (Task 1 Cost)
Task 1 Cost minus federal share = Non-federal share
$1,250,000 - $1,000,000 = $250,000 (Non-federal share)

Task 2
$500,000 divided 80% = $625,000 (Task 2 Cost)
Task 2 Cost minus federal share = Non-federal share
$625,000 - $500,000 = $125,000 (Non-federal share)

Task 3
$400,000 / 50% = $800,000 (Task 3 Cost)
Task 3 Cost minus federal share = Non-federal share
$800,000 - $400,000 = $400,000 (Non-federal share)

Task 4
Federal share = $100,000
Non-federal cost share is not mandated for outreach = $0 (Non-federal share)

The calculation may then be completed as follows:

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

Blended Cost Share %
Non-federal share ($775,000) divided by Total Project Cost ($2,775,000) = 27.9% (Non-federal)
Federal share ($2,000,000) divided by Total Project Cost ($2,775,000) = 72.1% (Federal)

Appendix C – Waiver Request: Performance of Work in the United States

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 purchases of these items. However, the Prime Recipient should make every effort to purchase supplies and equipment within the United States. There may be limited circumstances where it is in the interest of the project to perform a portion of the work outside the United States. To seek a waiver of the Performance of Work in the United States requirement, the applicant must submit an explicit waiver request in the Full Application. A separate waiver request must be submitted for each entity proposing performance of work outside of the United States.

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

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

EERE may require additional information before considering the waiver request.
The applicant does not have the right to appeal EERE's decision concerning a waiver request.

Appendix D - Data Management Plan

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

DMP Requirements

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

At a minimum, the DMP must describe how data sharing and preservation will enable validation of the results from the proposed work, or how results could be validated if data are 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 publication. This includes data that are displayed in charts, figures, images, etc. In addition, the underlying digital research data used to generate the displayed data should be made as accessible as possible in accordance with the principles stated above. This requirement could be met by including the data as supplementary information to the published article, or through other means. The published article should indicate how these data can be accessed.

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

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

Data Determination for a DMP

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

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

Suggested Elements for a DMP

The following list of elements for a DMP provides suggestions regarding the data management planning process and the structure of the DMP:

Data Types and Sources: A brief, high-level description of the data to be generated or used through the course of the proposed work and which of these are considered digital research data necessary to validate the research findings or results.

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

Sharing and Preservation: A description of the plans for data sharing and preservation. This should include, when appropriate: the anticipated means for sharing and the rationale for any restrictions on who may access the data and under what conditions; a timeline for sharing and preservation that addresses both the minimum length of time the data will be available and any anticipated delay to data access after research findings are published; any special requirements for data sharing, for example, proprietary software needed to access or interpret data, applicable policies, provisions, and licenses for re-use and re-distribution, and for the production of derivatives, including guidance for how data and data products should be cited; any resources and capabilities (equipment, connections,

systems, software, expertise, etc.) requested in the research proposal that are needed to meet the stated goals for sharing and preservation (this could reference the relevant section of the associated research proposal and budget request); and whether/where the data will be preserved after direct project funding ends and any plans for the transfer of responsibilities for sharing and preservation.

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

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

Additional Guidance

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

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

Costs associated with the scope of work and resources articulated in a DMP may be included in the proposed research budget as permitted by the applicable cost principles.

To improve the discoverability of and attribution for datasets created and used in the course of research, EERE encourages the citation of publicly available datasets within the reference section of publications, and the identification of datasets with persistent identifiers such as Digital Object Identifiers (DOIs). In most cases, EERE can provide DOIs free of charge for data resulting from DOE-funded research through its Office of Scientific and Technical Information (OSTI) DataID Service.

EERE's Digital Data Management principles can be found at: EERE Digital Data Management | Department of Energy

Definitions

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

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

Digital Research Data: The term digital data encompasses a wide variety of information stored in digital form including: experimental, observational, and simulation data; codes, software and algorithms; text; numeric information; images; video; audio; and associated metadata. It also encompasses information in a variety of different forms including raw, processed, and analyzed data, published and archived data.

Research Data: The recorded factual material commonly accepted in the scientific community as necessary to validate research findings, but not any of the following: preliminary analyses, drafts of scientific papers, plans for future research, peer reviews, or communications with colleagues. This 'recorded' material excludes physical objects (e.g., laboratory samples). Research data also do not include:

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

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