

**DEPARTMENT OF ENERGY
OFFICE OF SCIENCE
BASIC ENERGY SCIENCES**



**ESTABLISHED PROGRAM TO STIMULATE COMPETITIVE
RESEARCH (DOE EPSCoR) IMPLEMENTATION GRANTS**

**FUNDING OPPORTUNITY ANNOUNCEMENT (FOA) NUMBER:
DE-FOA-0002023**

**FOA TYPE: *Amendment 000001*
CFDA NUMBER: 81.049**

***This Amendment 000001 is to change the pre-application response date from
1/25/2019 to 2/6/2019***

FOA Issue Date:	11/13/2018
Submission Deadline for Letters of Intent:	N/A
Submission Deadline for Pre-Applications:	A Pre-Application is required and is due 12/20/2018 at 5:00 PM Eastern Time
Pre-Application Response Date:	02/06/2019 by 5:00 PM Eastern Time
Submission Deadline for Applications:	3/27/2019 at 5:00 PM Eastern Time

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UPDATES AND REMINDERS

RECOMMENDATION

The Department of Energy (DOE) Office of Science (SC) encourages you to register in all systems as soon as possible. You are also encouraged to pre-applications, and applications well before the deadline.

PRE-APPLICATION REVIEW

Pre-applications will be comparatively reviewed by DOE program managers to determine which pre-applications may yield the most competitive applications. Pre-applications that are determined to be noncompetitive will not be permitted to submit applications.

AVOIDING ERRORS

The following advice is compiled from actual experiences of applicants for SC financial assistance awards.

- Please ensure that the research narrative is comprised of one and only one Portable Document Format (PDF) file, including all appendices, when it is attached to the SF-424 (R&R) form.
- When using the PAMS website at <https://pamspublic.science.energy.gov>, please avoid using the back-arrow button in your web browser to navigate.
- Please ensure that the application contains no personally identifiable information (PII).
- Please ensure that the budget is calculated using the applicable negotiated indirect cost and fringe benefit rates.

GRANTS.GOV WORKSPACE

Applications submitted through Grants.gov at <https://www.Grants.gov> must be submitted through a “Workspace.” Workspace permits members of a team to simultaneously work on their application in an online collaborative environment. Application forms may exist as both online webforms and downloadable forms. More information is available at <https://www.grants.gov/web/grants/applicants/workspace-overview.html>.

DATA MANAGEMENT PLAN

Applications submitted under this FOA are subject to the Office of Science Statement on Digital Data Management, published at <https://science.energy.gov/funding-opportunities/digital-data-management/>. Compliance with this statement is detailed in Part IV of this FOA.

ACKNOWLEDGMENT OF FEDERAL SUPPORT

SC published guidance about how its support should be acknowledged at <https://science.energy.gov/funding-opportunities/acknowledgements/>.

Section I – FUNDING OPPORTUNITY DESCRIPTION

GENERAL INQUIRIES ABOUT THIS FOA SHOULD BE DIRECTED TO:

Technical/Scientific Program Contact:

Dr. Tim Fitzsimmons
301-903-9830
Tim.Fitzsimmons@science.doe.gov

STATUTORY AUTHORITY

Public Law 95-91, U.S. Department of Energy Organization Act
Public Law 109-58, Energy Policy Act of 2005

APPLICABLE REGULATIONS

Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards, codified at 2 CFR 200
U.S. Department of Energy Financial Assistance Rules, codified at 2 CFR 910
U.S. Department of Energy, Office of Science Financial Assistance Program Rule, codified at 10 CFR 605

SUMMARY

DOE's Established Program to Stimulate Competitive Research (DOE EPSCoR) hereby announces its interest in receiving applications from [eligible jurisdictions](#) for Implementation Grants. The applications are sought for research in key science and technology areas related to DOE missions as limited by the specific language of this FOA.

Note that there is a listing of [areas of either specific interest or disinterest](#) under the section labelled Supplementary Information. Please review this list carefully when considering preparation of a potential application. Assessment of responsiveness to the requirements of the FOA will be part of the review of the required pre-applications. Non-responsive pre-applications will be not be permitted to submit an application. In addition, a comparative review of pre-applications by program managers will be used to determine the most competitive pre-applications for encouragement of application submissions.

Grants awarded under this program are intended to improve research capability through the support of a group of scientists and engineers, including graduate students and post-doctoral fellows, working on a common scientific theme in one or more than one EPSCoR jurisdictions. These awards are not appropriate mechanisms to provide support for individual faculty science and technology research projects.

While the academic, non-profit and industrial research community is welcome to lead or to participate in applications, a strong component of graduate student education is required for all applicants. DOE EPSCoR currently follows eligibility determinations made by the National

Science Foundation Experimental Program to Stimulate Competitive Research (NSF EPSCoR) for its Research Infrastructure Improvement program. Thus, entities located within the following jurisdictions will be eligible to apply under this FOA: Alabama, Alaska, Arkansas, Delaware, Guam, Hawaii, Idaho, Kansas, Kentucky, Louisiana, Maine, Mississippi, Montana, Nebraska, Nevada, New Hampshire, North Dakota, Oklahoma, Puerto Rico, Rhode Island, South Carolina, South Dakota, Vermont, Virgin Islands, West Virginia, and Wyoming.

SUPPLEMENTARY INFORMATION

Program Objectives

The U.S. Department of Energy's Established Program to Stimulate Competitive Research (DOE EPSCoR) is a federal-state partnership program designed to:

- Enhance the capabilities of designated jurisdictions to conduct sustainable and nationally competitive energy-related research through increased human and technical resources, including training of scientists and engineers.
- Advance DOE's overarching mission by supporting early stage research and development for a wide range of topical areas across the Department:
 - Office of Science: Advanced Scientific Computing Research, Basic Energy Sciences, Biological and Environmental Research, Fusion Energy Sciences, High Energy Physics, and Nuclear Physics
 - Technology Offices: Electricity, Energy Efficiency and Renewable Energy, Environmental Management, Fossil Energy, Nuclear Energy, and the National Nuclear Security Administration.

The objectives of the DOE EPSCoR Implementation Grants are to:

- Jumpstart capability development in the jurisdiction(s) through increased human and technical resources.
- Support a group of researchers working on a common scientific theme, with mutually supporting goals and objectives.
- When topically relevant to the subject matter of the application, promote collaborations with other institutions of higher education and industry with strong participation by students, postdoctoral fellows, and junior faculty from EPSCoR eligible institutions. These collaborations may include institutions from other EPSCoR jurisdictions. Collaborations involving more than one institution or more than one EPSCoR jurisdiction, while welcome, are not a requirement.

DOE EPSCoR also encourages but does not require implementation grants to work toward building beneficial relationships between institutions in EPSCoR jurisdictions and the 10 world-class Federally Funded Research and Development Centers (FFRDCs) managed by the Office of Science. These institutions offer opportunities to leverage capabilities of DOE national user facilities and develop intellectual collaborations that may not be available locally. Please refer to the section on [funding limitations](#) below for limitations on national laboratory participation.

To further the success of the federal-state partnership and of the implementation grants in general, applicants must be aware of the following expectations:

1. Applications must present the opportunities for enhanced academic research and development competitiveness and if appropriate, industrial or economic competitiveness, for the jurisdiction, including plans for the acquisition of sustained non-EPSCoR support.
2. Applications must exhibit a coherent focus on one DOE-related research area bringing together multiple researchers.
3. Applications must present a management plan for coordinating multiple investigators working on a common theme. This must include performance milestones and a timetable for achieving project goals and deliverables. Adequate provision for substantive time commitment by the principal investigator, the research team and appropriate administrative support is an important factor contributing to the success of Implementation Grants. Previous experience indicates that strong external advisory boards are also a useful tool to assist in management of Implementation Grant awards. DOE EPSCoR strongly encourages their formation and regular use.
4. Applications must include letters of commitment/endorsement as noted below under:
 - a) [Principal Investigator and Project Director Roles](#); and in the subsections labelled:
 - b) [LETTERS](#);
 - c) [Appendix 7: Letters of Commitment and Endorsement](#)
5. DOE EPSCoR reserves the right to give priority to applications that propose to develop new research areas rather than those that propose to enhance or continue research areas that have been previously funded under EPSCoR implementation grants. Other program policy and selection criteria are described in [subsection 2 of Section V B, REVIEW AND SELECTION PROCESS](#).

Applications must identify the topical research area or areas with respect to the relevant DOE program office or offices (listed below) and the office's specific program goals. Please review the [websites for information on the office's goals as well as reviewing the section on topics identified of special interest and disinterest below](#). The relevant program Office(s) and the associated scientific/technical point(s) of contact on the DOE (and not National Laboratory) staff must be identified on the first page of the application narrative. If the program office or the associated scientific/technical point(s) of contact are unknown, please contact the DOE EPSCoR office well in advance of the pre-application due date.

As a measure of relevance to DOE missions, DOE EPSCoR will ask the program office or offices to make a meaningful commitment to applications selected for award such as a financial contribution of up to 10% of the support for the proposed effort. While program offices or program office staff may not recommend commitment of funds prior to merit review, prospective applicants should make themselves aware of potential programmatic areas of interest prior to drafting an application. Additional information on the DOE research programs is available at the following website addresses:

Department of Energy (General Information):	http://www.energy.gov/
Office of Science,	http://science.energy.gov/
Advanced Scientific Computing Research:	http://science.energy.gov/ascr/
Basic Energy Sciences:	http://science.energy.gov/bes/
Biological and Environmental Research:	http://science.energy.gov/ber/
Fusion Energy Sciences:	http://science.energy.gov/fes/

High Energy Physics:	http://science.energy.gov/hep/
Nuclear Physics:	http://science.energy.gov/np/
Office of Electricity	http://www.oe.energy.gov/
Office of Energy Efficiency and Renewable Energy	http://www.eere.doe.gov
Office of Environmental Management	http://www.em.doe.gov
Office of Fossil Energy	http://www.fe.doe.gov
Office of Nuclear Energy	http://www.ne.doe.gov
National Nuclear Security Administration	http://www.nnsa.doe.gov/

Areas of Specific Interest and Disinterest

While applications are welcome serving the research mission of the DOE offices listed above, a number of DOE programs provided additional guidance regarding of areas of specific interest or disinterest for their program or for subprograms within their overall program. Please note that lack of additional guidance in a topical area DOES NOT NECESSARILY MEAN a lack of interest. Many program managers instead wish to provide their respective communities the opportunity to propose broadly.

Pre-applications and applications that propose research in areas of disinterest **will be deemed nonresponsive to the FOA and will be declined without review.**

For Advanced Scientific Computing Research

In Applied Mathematics—Research and development of applied mathematical models, methods, and algorithms for understanding complex natural and engineered systems related to DOE’s mission. Important areas of supported research include: (1) novel numerical methods for the scalable solution of large-scale, linear and nonlinear systems of equations, including those solution methods that take into consideration the possibilities brought about by future HPC architectures; (2) optimization techniques and next-generation solvers; and (3) numerical methods for modeling multiscale, multi-physics or multi-component continuous or discrete systems that span a wide range of time and length scales.

In Computer Science—Research that enables computing and networking at extreme scales and the understanding of extreme scale, or complex data from both simulations and experiments. It aims to make high performance scientific computers and networks highly productive and efficient to solve scientific challenges while attempting to reduce domain science application complexity as much as possible. The computer science program does this in the context of sharp increases in the heterogeneity and complexity of high performance computing systems; the need to seamlessly and intelligently integrate simulation, data analysis, and other tasks into coherent and usable workflows; and the challenges posed by highly novel computing platforms such as artificial intelligence, machine learning, neuromorphic and quantum systems.

For Basic Energy Sciences

Please refer to the current CONTINUATION OF SOLICITATION FOR THE OFFICE OF SCIENCE FINANCIAL ASSISTANCE PROGRAM subsection entitled, Basic Energy Sciences. (https://science.energy.gov/~media/grants/pdf/foas/2018/SC_FOA_0001820.pdf).

For Biological and Environmental Research

In Biological Systems Sciences—

for Genomic Science: Areas of interest are: (1) Determine the molecular mechanisms, regulatory elements, and integrated networks needed to understand genome-scale functional properties of microbes, plants, and communities (including the study of natural microbiomes and model microbiomes in targeted field environments relevant to BER's bioenergy and environmental research efforts); (2) develop “-omics” experimental capabilities and enabling technologies needed to achieve a dynamic, system-level understanding of organism and community functions; and, (3) develop the knowledge base, computational infrastructure, and modeling capabilities to advance predictive understanding, manipulation and design of biological systems.

For Biomolecular Characterization and Imaging Science: Areas of interest are: Develop advanced characterization, measurement and imaging technologies to visualize the spatial and temporal relationships of key metabolic processes governing phenotypic expression in plants and microbes, information crucial for developing an understanding of the impact of various environmental and/or 5iosystems designs on whole cell or community function.

The current focus of the program is on fundamental plant biology leading to the development of dedicated bioenergy crops, development of new platform microorganisms with traits relevant to the breakdown of lignocellulosic biomass and/or production or fuels and products from lignocellulosic biomass, and understanding the biologically mediated controls on nutrient (C, N, P) cycling in environmental systems.

Areas of specific disinterest are: starch-derived fuels and products; natural gas-, petroleum-, or coal-derived biofuels and bioproducts; bioethanol, biohydrogen, and biogas production; pharmaceuticals; nutraceuticals; cosmetics; food products; municipal solid waste; microbial fuel cells; wastewater treatment; biomimetic hydrogen production; microbial bioremediation; and applications focused exclusively on eukaryotic algal systems.

For Fusion Energy Sciences

In Burning Plasma Science: Foundations—

for Advanced Tokamak and Spherical Tokamak: Areas of specific interest include: experimental research addressing critical issues that may affect the tokamak concept (e.g. plasma disruptions, impulsive heat loads, confinement and transport, and operational maintenance and complexity), or research on topics common to all fusion power plant concepts (e.g. interactions between plasma and material surfaces). Innovative applications of transformational approaches and technologies such as machine learning, advanced manufacturing, and engineered materials are also encouraged.

for Theory and Simulation of Magnetically Confined Plasmas: Areas of specific interest include: macroscopic stability including transient effects such as edge localized modes, plasma disruptions, and runaway electron physics; collisional and turbulent transport of particles, momentum, and energy; interaction of radiofrequency waves with plasma and surrounding structures; the physics of energetic particles; and boundary or edge physics,

including the edge pedestal.

In Burning Plasma Science: Long Pulse—

for Long Pulse Tokamak: Areas of specific interest include: research conducted by U.S. collaborative teams on long pulse superconducting international tokamaks as well as short pulse international tokamaks with unique capabilities. These teams build on the experience gained from U.S. fusion facilities to conduct research on these international machines to enable the exploration of scientific regimes that cannot be sustained for long duration on domestic facilities.

for Long Pulse Stellarator: Areas of specific interest include: understanding and (if possible) reducing the level of turbulent transport in stellarators, and improving the understanding of 3-D shaping in an integrated manner in plasmas with higher levels of performance. Also of interest is stellarator research aimed at resolving magnetic-confinement fusion plasma science issues that will be faced in the next generation of machines, including ITER, and addressing new and unique scientific regimes that can be achieved with long-pulse superconducting international stellarators.

For Fusion Nuclear Science, Materials Research and Enabling R&D Programs for Fusion: Areas of specific interest include: research aimed at resolving key hurdles in order to establish the scientific proof of principle for fusion energy from a materials science and engineering perspective. More specifically, proposals are encouraged for the development of plasma-facing materials and components; development of advanced structural and functional materials; development of breeder blanket concepts; development of tritium fuel cycle technologies; and development of superconducting magnet technologies.

In Discovery Plasma Science: Plasma Science Frontiers—

for General Plasma Science: Areas of specific interest include: (1) dynamical processes in laboratory plasmas, magnetospheric, solar, and astrophysical plasmas, such as magnetic reconnection, particle energization, plasma dynamo, turbulence and transport, energetic particles, flows, collisional and collisionless shocks; (2) understanding the behavior of dusty plasmas, non-neutral, single-component matter and/or anti-matter plasmas, and ultra-cold neutral plasmas; and (3) understanding plasma processes and/or plasma chemistry in low temperature plasma, interfacial plasma, plasma-surface interaction, interaction of plasma with materials and/or biomaterials, microplasmas, and the synthesis of nanomaterials.

Areas of specific disinterest are: low-energy nuclear reactions and “cold fusion” research.

For High Energy Density Laboratory Plasmas (HEDLP): Areas of specific interest include: research focusing on the study of ionized matter at extremely high density and temperature, specifically when matter is heated and compressed to a point that the stored energy in the matter reaches approximately 100 billion Joules per cubic meter. More specifically, proposals are encouraged in the following areas: (1) high-energy-density hydrodynamics, (2) radiation-dominated dynamics and material properties, (3) magnetized HED plasmas, (4) nonlinear optics of plasmas and laser-plasma interactions,

(5) relativistic HED plasmas and intense beam physics, and (6) warm dense matter. Applications focusing on developing high energy density materials relevant to Quantum Information Science (QIS) are also encouraged.

Areas of specific disinterest are: low-energy nuclear reactions and “cold fusion” research.

For Measurement Innovation: Areas of specific interest include: research in diagnostic systems to achieve higher resolution or higher reliability, reduce complexity, and improve the ability to function in a burning plasma environment or provide access to previously unmeasured parameters. Proposals should seek to enable breakthroughs in scientific understanding, the linking of theory/computation with experiments, or active control of plasma properties to optimize device operation and plasma performance in a variety of device configurations.

For High Energy Physics

Areas of specific interest include research within the three experimental scientific frontiers: Energy, Intensity, and Cosmic Frontiers, as well as crosscutting efforts that enable new scientific opportunities by developing the necessary tools and methods for discovery. The program focuses on those opportunities identified by the [2014 Particle Physics Project Prioritization Panel \(P5\) long-range strategic plan](#). These include experimental, theoretical and computational research into the physics explored with high energy and/or high intensity particle beams, studies of the nature of dark matter and dark energy, and research and development efforts in particle accelerator science and technology and in particle detector technology. Computing technology (including high performance and exascale approaches) and quantum information science (including simulation, sensors, and algorithms) that relate to and impact high-energy physics are also of interest.

Areas of specific disinterest are those that are not in alignment with the P5 report and HEP program priorities. These include heavy ion physics, neutrinoless double beta decay, the LHCb experiment, classical gravitational physics, classical astrophysics, and future gamma and cosmic ray experiments.

For Energy Efficiency and Renewable Energy In Advanced Manufacturing Technologies

For Hybrid/Integrated Chemical Reaction-Separation – background: Most chemical processes begin with a reaction and are followed by a separation of the product mixture into desired product, unreacted feedstock, and unwanted by-products. The unreacted feedstock and unwanted by-products are recycled back to the reactor. Since most industrial reactions have typically low conversions and selectivity's, the separation train is usually both energy and capital intensive. Similarly, the recycle loop is usually large, resulting in large electrical energy required to pump the liquids or compress the gases in order to move the fluids around.

Area of interest include: integrated reactor and separation technologies that improve both reactions and separations together, especially using non-thermal processes like reactive distillation, membrane reactors and ionic reaction media to result in simplified processes. Reactions and separations in the chemical industry are coupled and therefore problems associated with either one of them must be solved simultaneously. This would be the most effective way to deal with the coupled nature of process reaction and separation and provides the opportunity to break non-idealities like reaction equilibriums, isomers separation, and azeotropes.

For Ionic Liquids for Improved Chemical Reactions and Separations – background: Molecular design and synthesis of new ionic liquids (ILs) with different functionalities has expanded the scope of applications for ionic liquids. ILs are unique organic salts composed entirely of ions, typically large poor coordinating organic cations and small inorganic anions, resulting in highly polar molecules. The use of ILs has grown beyond their advantage over conventional organics solvents in the development of green technologies to other areas like reaction media and catalysis, separations (especially azeotropes), battery electrolytes, lubricants, and so on. Areas of interest include: better understanding of molecular interactions between ionic liquids and other fluids in order to develop better separation methods to get pure and more stable ILs.

For Materials for Sensors in Harsh Environments – background: Sensor materials responding to changes in stress, temperature, composition, electromagnetic and gravitational fields are well characterized for many applications, but there are few sensor materials capable of withstanding harsh environments of high temperature, high stress, and corrosive environments. This is especially true for microelectronic and micromechanical sensors, which are typically silicon based. Areas of Interest: Exploratory investigations in materials capable of converting or generating a measurable signal related to their environments are warranted, and especially so for environments regarded as too extreme for available sensor use. It would be useful for such sensors to be integrated into a wireless configuration. Example end uses include gas turbines, high temperature furnaces, and corrosive environments such as supercritical CO₂.

ADDITIONAL (GENERAL) AREAS FOR CONSIDERATION

Some experimentation into electro processes and what is happening, for example, covetics, enhanced forming, plasma and microwave interaction within carbon fiber production, laser and e-beam and x-Ray and neutron interactions with materials such as used in additive manufacturing, etc.

In Fuel Cell Technologies—

An area of specific interest is the development of new physics-based multi-scale theoretical and computational models to accelerate the discovery and development of engineered materials and interfaces for key hydrogen and fuel cell applications. Specific subtopics of interest within the program are listed below.

For PGM-Free Catalysts for Fuel Cells—background: The development of high-

performance, durable PGM-free catalysts for polymer electrolyte membrane (PEM) and alkaline electrolyte membrane (AEM) fuel cells critically depends on modeling methodologies that provide a fundamental understanding of the reaction mechanism, such as helping elucidate the active site of these catalysts, improve the understanding of catalyst degradation, and are predictive in nature. Multi-scale modeling approaches to understand the catalyst in the context of the reaction environment, approaches to determine materials that can replace iron (Fe) as the main constituent in current state of the art PGM-free oxygen reduction reaction (ORR) catalysts, and approaches to quantify and describe catalyst durability, among others, are needed.

An area of specific interest is the development of high-throughput, predictive models to the accelerate discovery and development of PGM-free catalysts for fuel cells. Models relating to PEM ORR catalysts, as well as to PGM-free AEM ORR and hydrogen oxidation reaction (HOR) catalysts are of interest.

For Hydrogen Storage Materials—background: Multi-scale models to predict reactive solid interfaces are critical to the advancement of breakthrough materials systems for hydrogen storage. Nearly all advanced nucleation and growth models rely on an accurate description of the thermodynamics and kinetics of solid-solid interfaces. In complex light metal hydrides, these interfaces are particularly complicated, since they are multicomponent, incoherent, and involve molecular reactions.

An area of specific interest is the development a reliable theoretical formalism for integrating the necessary first principles-derived ingredients (chemical reaction, defect formation/migration, and solid-state diffusion kinetics) to give a good model for the structure/chemistry, energetics, and dynamics of reactive interfaces relevant to viable hydrogen storage materials.

For Hydrogen Compatible Materials for Infrastructure—background: A physics-based understanding of materials compatibility in hydrogen environments is critical for reliable performance of technologies in a broad range of sectors (e.g. structures in offshore environments, hydrogen tube trailers and storage vessels, welding of pipelines, etc.). Current macroscopic models of hydrogen induced damage rely heavily on empirical data and trends rather than a foundational, constitutive understanding of nano-and micro-structural scale phenomena.

An area of specific interest is the derivation of predictive relationship of materials compatibility with hydrogen, based on an integrative approach leveraging advanced multi-scale/multi-physics computational theory in conjunction with state-of-the-art characterization techniques (such as in-situ neutron diffraction imaging). Areas of interest include: characterization and prediction of the behavior of short cracks that behave in a nonlinear fashion, use of oligocrystals to study interactions between hydrogen and grain boundaries, exploration of innovative techniques to characterize materials compatibility without the use of high-pressure hydrogen chambers (e.g. using inerting gases), and modeling of the behavior of polymers in hydrogen at an atomistic scale.

For Hydrogen Production Materials—background: Multi-scale/multi-physics approaches to model reactive solid-solid and solid-liquid interfaces are critical to the advancement of breakthrough materials systems for hydrogen production by water splitting. Effective models must address the thermodynamic and kinetic phenomena of multiple materials and interfaces, as well as electronic, ionic and mass transport effects over multiple time and length scales. In direct solar water splitting pathways, fundamental light-matter interactions also need to be accounted for.

Areas of specific disinterest across fuel cell technologies include models of hydrogen production materials systems (which is being addressed in the HydroGEN Consortium) and composite materials relevant to compressed hydrogen storage tanks.

Another area of specific interest is in discovery and development of scalable, and efficient approaches for liquefaction. Conventional liquefaction cycles (e.g. for natural gas, hydrogen, etc.) rely on mechanical cycles (e.g. compression, throttling) that are inherently inefficient. For example, liquefaction of hydrogen utilizes heat transfer fluid along with mechanical equipment to achieve a temperature of 20K, and consumes 10-15 kWh/kg. Alternative approaches with potential to achieve step-change improvements in liquefaction efficiency are of interest. Examples include: 1) the development and evaluation of acoustic liquefaction concepts; 2) the discovery, development, and evaluation of caloric materials (e.g. elastocaloric, electrocaloric, and magnetocaloric materials) for use in liquefaction; 3) the development of highly efficient, low-cost cryocoolers for use in hydrogen liquefaction; and 4) the discovery and development of catalysts for isomeric conversions of hydrogen (e.g. from para to ortho form).

In Solid State Lighting

Practical LED advancements have outpaced the fundamental semiconductor physics, materials science, semiconductor device understanding of the LED devices themselves. In order to accelerate understanding of the underlying LED science that can lead to future LED performance advancements, we propose the following R&D topics: 1) modeling of LED materials-device-synthesis relationships and expected performance, and 2) characterization of alternative LED materials. These topics are related and can have overlap depending on the capabilities of research institution.

Developing a predictive model for LED performance based on materials properties, device structures, and synthesis possibilities could guide R&D advancements in all three aspects of LED design – materials, device, and synthesis. Currently, there is only limited capability to predict LED performance for the most mature LED materials and predictive models for less mature LED materials routinely fall short, for example, predictions of ZnO LED, non-polar and semipolar GaN LED, dilute nitrides LED, etc. Historically, LED advancements have come from experimental progress; but given the vast array of materials combinations, there may be materials-device-synthesis combinations that are favorable for developing new LED technologies. This proposed topic could be categorized as an underpinning for ‘materials by design’, if a reliable, materials agnostic, predictive model could be developed.

The second, related, topic would be to develop and apply a standard characterization approach for LEDs of all materials systems, so their performance and limitations can be readily compared. LED characterization information could feed into the LED modeling topic. LED characterizations could be based on experimental results that are performed first-hand by the research institution or based on literature based results. However, it would be important to understand the shortcoming of the various LEDs which are not always apparent in the published literature results. A broad effort to characterize the performance of wide array of LED materials could result in a ‘library’ of LED information that includes materials, devices, and synthesis techniques.

With the development of both of these R&D topics a feedback loop could be created that provides a process for prediction-synthesis-characterization of LEDs. Both of the described R&D topics require a large level of effort across a wide range of institutions but could also be a stepping stone for developing institutional expertise within the topic of LED materials and device science. Both of these topics would also support the objectives of the DOE SSL R&D Program. In order to reach the ultimate DOE SSL Program targets for LED lighting efficacy, breakthroughs will be necessary to achieve the required LED efficiency at green, amber, and red emission wavelengths. R&D results that can be used to further guide R&D approaches to achieve these breakthroughs will be highly valuable for enabling more effective use of R&D funds. The proposed R&D topics would also likely have crossover benefits for other optoelectronic device development, including lasers, photovoltaics, displays, and more.

In Solar Energy Technologies—

The [Solar Energy Technologies Office \(SETO\)](#) supports the development of solar technologies that decrease the cost of solar generated electricity to utilities and consumers. Areas of interest for the development of solar technologies have been outlined in previously released [FOAs](#), however a brief list is included here to guide applicants:

For photovoltaic systems: Areas of interest include: stable, high performance photovoltaic absorber materials and cell architectures to enable module efficiencies above 25%; fundamental understanding of the degradation mechanisms for PV materials; durable, transparent polymer substrate and packaging materials; new materials and processes for metallization; development of new characterization techniques to enable understanding of high performance PV materials and devices; novel charge separation and solar energy harvesting materials and mechanisms for converting solar energy to electricity and/or fuels.

for concentrating solar power technologies: Areas of interest include: thermal energy storage materials and technologies for operation > 700 °C, including thermochemical endothermic/exothermic cycles, phase change materials, and the encapsulation of phase change materials; methods for low-loss broad-solar-spectrum optical concentration that do not require tracking; novel materials or concepts to enable low-cost transport of pressurized fluids at > 700 °C, including robust high-temperature thin film insulators; development of passive corrosion control mechanisms for molten chloride salts operating between 450 and 800 °C; novel materials or concepts to enable passive thermal transport or control in CSP systems.

for systems integration: Areas of interest include: interaction of solar PV power electronics and legacy control devices in electric power systems, inverter-dominated network control, scalable dynamic system modeling for power system operation, enhanced protection for solar PV and power systems, and grid services provided by distributed energy resources.

for soft costs: Areas of interest include: impacts of public policy on technological development speed and verified breakthroughs; behavioral dynamics and decision science with regards to adoption (personal or organizational) of new technologies; identification and analysis of non-economic drivers of technological adoption; analysis of novel business models and their influence on technological adoption; analysis of the adoption of new technologies and its drivers for low-income individuals or communities; methods to increase solar energy access for low-income individuals; analysis for the potential use of block chain for solar energy management and transactions.

Areas of specific disinterest across solar energy technologies include: DC-based distribution and transmission materials and designs; frameworks and testing services for interoperability; frameworks and testing services for cybersecurity; energy storage materials and system designs; business model and benefit/cost analysis of solar deployment options; and grid pricing models and transactive grid frameworks; analysis of behavioral dynamics or economics for topics unrelated to technological development or adoption; cryptocurrencies or coin offering related research.

For Fossil Energy

Multi-functional Catalyst Research and Development –

N.B. [Background information in support of this topic](#) is available at the linked file.

As outlined in the background section for this topic, the reduction of flaring through the direct conversion of methane is a multifaceted problem. High-productivity catalysts are needed that can mimic the conversion processes that are found in methanotrophic and other organisms, while possessing robust properties consistent with the challenging operating conditions and constraints found at remote production sites. Additionally separation materials (i.e., membranes, sorbents or solvents) are needed that can be integrated into a multi-functional reactor, which can simultaneously:

- Pretreat the associated gas feed to remove impurities, such as H₂S, and condensable hydrocarbons, such as propane, butanes and C₅+ compounds (as necessary)
- Directly convert methane alone, or in combination with ethane and/or CO₂, into easily transported, value-added intermediates or finished products (to be identified and proposed by the applicant)
- Fractionation of the reaction raw products to recover the desired product(s) and recycle unconverted reactants

Proposals to this topic area should be directed toward:

1. Identifying pathways for synthesizing and separating products identified by the applicant based on specified feeds

2. Molecular design of high-productivity catalysts and materials that can mimic and improve upon conversion processes found in methanotrophic and other natural organisms
3. *In silico* screening of proposed catalyst and separation material(s) formulations for the pathways identified in (1), reflecting both stand-alone and integrated catalysis and separation systems
4. Bench-scale screening of most promising catalysts and materials identified in (2)

Others areas of particular interest for this topic area include:

- Co-conversion of ethane, CO₂ or both;
- Chemistries that employ CO₂ as a source of carbon, oxygen or both in the final product
- Chemistries that make use of excess hydrogen in methane to provide the energy requirements of the conversion reaction
- Production of economically-transportable products
- Initially target high-value, small volume product markets but can pivot toward commodity markets as the technology develops and matures
- Technology platforms capable of producing a variety of products using the same or similar catalysts
- Catalysts integrated with other materials and used for simultaneous conversion, feed gas purification, fractionation of products, and removal of unconverted reactants

Areas considered outside the scope for this topic area include:

- Biological conversions based on gas fermentation
- Indirect conversion processes that involve gaseous intermediates, such as synthesis gas (CO+H₂)
- Non-conversion uses for waste methane, such as oil reservoir pressure management
- Research focused on developing actual industrial reactor and separation equipment, and process design and integration
- Other critical aspects of mitigating flaring that are **not of interest** for the EPSCoR FOA are:
 - 1) *Multi-functional, Compact Equipment Development and Design* – process intensification will need to be used to minimize processing steps and combine process unit operations into a minimum number of compact modules that can be easily transported and relocated in remote areas and
 - 2) *Energy-efficient Process Development and Integration* – modular components of a conversion technology will need to be highly integrated, since process utilities must be minimized at remote sites. The system will also need to be operable under a wide range of varying operating conditions. Advanced process control systems incorporating real-time simulation will also need to be developed and tested to ensure the complete system can perform under real-world operating conditions.

However, applicants need to carefully consider these latter aspects in formulating their R&D approach to ensure that catalysts and materials developed through their research are holistically applicable to solving the flaring problem. Applicants are also

advised that successful catalysts and materials developed under this EPSCoR funded project may be of interest to DOE's Office of Fossil Energy in the future, should the Office pursue the development and demonstration of technologies addressing aspects one and two above.

Selenium Reclamation from Amine Solvents

N.B. [Background information in support of this topic](#) is available at the linked file.

Solvent reclamation can be an important component of advancing the future deployment of carbon capture technologies. This topic requests R&D to develop solvent reclamation techniques that can be used to reclaim selenium (with or without other metals) from amine solvents. It is anticipated that the Technology Readiness Level (TRL) of the proposed work will be TRL 3. Anticipated work scope includes laboratory-based R&D where selenium remediation/removal technologies are developed and tested on amine solvents contaminated with selenium and/or other metals. In addition to a final report, a techno-economic analysis (TEA) will be required that presents the cost for the solvent mitigation(s) proposed. The TEA can follow guidance provided by DOE's National Energy Technology Laboratory.

References

<http://www.namc.org/docs/00062756.PDF>
http://www.degremont-technologies.com/cms_medias/pdf/tech_infilco_Selenium-Removal.pdf
<http://www.vsep.com/pdf/FGD-Membrane-Treatment-Selenium-Case-Study.pdf>
<https://www.waterworld.com/articles/iww/print/volume-6/issue-6/columns/trends-technology/an-overview-of-coal-fired-power-plant-fgd-wastewater-treatment-coal-combustion-and-emissions-control.html>
<https://www.netl.doe.gov/File%20Library/events/2013/co2%20capture/J-Wheeldon-NCCC-Post-Combustion.pdf>
https://ieaghg.org/docs/General_Docs/PCCC2/Secured%20pdfs/6_3_bergen%20reclaiming%20final%20condensed.pdf
<http://trimeric.com/assets/2016-eval-of-amine-reclaimer-cost-and-waste---from-proceedings.pdf>

For Nuclear Energy

Advanced Reactor Materials

High-temperature, radiation damage and corrosion-resistant materials for use in molten salt systems. Materials that employ microstructure features to minimize neutron induced loss of creep ductility in nickel-based alloys are especially desirable. Materials that maintain desirable performance attributes at temperatures above 750 °C and can be readily formed and joined are especially desirable.

Functional materials for valves, filters, control elements and drive mechanisms, gaskets, impulse lines, bellows, and optical windows for molten salts.

Molten Salt Chemistry

An area of specific interest is molten salt chemistry, including (i) low-uncertainty molten salt thermochemical and thermophysical properties for advanced nuclear systems, (ii) practical techniques for implementing chemical control at MSR, (iii) phase equilibria and diagram data for molten salt bearing actinides and fission products, and (iv) fuel-salt iodine removal techniques to minimize potential accident source term.

Instrumentation and techniques to rapidly and inexpensively assess the trace impurity levels of newly received salts.

Low-cost, large-scale chlorine isotope separation techniques.

High thermal neutron cross section lanthanide element separation techniques from fuel salt without prior actinide removal.

Techniques to process used fuel salts into stable waste forms.

Nuclear Data

Areas of interest include improving nuclear data for actinides and chlorine, including neutron cross section refinement and covariance data for advanced nuclear fuels and reactors.

Advanced Manufacturing

Techniques to apply high-quality, corrosion resistant layers/coatings (carbides, nitrides, phosphides, refractory or noble metals, etc.) to high-temperature structural alloys for molten salt reactors. Techniques suitable for long heat exchanger tubes and complex geometries are especially desirable. Suitability for deployment in a high neutron flux environment is also desired.

Tooling and techniques to support rapid replacement of used components to minimize outage intervals.

Instrumentation

Low uncertainty heat balance instruments and measurement techniques (mass flow and temperature difference) for utility scale molten salt coolant lines.

Rapid quantification instrumentation and techniques for residual fissile materials on used components and filters being removed from the reactor containment.

Plant instrumentation to assess the composition (corrosion products, actinide isotopes, tritium, oxygen) of small, periodically withdrawn, highly radioactive fuel salt samples.

Techniques and tooling to support remote replacement or recalibration of sensors within a high-radiation containment.

Areas of specific disinterest across nuclear energy technologies include: Fissile material separation technologies.

Funding Limitations

DOE EPSCoR funding will neither be awarded to DOE National Laboratories or other Federally Funded Research and Development Centers FFRDCs nor to non-EPSCoR jurisdictions either as the awardee or as a subawardee. Awardees may use EPSCoR funding to provide travel reimbursement for FFRDC and non-EPSCoR state collaborators for on-site experiments and collaborations. Applications requesting consultant costs will need to explain: how the overall consultant costs are in line with the EPSCoR mission and how the skills, expertise or capabilities provided by the consultant will be transferred in a sustainable manner to the applicant institution. No funds provided in any award, subaward or other relationship resulting from this Funding Opportunity Announcement may be used for purposes of construction, alteration, renovation, or the purchase of real property. Applications containing such requested costs will be rejected without further review or consideration.

After an initial project period of up to two years, renewal applications will be considered for up to two additional project periods of up to two years each. Renewal applications will be subject to peer review. Consideration in the decision process for renewals will include but are not limited to: continuing meritorious performance and progress in the previous award period, continuing commitment to the effort on behalf of the awardee institution(s) and the jurisdiction, continuing program office need at DOE, DOE program office commitment to the effort, and the availability of funds. Requests for continuation funding and renewal funding will also be evaluated for adherence to the Office of Science [Public Access Plan](#) for publications and inclusion of [appropriate acknowledgements](#) in peer reviewed and technical publications.

Collaboration – Subawards

If multiple EPSCoR institutions wish to collaborate on an application then they must choose one institution as the lead. The lead institution will submit the application with the other EPSCoR participants receiving support as subawardees. EPSCoR participants receiving funding as subawardees must be also located in acceptable EPSCoR jurisdictions listed in [Section III A](#). Formal collaborative pre-applications or applications, in which each proposing institution partnering on the research submits an application separately to DOE, will be deemed non-responsive to the FOA. Again, no funding on under these awards may be sub awarded to FFRDCs.

Principal Investigator and Project Director Roles:

For this EPSCoR FOA, each application will have a single principal investigator (PI) with other scientific/technical participants having a role of “Co-Investigator” (Co-I). It is recommended that the PI be the lead technical director for the application and have affiliation with the lead institution or organization. If it is advantageous to the management of the research, s/he should work under a specified Project Director (PD) who may help coordinate research efforts

particularly if it involves multiple organizations or institutions. The PD and PI must provide signed statements that reflects their commitment to the project, including the level of time commitment. These letters of commitment are limited to one page each.

Principal Investigators Meetings, Program Meetings, Reviews

While the EPSCoR program does not have annual meetings, PIs should budget for and plan on attending DOE program meetings relevant to the proposed research. Such meetings may occur on an annual or biennial basis. DOE EPSCoR may conduct on-site or reverse-site visit reviews. It is advisable to build in flexibility to accommodate for these possibilities as well.

Open Science

SC is dedicated to promoting the values of openness in Federally-supported scientific research, including, but not limited to, ensuring that research may be reproduced and that the results of Federally-supported research are made available to other researchers. These objectives may be met through any number of mechanisms including, but not limited to, data access plans, data sharing agreements, the use of archives and repositories, and the use of various licensing schemes.

The use of the phrase “open-source” does not refer to any particular licensing arrangement, but is to be understood as encompassing any arrangement that furthers the objective of openness.

All entities submitting applications to this FOA must recognize the moral and legal obligations to comply with export controls and policies that limit the transfer of technologies with potential dual use. Applicants are reminded that international collaboration must comply with nonproliferation, sanction, and other protocols described at <https://www.export.gov> and <https://www.state.gov/strategictrade/overview/>

International activities related to special nuclear materials (SNM) are subject to additional requirements. Please see 10 CFR 810 for further information.

This FOA is to support scientific endeavors that could be described in scholarly publications. Do not submit applications containing restricted data or unclassified nuclear information as defined in the Atomic Energy Act of 1954, as amended, 42 USC 2011 et seq., 10 CFR 1017, 10 CFR 1045.

Section II – AWARD INFORMATION

A. TYPE OF AWARD INSTRUMENT

DOE anticipates awarding grants under this FOA.

B. ESTIMATED FUNDING

Research grant awards, fully funded in FY 2019, are expected to be made for a period of up to two years at a funding level appropriate for the proposed scope. Release of continuation funding (funding for the second budget period) will be contingent on: (1) continued availability of funds appropriated by Congress; (2) progress towards meeting the objectives of the approved application; (3) submission of required reports; and (4) compliance with the terms and conditions of the award.

Total funding up to \$20,000,000 is expected to be available to support this FOA, subject to appropriation of funds by the Congress, with the potential for up to 10 awards. DOE is under no obligation to pay for any costs associated with the preparation or submission of an application. DOE reserves the right to fund, in whole or in part, any, all, or none of the applications submitted in response to this FOA.

C. MAXIMUM AND MINIMUM AWARD SIZE

The award size will depend on the number of meritorious applications and the availability of appropriated funds.

Ceiling

\$1,500,000 per year

Floor

\$1,000,000 per year

D. EXPECTED NUMBER OF AWARDS

DOE expects up to 10 awards under this FOA. The exact number of awards will depend on the number of meritorious applications and the availability of appropriated funds.

E. ANTICIPATED AWARD SIZE

Applicants are encouraged to propose research expenditures that correspond to the funding needed for their proposed research program. DOE expects the typical award size will be 2,000,000 to 3,000,000 for two years.

F. PERIOD OF PERFORMANCE

DOE anticipates making awards with a project period of two years.

G. TYPE OF APPLICATION

DOE will accept new applications under this FOA.

H. SUBSEQUENT RENEWAL APPLICATIONS

Successful awardees may apply for up to two renewals periods of up to two years each for a total support period of six years. It is anticipated that successful renewal awards will be up to \$2,500,000 per year.

I. RESPONSIBILITY

The successful prime applicant/awardee (lead organization) 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 applicant and any team member, and/or subawardee.

Section III – ELIGIBILITY INFORMATION

A. ELIGIBLE APPLICANTS

All types of applicants meeting the jurisdictional limitations described below are eligible to apply except: DOE National Laboratories, other Federally Funded Research and Development Center (FFRDC) Contractors, and nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995.

Since DOE EPSCoR follows [NSF EPSCoR RII Program eligibility determinations](#), applicants within the following jurisdictions will be eligible for this FOA: Alabama, Alaska, Arkansas, Delaware, Guam, Hawaii, Idaho, Kansas, Kentucky, Louisiana, Maine, Mississippi, Montana, Nebraska, Nevada, New Hampshire, North Dakota, Oklahoma, Puerto Rico, Rhode Island, South Carolina, South Dakota, Vermont, Virgin Islands, West Virginia, and Wyoming.

All research supported by an EPSCoR award must be performed in an EPSCoR jurisdiction or at a DOE national laboratory. Funding support for the prime applicant and any potential subawardees or consortia members is limited to those with addresses within one or more EPSCoR jurisdictions. Funding of foreign entities is not permitted for this FOA.

Domestic industrial applicants must include a letter from a responsible member of institutional management committing that the location of the research as well as the staff participating for this application will be within one of the eligible jurisdictions.

To be considered eligible for an award under this FOA, potential lead organizations are *required* to submit a pre-application in accordance with the instructions provided in [Section IV.B.2](#), and to receive notification from DOE that they are allowed to submit a full proposal. Applications received from an applicant who has not submitted the required pre-application, or who has received notification from DOE that they are disallowed from submitting a full application, will be deemed non-responsive and will be rejected without further review.

Also as noted in Section I E in the [subsection on collaboration – subawards](#), if multiple institutions are involved, there will be one organization leading. Other participating organization(s) may be included as lower-tier participant(s) or sub-awardee(s) who will be responsible for a smaller portion of the overall project. If an application is approved for funding, DOE will provide the total DOE project funds to the lead organization that will then provide funding to the other participant(s) via a subcontract/subaward arrangement. The application must clearly describe the role to be played by each organization, specify the managerial arrangements and explain the advantages of the multi-organizational effort.

For applications containing subcontracts/subawards, upon request, the applicant must provide the DOE contracting officer (CO) with a collaboration agreement, commonly referred to as the articles of collaboration, which sets out the rights and responsibilities of each participant of the research consortium. This agreement binds the individual consortium members together and must discuss, among other things, the consortiums:

- 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.

Applications from for-profit organizations that propose research related to current commercial activity may be declined without merit review.

Domestic industrial or non-profit applicants or subcontractees/subawardees must include a letter from the responsible member of management committing that the location of the research as well as the staff participating for this application will be within one of the eligible jurisdictions. A foreign entity may not serve at the lead in an application but may receive funding as a subawardee or subcontractor (team member) after committing that the location of the research and the staff participating will be within an eligible State or territory of the United States.

Applicants with mailing addresses, corporate offices, or headquarters in non-EPSCoR jurisdictions must ensure that their applications describe how all work will be performed in either EPSCoR jurisdictions or DOE National Laboratories.

B. COST SHARING

Cost sharing is not required. Letters of jurisdictional, institutional or private sector commitment towards the research effort are required. Please refer to [Section IV C., Appendix 7](#).

C. ELIGIBLE INDIVIDUALS

Individuals with the skills, knowledge, and the resources necessary to carry out the proposed research as a Principal Investigator (PI) are invited to work with their organizations to develop an application for assistance. Individuals from underrepresented groups as well as individuals with disabilities are always encouraged to apply for assistance.

Section IV – APPLICATION AND SUBMISSION INFORMATION

A. ADDRESS TO REQUEST APPLICATION PACKAGE

Application forms and instructions are available at Grants.gov. To access these materials, go to <https://www.grants.gov>, select “Apply for Grants”, and then select “Download Application Package.” Enter the CFDA number (81.049) and/or the funding opportunity number (DE-FOA-0002023) shown on the cover of this FOA and then follow the prompts to download the application package.

Applications submitted through www.FedConnect.net will not be accepted.

B. LETTER OF INTENT AND PRE-APPLICATION

1. Letter of Intent

Not applicable.

2. Pre-application

PRE-APPLICATION DUE DATE

[See Section IV, Part F.](#)

ENCOURAGE/DISCOURAGE DATE

[See Section IV, Part F.](#)

A pre-application is required and must be submitted by the due date specified.

Pre-applications will be reviewed as outlined below. DOE will send a response by email to each applicant encouraging or discouraging the submission of an application by the specified date. Applicants who have not received a response regarding the status of their pre-application by this date are responsible for contacting the program to confirm this status. Only those applicants that receive notification from DOE encouraging an application may submit applications. No other applications will be considered.

The pre-application attachment must include, at the top of the first page, the following information:

- 1) A cover sheet containing:
 - a. the planned title of the research application
 - b. the name, e-mail address, and telephone number of the Project Director (PD);
 - c. the name, e-mail address, and telephone number of the principal investigator (PI);
 - d. the name, e-mail address, and telephone number of the administrative point of contact;

- e. the name and mailing address of the sponsoring institution;
 - f. the Funding Opportunity Announcement Number: DE-FOA-0002023
 - g. DOE Office Sponsoring this FOA: DOE EPSCoR;
 - h. DOE EPSCoR Point of Contact: Tim Fitzsimmons;
 - i. DOE Program Office(s) of interest (this is in addition to the EPSCoR program); and,
 - j. DOE Program Office Scientific/Technical Contact(s) (this is in addition to the DOE EPSCoR program manager and may not be a DOE National Laboratory staff member other than Fossil Energy Program Managers from the National Energy Technology Laboratory); and,
 - k. the topical research area(s) (discussed in Section I of this FOA)
- 2) A narrative of up to four pages (excluding the cover page). The narrative must present the scientific and technical objectives and the research plan. The narrative must reference the jurisdiction’s strategy to develop and utilize the scientific and technical resources (this is the jurisdiction’s science and technology plan referred to in NSF EPSCoR literature) and place the research in context of that jurisdiction’s strategy. The pre-application may not exceed four pages, with a minimum text font size of 11 point and margins no smaller than one inch on all sides. Figures and references, if included, must fit within the four-page limit. Pre-applications that exceed the four-page limit for the technical narrative may be discouraged without additional review.
- 3) The pre-application must also include a list of the names and institutional affiliations of all participating investigators, including collaborators and consultants on the proposed project. This information is not included in the four-page limit. For each funded investigator, provide a list of collaborative co-investigators including co-authors of the past 48 months, co-editors of the past 24 months, graduate and postdoctoral advisors/advisees, and close associations. This list of participants and collaborators will not count toward the page limit for the pre-application. This information must be submitted in the tables, whose format is shown below. If these tables are not included, the pre-application will be discouraged without additional review.

Table 1: PI and Co-Is on the application and institutional affiliations

PI and Co-Is			Institution
Last Name	First Name	Title	Institution Name

Table 2: Collaborators for PI and Co-Is* **

Collaborator			Institution
Last Name	First Name	Title	Institution Name

* For the PI and Co-Is, Table 2 must include co-authors over the past 48 months, graduate and postdoctoral advisors, graduate students and postdoctoral associates that have been supervised during the past 60 months, and any other current close associations. Table 2 must exclude all personnel at any of the institutions listed in Table 1.

** Applicants are strongly encouraged to follow the exact format of the sample table since the tabular information will be compiled across all applications. This includes the following elements:

- Include grid lines around each cell.
- Do not merge name or institution cells, even if individuals share the same institution.
- Do not change the order of the columns.
- Do not include any additional information (e.g. “PI”, “Co-PI”, or footnote symbols) under “Last Name” and “First Name”.
- Do not include departmental affiliations under Institutions.
- If an individual has a joint appointment, separate the institutions with a “/” (i.e. “Univ of X / National Lab Y”).

PRE-APPLICATION REVIEW

All pre-applications will be reviewed to determine their responsiveness to the objectives of the FOA.

Pre-applications that fail to comply with administrative requirements will be discouraged without further review. Pay particular attention to:

- Observing the four-page limit for the narrative
- Including the required tables of collaborators

In addition, federal Program Managers will evaluate the pre-applications to determine their competitiveness, based on the following criteria:

1. Responsiveness to the objectives of the FOA.
2. Scientific and technical merit.
3. Appropriateness of the proposed research approaches.
4. Likelihood of scientific impact.
5. Fit within the jurisdiction’s strategy to develop and utilize the scientific and technical resources
6. Ensuring a diverse pool of applicants.

Pre-application comparative reviews will compare pre-applications within a topical field with priority given to scientifically innovative and forward-looking early stage research with the highest likelihood of success as a full application. These reviews will be conducted by no less than three federal program managers chosen for their topical knowledge and diversity of perspective. The results of the review will be documented.

Applicants with the highest rated pre-applications will be encouraged to submit applications; others will not be permitted to submit applications. Upon request, feedback from the comparative review will be provided after the deadline for the receipt of applications.

DOE is committed to ensuring that a sufficient number of applicants will be encouraged to submit applications to foster a competitive merit review of full applications. The intent in discouraging submission of certain pre-applications is to benefit applicants who would not prepare and submit applications with a negligible likelihood of success.

The PI will be automatically notified when the pre-application is encouraged or discouraged. The DOE SC Portfolio Analysis and Management System (PAMS) will send an email to the PI from PAMS.Autoreply@science.doe.gov, and the status of the pre-application will be updated at the PAMS website <https://pamspublic.science.energy.gov/>. Notifications are sent as soon as the decisions to encourage or discourage are finalized.

PRE-APPLICATION SUBMISSION

It is important that the pre-application be a single file with extension .pdf, .docx, or .doc. The filename must not exceed 50 characters. The pre-application must be submitted electronically through the DOE SC Portfolio Analysis and Management System (PAMS) website <https://pamspublic.science.energy.gov/>. The PI and anyone submitting on behalf of the PI must register for an account in PAMS before it will be possible to submit a pre-application. All PIs and those submitting pre-applications on behalf of PIs are encouraged to establish PAMS accounts as soon as possible to avoid submission delays.

You may use the Internet Explorer, Firefox, Google Chrome, or Safari browsers to access PAMS.

Please see Part I, 4. DOE SC Portfolio Analysis and Management System (PAMS), below, for instructions about how to register in PAMS.

Submit Your Pre-Application:

- Create your pre-application (called a preproposal in PAMS) outside the system and save it as a file with extension .docx, .doc, or .pdf. Make a note of the location of the file on your computer so you can browse for it later from within PAMS.
- Log into PAMS and click the Proposals tab. Click the “View / Respond to Funding Opportunity Announcements” link and find the current announcement in the list. Click the “Actions/Views” link in the Options column next to this announcement to obtain a dropdown menu. Select “Submit Preproposal” from the dropdown.

- On the Submit Preproposal page, select the institution from which you are submitting this preproposal from the Institution dropdown. If you are associated with only one institution in the system, there will only be one institution in the dropdown.
- Note that you must select one and only one PI per preproposal; to do so, click the “Select PI” button on the far right side of the screen. Find the appropriate PI from the list of all registered users from your institution returned by PAMS. (Hint: You may have to sort, filter, or search through the list if it has multiple pages.) Click the “Actions” link in the Options column next to the appropriate PI to obtain a dropdown menu. From the dropdown, choose “Select PI.”
- If the PI for whom you are submitting does not appear on the list, it means he or she has not yet registered in PAMS. For your convenience, you may have PAMS send an email invitation to the PI to register in PAMS. To do so, click the “Invite PI” link at the top left of the “Select PI” screen. You can enter an optional personal message to the PI in the “Comments” box, and it will be included in the email sent by PAMS to the PI. You must wait until the PI registers before you can submit the preproposal. Save the preproposal for later work by clicking the “Save” button at the bottom of the screen. It will be stored in “My Preproposals” for later editing.
- Enter a title for your preproposal.
- Select the appropriate technical contact from the Program Manager dropdown.
- To upload the preproposal file into PAMS, click the “Attach File” button at the far right side of the screen. Click the “Browse” (or “Choose File” depending on your browser) button to search for your file. You may enter an optional description of the file you are attaching. Click the “Upload” button to upload the file.
- At the bottom of the screen, click the “Submit to DOE” button to save and submit the preproposal to DOE.
- Upon submission, the PI will receive an email from the PAMS system <PAMS.Autoreply@science.doe.gov> acknowledging receipt of the preproposal.

You are encouraged to register for an account in PAMS at least a week in advance of the preproposal submission deadline so that there will be no delays with your submission.

WARNING: The PAMS website at <https://pampspublic.science.energy.gov> will permit you to edit a previously submitted pre-application in the time between your submission and the deadline. If you choose to edit, doing so will remove your previously submitted version from consideration. If you are still editing at the time of the deadline, you will not have a valid submission. Please pay attention to the deadline.

For help with PAMS, click the “External User Guide” link on the PAMS website, <https://pampspublic.science.energy.gov/>. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9:00 AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, email: sc.pams-helpdesk@science.doe.gov. All submission and inquiries about this FOA should reference **DE-FOA-0002023**.

Preapplications submitted outside PAMS will not be considered. Preapplications may not be submitted through grants.gov or www.FedConnect.net.

C. GRANTS.GOV APPLICATION SUBMISSION AND RECEIPT PROCEDURES

This section provides the application submission and receipt instructions for applications to SC. Please read the following instructions carefully and completely.

1. Electronic Delivery

SC is participating in the Grants.gov initiative to provide the grant community with a single site to find and apply for grant funding opportunities. SC requires applicants to submit their applications online through Grants.gov.

2. How to Register to Apply through Grants.gov

a. Instructions: Read the instructions below about registering to apply for SC funds. Applicants should read the registration instructions carefully and prepare the information requested before beginning the registration process. Reviewing and assembling the required information before beginning the registration process will alleviate last-minute searches for required information.

Organizations must have a Data Universal Numbering System (DUNS) Number, active System for Award Management (SAM) registration, and Grants.gov account to apply for grants. If individual applicants are eligible to apply for this funding opportunity, then you should begin with step 3, Create a Grants.gov Account, listed below.

Creating a Grants.gov account can be completed online in minutes, but DUNS and SAM registrations may take several weeks. Therefore, an organization's registration should be done in sufficient time to ensure it does not impact the entity's ability to meet required application submission deadlines.

Complete organization instructions can be found on Grants.gov here:

<https://www.grants.gov/web/grants/applicants/organization-registration.html>

1) *Obtain a DUNS Number*: All entities applying for funding, including renewal funding, must have a DUNS Number from Dun & Bradstreet (D&B). Applicants must enter the DUNS Number in the data entry field labeled "Organizational DUNS" on the SF-424 form. For more detailed instructions for obtaining a DUNS Number, refer to:

<https://www.grants.gov/web/grants/applicants/organization-registration/step-1-obtain-duns-number.html>

2) *Register with SAM*: All organizations applying online through Grants.gov must register with SAM at <https://www.sam.gov>. Failure to register with SAM will prevent your organization from applying through Grants.gov. SAM registration must be renewed annually. For more detailed instructions for registering with SAM, refer to:

<https://www.grants.gov/web/grants/applicants/organization-registration/step-2-register-with-sam.html>

3) *Create a Grants.gov Account:* The next step is to register an account with Grants.gov. Follow the on-screen instructions or refer to the detailed instructions here:
<https://www.grants.gov/web/grants/applicants/registration.html>

4) *Add a Profile to a Grants.gov Account:* A profile in Grants.gov corresponds to a single applicant organization the user represents (i.e., an applicant) or an individual applicant. If you work for or consult with multiple organizations and have a profile for each, you may log in to one Grants.gov account to access all of your grant applications. To add an organizational profile to your Grants.gov account, enter the DUNS Number for the organization in the DUNS field while adding a profile. For more detailed instructions about creating a profile on Grants.gov, refer to: <https://www.grants.gov/web/grants/applicants/registration/add-profile.html>

5) *EBiz POC Authorized Profile Roles:* After you register with Grants.gov and create an Organization Applicant Profile, the organization applicant's request for Grants.gov roles and access is sent to the EBiz POC. The EBiz POC will then log in to Grants.gov and authorize the appropriate roles, which may include the AOR role, thereby giving you permission to complete and submit applications on behalf of the organization. You will be able to submit your application online any time after you have been assigned the AOR role. For more detailed instructions about creating a profile on Grants.gov, refer to:
<https://www.grants.gov/web/grants/applicants/registration/authorize-roles.html>

6) *Track Role Status:* To track your role request, refer to:
<https://www.grants.gov/web/grants/applicants/registration/track-role-status.html>

b. *Electronic Signature:* When applications are submitted through Grants.gov, the name of the organization applicant with the AOR role that submitted the application is inserted into the signature line of the application, serving as the electronic signature. The EBiz POC **must** authorize people who are able to make legally binding commitments on behalf of the organization as a user with the AOR role; **this step is often missed and it is crucial for valid and timely submissions.**

3. How to Submit an Application to SC via Grants.gov

Grants.gov applicants can apply online using Workspace. Workspace is a shared, online environment where members of a grant team may simultaneously access and edit different webforms within an application. For each FOA, you can create individual instances of a workspace.

Below is an overview of applying on Grants.gov. For access to complete instructions on how to apply for opportunities, refer to:

<https://www.grants.gov/web/grants/applicants/apply-for-grants.html>

1) *Create a Workspace:* Creating a workspace allows you to complete it online and route it through your organization for review before submitting.

2) *Complete a Workspace:* Add participants to the workspace, complete all the required forms,

and check for errors before submission.

a. Adobe Reader: If you decide not to apply by filling out webforms you can download individual PDF forms in Workspace so that they will appear similar to other Standard forms. The individual PDF forms can be downloaded and saved to your local device storage, network drive(s), or external drives, then accessed through Adobe Reader.

NOTE: Visit the Adobe Software Compatibility page on Grants.gov to download the appropriate version of the software at: <https://www.grants.gov/web/grants/applicants/adobe-software-compatibility.html>

b. Mandatory Fields in Forms: In the forms, you will note fields marked with an asterisk and a different background color. These fields are mandatory fields that must be completed to successfully submit your application.

c. Complete SF-424 Fields First: The forms are designed to fill in common required fields across other forms, such as the applicant name, address, and DUNS number. To trigger this feature, an applicant must complete the SF-424 information first. Once it is completed, the information will transfer to the other forms.

3) Submit a Workspace: An application may be submitted through workspace by clicking the Sign and Submit button on the Manage Workspace page, under the Forms tab. Grants.gov recommends submitting your application package at least 24-48 hours prior to the close date to provide you with time to correct any potential technical issues that may disrupt the application submission.

4) Track a Workspace: After successfully submitting a workspace package, a Grants.gov Tracking Number (GRANTXXXXXXXX) is automatically assigned to the package. The number will be listed on the Confirmation page that is generated after submission.

For additional training resources, including video tutorials, refer to:
<https://www.grants.gov/web/grants/applicants/applicant-training.html>

Applicant Support: Grants.gov provides applicants 24/7 support via the toll-free number 1-800-518-4726 and email at support@grants.gov. For questions related to the specific grant opportunity, contact the number listed in the application package of the grant you are applying for.

If you are experiencing difficulties with your submission, it is best to call the Grants.gov Support Center and get a ticket number. The Support Center ticket number will assist SC with tracking your issue and understanding background information on the issue.

4. Timely Receipt Requirements and Proof of Timely Submission

Proof of timely submission is automatically recorded by Grants.gov. An electronic date/time stamp is generated within the system when the application is successfully received by

Grants.gov. The applicant AOR will receive an acknowledgement of receipt and a tracking number (GRANTXXXXXXXX) from Grants.gov with the successful transmission of their application. Applicant AORs will also receive the official date/time stamp and Grants.gov Tracking number in an email serving as proof of their timely submission.

When SC successfully retrieves the application from Grants.gov, and acknowledges the download of submissions, Grants.gov will provide an electronic acknowledgment of receipt of the application to the email address of the applicant with the AOR role. Again, proof of timely submission shall be the official date and time that Grants.gov receives your application. Applications received by Grants.gov after the established due date for the program will be considered late and will not be considered for funding by SC.

Applicants using slow internet, such as dial-up connections, should be aware that transmission can take some time before Grants.gov receives your application. Again, Grants.gov will provide either an error or a successfully received transmission in the form of an email sent to the applicant with the AOR role. The Grants.gov Support Center reports that some applicants end the transmission because they think that nothing is occurring during the transmission process. Please be patient and give the system time to process the application.

D. CONTENT AND APPLICATION FORMS

APPLICATION PREPARATION

You must submit the application through Grants.gov at <https://www.grants.gov/>, using either the online webforms or downloaded forms. (Additional instructions are provided in [Section IV, Part C](#) of this FOA.)

You are required to use the compatible version of Adobe Reader software to complete a [Grants.gov](#) Adobe application package. To ensure you have the [Grants.gov](#) compatible version of Adobe Reader, visit the software compatibility page at <https://www.grants.gov/web/grants/applicants/adobe-software-compatibility.html>.

You must complete the mandatory forms and any applicable optional forms (e.g., Disclosure of Lobbying Activities (SF-LLL)) in accordance with the instructions on the forms and the additional instructions below.

Files that are attached to the forms must be PDF files unless otherwise specified in this FOA. Attached PDF files must be plain files consisting of text, numbers, and images without editable fields, signatures, passwords, redactions, or other advanced features available in some PDF-compatible software. Do not use PDF portfolios or binders.

Please note the following restrictions that apply to the names of all files attached to your application:

- Please limit file names to 50 or fewer characters
- Do not attach any documents with the same name. All attachments must have a unique name.

- Please use only the following characters when naming your attachments: A-Z, a-z, 0-9, underscore, hyphen, space, period, parenthesis, curly braces, square brackets, ampersand, tilde, exclamation point, comma, semi colon, apostrophe, at sign, number sign, dollar sign, percent sign, plus sign, and equal sign. Attachments that do not follow this rule may cause the entire application to be rejected or cause issues during processing.

LETTERS

Letters of support or commitment must be included for all collaborations and consultants described or listed in the application as contributing to the research effort. These letters must not exceed a single page in length.

RENEWAL APPLICATIONS

Renewal applications may not be submitted for this FOA.

New awardees from this FOA may be able to submit up to two renewal applications in future EPSCoR Implementation Grant FOAs under this topic.

RESUBMISSION OF APPLICATIONS

Applications submitted under this FOA may be withdrawn from consideration by using the PAMS website at <https://pamspublic.science.energy.gov>. Applications may be withdrawn at any time between when the applicant submits the application and when DOE makes the application available to merit reviewers. Such withdrawals take effect immediately and cannot be reversed. Please exercise due caution.

After an application is withdrawn, it may be resubmitted, if this FOA is still open for the submission of applications. Such resubmissions will only count as one submission if this FOA restricts the number of applications from an applicant.

Note that there may be a delay between the application's submission in Grants.gov and when it is available to be withdrawn in PAMS. SC will usually consider the last submission, according to its Grants.gov timestamp, to be the intended version. Please consult with your program manager to resolve any confusion about which version of an application should be considered.

IMPROPER CONTENTS OF APPLICATIONS

Applications submitted under this FOA will be stored in controlled-access systems, but they may be made publicly available if an award is made. As such, it is critical that applicants follow these guidelines:

- Do not include information subject to any legal restriction on its open distribution, whether classified, export control, or unclassified controlled nuclear information.
- Do not include sensitive and protected personally identifiable information, including social security numbers, birthdates, citizenship, marital status, or home addresses. Pay particular attention to the content of biographical sketches and curriculum vitae.

- Do not include letters of support from Federal officials.
- Do not include letters of support on Federal letterhead. Letters that are not letters of support (such as letters confirming access to sites, facilities, equipment, or data; or letters from cognizant contracting officers) may be on Federal letterhead.
- Clearly mark all proprietary or trade-secret information.

CHANGE OF AWARDEE INSTITUTION

If an awardee chooses to relinquish an award made under this FOA to permit the transfer of the award to a new institution, the new institution must submit an application under the then-available SC “annual” or “open” FOA.

1. SF-424 (R&R)

Complete this form first to populate data in other forms. Complete all the required fields in accordance with the pop-up instructions on the form. The list of certifications and assurances referenced in Field 17 is available on the DOE Financial Assistance Forms Page at <https://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms> under Certifications and Assurances.

DUNS AND EIN NUMBERS (FIELDS 5 AND 6)

The DUNS and Employer Identification Number (EIN) fields on the SF-424 (R&R) form are used in PAMS to confirm the identity of the individual or organization submitting an application.

- Enter each number as a nine-digit number.
- Do not use hyphens or dashes.
- SC does not use the twelve-digit EIN format required by some other agencies.
- SC does not use the DUNS+4 format.

TYPE OF APPLICATION (FIELD 8)

A **new** application is one in which DOE support for the proposed research is being requested for the first time.

Please answer “yes” to the question “Is this application being submitted to other agencies?” if substantially similar, identical, or closely related research objectives are being submitted to another Federal agency. Indicate the agency or agencies to which the similar objectives have been submitted.

2. Research and Related Other Project Information

Note concerning question 4.a. and 4.b.

If any environmental impact, positive or negative, is anticipated, indicate “yes” in response to question 4.a., “potential impact – positive or negative - on the environment.” Disclosure of the impact should be provided in response to question 4.b. First, indicate whether the impact is positive or negative and then identify the area of concern (e.g., air, water, exposure to radiation, etc.).

DOE understands the phrase in field 4.a., “potential impact ... *negative*” to apply if the work described in the application could potentially have any of the impacts listed in (1) through (5) of 10 CFR 1021, Appendix B, Conditions that Are Integral Elements of the Classes of Action. (<https://www.ecfr.gov>)

Additionally, for actions which could have any other adverse impacts to the environment or have any possibility for adverse impacts to human health (e.g., use of human subjects, Biosafety Level 3-4 laboratory construction/operation, manufacture or use of certain nanoscale materials which are known to impact human health, or any activities involving transuranic or high level radioactive waste, or use of or exposure to any radioactive materials beyond de minimis levels), applicants should indicate a “negative” impact on the environment.

Lastly, if there would be 1) extraordinary circumstances (i.e., scientific or public controversy) related to the significance of environmental effects (10 CFR 1021.410 (b)(2)), 2) if the work is connected to other actions with potentially significant impacts (10 CFR 1021.410 (b)(3)), or 3) if the work is related to other nearby actions with the potential for cumulatively significant impacts (10 CFR 1021.410 (b)(3)), applicants should indicate a “negative” impact on the environment.

Complete questions in fields 1 through 6 of the SF-424(R&R) form and attach files. The files must comply with the following instructions:

PROJECT SUMMARY/ABSTRACT (FIELD 7 ON THE FORM)

The project summary/abstract is a summary of the proposed activity suitable for distribution to the public and sufficient to permit potential reviewers to identify conflicts of interest. It must be a self-contained document. Provide the name of the applicant, the project title, the PI and the PI’s institutional affiliation, any coinvestigators and their institutional affiliations, the objectives of the project, a description of the project, including methods to be employed, and the potential impact of the project (i.e., benefits, outcomes. The project summary must not exceed 1 page when printed using standard 8.5” by 11” paper with 1” margins (top, bottom, left and right) with font not smaller than 11 point. To attach a Project Summary/Abstract, click “Add Attachment.”

If an application is recommended for award, the project summary may be used in preparing a public abstract about the award. Award abstracts and titles form a Government document that

describes the project and justifies the expenditure of Federal funds in light of the DOE and SC mission statements at <https://energy.gov/mission> and <https://science.energy.gov/about/>.

- Do not include any proprietary or sensitive business information.
- DOE may use the abstract may to prepare public reports about supported research.

DOE COVER PAGE

(PART OF PROJECT NARRATIVE ATTACHED TO FIELD 8 ON THE FORM)

The application narrative must begin with a cover page that will not count toward the project narrative page limitation. The cover page must include the following items:

- The application title
- the name, e-mail address, and telephone number of the Project Director (PD);
- the name, e-mail address, and telephone number of the Principal Investigator (PI);
- the name, e-mail address, and telephone number of the Administrative Point of Contact
- The name and mailing address of the sponsoring institution
- Funding Opportunity FOA Number: DE-FOA-0002023
- DOE Office of Sponsoring this FOA: DOE EPSCoR
- DOE Office Point of Contact: Tim Fitzsimmons
- DOE Program Office(s) of interest:
- DOE Program Office Scientific/Technical Point(s) of Contact:
- PAMS Pre-Application tracking number:
- Topical research area or areas.

Important Instructions to the Sponsored Research Office of Submitting Institutions: SC requires that you create one single PDF file that contains the DOE Cover Page, project narrative, biographical sketch, current and pending support, bibliography and references cited, facilities and other resources, equipment, data management plan, and other attachments. This single PDF file must be attached in Field 8 on the Grants.gov form. Do not attach any of the items listed in this paragraph separately in any other field in Grants.gov. If you do, these additional attachments will not become part of the application in PAMS.

COVER PAGE SUPPLEMENT

(Part of Project Narrative attached to field 8 on the Form)

On separate pages, as a supplement to the cover page, include the following personnel and summary budget information for all PI and Co-I, including those at partner institutions. Failure to include these tables may result in the application being declined without further review.

Table 1: PI and Co-Is on the application and institutional affiliations

PI and Co-Is			Institution
Last Name	First Name	Title	Institution Name

** Applicants are strongly encouraged to follow the exact format of the sample table above since the tabular information will be compiled across all applications. This includes the following elements:

- Include grid lines around each cell.
- Do not merge name or institution cells, even if individuals share the same institution.
- Do not change the order of the columns.
- Do not include any additional information (e.g. “PI”, “Co-PI”, or footnote symbols) under “Last Name” and “First Name”.
- Do not include departmental affiliations under Institutions.
- If an individual has a joint appointment, separate the institutions with a “/” (i.e. “Univ of X / National Lab Y”).

Please include the following table as a supplement to the cover page:

Table 2: Summary budget information for all partner institutions

	Names	Institution	Year 1 Budget	Year 2 Budget	Total Budget
PI					
Co-I					
Co-I					
Co-I					

Example budget table (\$ in thousands)

- Provide a statement explaining the leadership structure of the collaboration.
- Include a description of each collaborating institution’s facilities, equipment, and resources that will be made available to the collaborative group.
- If applicable, explain how students and junior researchers will be trained and mentored by the collaborators.

PROJECT NARRATIVE (FIELD 8 ON THE FORM)

The project narrative **must not exceed 25 pages** of technical information, including charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5” by 11” paper with 1 inch margins (top, bottom, left, and right). The font must not be smaller than 11 point. Merit reviewers will only consider the number of pages specified in the first sentence of this paragraph. This page limit does not apply to the Cover Page, Budget Page(s), Budget Justification,

biographical material, publications and references, and appendices, each of which may have its own page limit.

Do not include any Internet addresses (URLs) that provide supplementary or additional information that constitutes a part of the application. Merit reviewers are not required to access Internet sites; however, Internet publications in a list of references will be treated identically to print publications. See Section VIII, D. for instructions on how to mark proprietary application information. To attach a Project Narrative, click “Add Attachment.”

Background/Introduction: Explanation of the importance and relevance of the proposed work as well as a review of the relevant literature.

Proposed Research and Methods: Identify the hypotheses to be tested (if any) and details of the methods to be used including the integration of experiments with theoretical and computational research efforts.

Timetable of Activities: Timeline for all major activities including milestones and deliverables.

Project Objectives: This section should provide a clear, concise statement of the specific objectives/aims of the proposed project.

The Project Narrative comprises the research plan for the project. It should contain enough background material in the Introduction, including review of the relevant literature, to demonstrate sufficient knowledge of the state of the science. The major part of the narrative should be devoted to a description and justification of the proposed project, including details of the method to be used. It should also include a timeline for the major activities of the proposed project, and should indicate which project personnel will be responsible for which activities. There should be no ambiguity about which personnel will perform particular parts of the project, and the time at which these activities will take place.

Do not attach any of the requested appendices described below as files for fields 9, 10, 11, and 12 in Grants.gov. Follow the below instructions to include the information as appendices in the single, bundled project narrative file.

APPENDIX 1: BIOGRAPHICAL SKETCH

Provide a biographical sketch for the PI and each senior/key person listed in Section A on the R&R Budget form.

As part of the sketch, provide information that can be used by reviewers to evaluate the PI’s potential for leadership within the scientific community. Examples of information of interest are invited and/or public lectures, awards received, scientific program committees, conference or workshop organization, professional society activities, special international or industrial partnerships, reviewing or editorship activities, or other scientific leadership experiences.

- Provide the biographical sketch information as an appendix to your project narrative.

- Do not attach a separate file.
- The biographical sketch appendix will not count in the project narrative page limitation.
- The biographical information (curriculum vitae) for each person must not exceed 2 pages when printed on 8.5” by 11” paper with 1 inch margins (top, bottom, left, and right) with font not smaller than 11 point and must include:

The biographical information (curriculum vitae) must include the following items within its page limit:

- **Education and Training:** Undergraduate, graduate and postdoctoral training, provide institution, major/area, degree and year.
- **Research and Professional Experience:** Beginning with the current position list, in chronological order, professional/academic positions with a brief description.
- **Publications:** Provide a list of up to 10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically. Patents, copyrights and software systems developed may be provided in addition to or substituted for publications. An abbreviated style such as the Physical Review Letters (PRL) convention for citations (list only the first author) may be used for publications with more than 10 authors.
- **Synergistic Activities:** List no more than 5 professional and scholarly activities related to the effort proposed.

In addition, the biographical sketch must include information to permit DOE to identify individuals who are conflicted with or potentially biased (favorably or unfavorably) against the investigator. Include a section entitled “**Identification of Potential Conflicts of Interest or Bias in Selection of Reviewers**” that will not count in a page limit. Provide the following information in this section:

- **Collaborators and Co-editors:** List in alphabetical order all persons, including their current organizational affiliation, who are, or who have been, collaborators or co-authors with you on a research project, book or book article, report, abstract, or paper during the 48 months preceding the submission of this application. For publications or collaborations with more than 10 authors or participants, only list those individuals in the core group with whom the PI interacted on a regular basis while the research was being done. Also, list any individuals who are currently, or have been, co-editors with you on a special issue of a journal, compendium, or conference proceedings during the 24 months preceding the submission of this application. If there are no collaborators or co-editors to report, state “None.”
- **Graduate and Postdoctoral Advisors and Advisees:** List the names and current organizational affiliations of your graduate advisor(s) and principal postdoctoral sponsor(s). Also, list the names and current organizational affiliations of your graduate students and postdoctoral associates.

Personally Identifiable Information: Do not include sensitive and protected personally identifiable information including social security numbers, birthdates, citizenship, marital status, or home addresses. Do not include information that a merit reviewer should not make use of.

APPENDIX 2: CURRENT AND PENDING SUPPORT

Provide a list of all current and pending support (both Federal and non-Federal) for the PI and other senior/key persons, including subawardees, for ongoing projects and pending applications. List all sponsored activities or awards requiring a measurable commitment of effort, whether paid or unpaid.

For every activity, list the following items:

- The sponsor of the activity or the source of funding
- The award or other identifying number
- The title of the award or activity
- The total cost or value of the award or activity, including direct and indirect costs. For pending proposals, provide the total amount of requested funding.
- The award period (start date – end date).
- The person-months of effort per year being dedicated to the award or activity, or planned to be dedicated to a pending proposal.
- Briefly describe the research being performed, or planned for pending proposals, and explicitly identify any similarities, differences, overlaps, or synergies with the proposed research.

Provide the Current and Pending Support as an appendix to your project narrative. Concurrent submission of an application to other organizations for simultaneous consideration will not prejudice its review.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 3: BIBLIOGRAPHY & REFERENCES CITED

Provide a bibliography of any references cited in the Project Narrative. Each reference must include the names of all authors (in the same sequence in which they appear in the publication), the article and journal title, book title, volume number, page numbers, and year of publication. For research areas where there are routinely more than ten coauthors of archival publications, you may use an abbreviated style such as the Physical Review Letters (PRL) convention for citations (listing only the first author). Applicants should be especially careful to follow scholarly practices in providing citations for source materials relied upon when preparing any section of the application. Provide the Bibliography and References Cited information as an appendix to your project narrative.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 4: FACILITIES & OTHER RESOURCES

This information is used to assess the capability of the organizational resources, including subawardee resources, available to perform the effort proposed. Identify the facilities to be used (Laboratory, Animal, Computer, Office, Clinical and Other). If appropriate, indicate their capacities, pertinent capabilities, relative proximity, and extent of availability to the project. Describe only those resources that are directly applicable to the proposed work. Describe other resources available to the project (e.g., machine shop, electronic shop) and the extent to which

they would be available to the project. For proposed investigations requiring access to experimental user facilities maintained by institutions other than the applicant, please provide a document from the facility manager confirming that the researchers will have access to the facility. Please provide the Facility and Other Resource information as an appendix to your project narrative.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 5: EQUIPMENT

List major items of equipment already available for this project and, if appropriate identify location and pertinent capabilities. Provide the Equipment information as an appendix to your project narrative.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 6: DATA MANAGEMENT PLAN

Provide a Data Management Plan (DMP) that addresses the following requirements:

1. DMPs should describe whether and how data generated in the course of the proposed research will be shared and preserved. If the plan is not to share and/or preserve certain data, then the plan must explain the basis of the decision (for example, cost/benefit considerations, other parameters of feasibility, scientific appropriateness, or limitations discussed in #4). At a minimum, DMPs must describe how data sharing and preservation will enable validation of results, or how results could be validated if data are not shared or preserved.
2. DMPs should provide a plan for making all research data displayed in publications resulting from the proposed research open, machine-readable, and digitally accessible to the public 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 to the public in accordance with the principles stated in the Office of Science Statement on Digital Data Management (<https://science.energy.gov/funding-opportunities/digital-data-management>). 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.
3. DMPs should consult and reference available information about data management resources to be used in the course of the proposed research. In particular, DMPs that explicitly or implicitly commit 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 SC 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 SC facilities can be found in the additional guidance from the sponsoring program.
4. DMPs 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 applicable laws, and regulations. There is no requirement to share proprietary data.

DMPs will be reviewed as part of the overall SC research proposal merit review process. Applicants are encouraged to consult the SC website for further information and suggestions for how to structure a DMP: <https://science.energy.gov/funding-opportunities/digital-data-management>

- This appendix should not exceed 3 pages including charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5” by 11” paper with 1 inch margins (top, bottom, left, and right)
- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 7: LETTERS OF COMMITMENT AND ENDORSEMENT

The National Academies study of EPSCoR and EPSCoR like programs and a Committee of Visitors report on DOE EPSCoR recommended actions to promote engagement and commitment on the part of the EPSCoR institutions and jurisdictions as a necessary component of the EPSCoR partnership. Accordingly, the applicant must provide a letter or letters of commitment describing any jurisdictional, institutional or private sector commitments towards the research effort. Examples of previously successful contributions have included, but are not limited to: faculty hires, equipment purchases, facility renovations, faculty time, graduate student and post-doctoral fellow support, and travel and administrative support. Commitment by the institution or jurisdiction will be a factor included in the evaluation process.

In addition: Letters of commitment from the PD and PI, and letters of commitment from collaborators and any consultants must also be included in this appendix.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.

APPENDIX 8: LIST OF COLLABORATORS AND POSSIBLE CONFLICTS OF INTEREST

In tabular form following the example below**, provide a list of collaborators for the PI and Co-Is, including co-authors over the past 48 months, graduate and postdoctoral advisors of the senior/key personnel, graduate students and postdoctoral associates that have been supervised by the senior/key personnel during the past 60 months, and any other current close associations of the senior/key personnel. The table must exclude all personnel at any of the institutions participating in this application. Note that this is an update to the table provided as part of the pre-application.

Collaborator			Institution
Last Name	First Name	Title	Institution Name

--	--	--	--

** Applicants are strongly encouraged to follow the exact format of the sample table since the tabular information will be compiled across all applications. This includes the following elements:

- Include grid lines around each cell.
- Do not merge name or institution cells, even if individuals share the same institution.
- Do not change the order of the columns.
- Do not include any additional information (e.g. “PI”, “Co-PI”, or footnote symbols) under “Last Name” and “First Name”.
- Do not include departmental affiliations under Institutions.
- If an individual has a joint appointment, separate the institutions with a “/” (i.e. “Univ of X / National Lab Y”).
- Provide “LIST OF COLLABORATORS AND POSSIBLE CONFLICTS OF INTEREST” as Appendix 8 to the project narrative within the same file. Do not attach a separate file.
- This appendix will not count in the Project Narrative page limitation.

APPENDIX 9: OTHER ATTACHMENT

Information not easily accessible to a reviewer may be included in this appendix, but do not use this appendix to circumvent the page limitations of the application. Reviewers are not required to consider information in this appendix, and reviewers may not have time to read extensive appendix materials with the same care they would use with the application proper. Do not include scientific publications.

- Do not attach a separate file.
- This appendix will not count in the project narrative page limitation.
- **Do not attach any of the requested appendices described above as files for fields 9, 10, 11, and 12.**
- **Follow the above instructions to include the information as appendices to the project narrative file.**
- **These appendices will not count toward the project narrative’s page limitation.**
- **Do not attach any files to fields 9, 10, 11, or 12.**

3. Research And Related Budget

Complete the Research and Related Budget form in accordance with the instructions on the form (Activate Help Mode to see instructions) and the following instructions. You must complete a separate budget for each year of support requested. The form will generate a cumulative budget for the total project period. You must complete all the mandatory information on the form before the NEXT PERIOD button is activated. You may request funds under any of the categories listed as long as the item and amount are necessary to perform the proposed work, meet all the criteria for allowability under the applicable Federal cost principles, and are not prohibited by the funding restrictions in this FOA (See [Section IV H](#)).

The following advice will improve the accuracy of your budget request:

- Funds requested for personnel (senior, key, and other) must be justified as the product of their effort on the project and their institutional base salary.
- Funds requested for fringe benefits must be calculated as the product of the requested salary and, if present, the negotiated fringe benefit rate contained in an institutions negotiated indirect cost rate agreement.
- Funds requested for indirect costs must be calculated using the correct indirect cost base and the negotiated indirect cost rate.
- You are encouraged to include the rate agreement used in preparing a budget as a part of the budget justification.

Budget Fields

Section A Senior/Key Person	For each Senior/Key Person, enter the requested information. List personnel, base salary, the number of months that person will be allocated to the project, requested salary, fringe benefits, and the total funds requested for each person. The requested salary must be the product of the base salary and the effort. Include a written narrative in the budget justification that justifies the need for requested personnel.
Section B Other Personnel	List personnel, the number of months that person will be allocated to the project, requested salary fringe benefits, and the total funds requested for each person. Include a written narrative in the budget justification that fully justifies the need for requested personnel.
Section C Equipment	For the purpose of this budget, equipment is designated as an item of property that has an acquisition cost of \$5,000 or more and an expected service life of more than one year. (Note that this designation applies for proposal budgeting only and differs from the DOE definition of capital equipment.) List each item of equipment separately and justify each in the budget justification section. Do not aggregate items of equipment. Allowable items ordinarily will be limited to research equipment and apparatus not already available for the conduct of the work. General-purpose office equipment is not eligible for support unless primarily or exclusively used in the actual conduct of scientific research.
Section D Travel	For purposes of this section only, travel to Canada or to Mexico is considered domestic travel. In the budget justification, list each trip's destination, dates, estimated costs including transportation and subsistence, number of staff traveling, the purpose of the travel, and how it relates to the project. Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis). To qualify for support, attendance at meetings or conferences must enhance the investigator's capability to perform the research, plan extensions of it, or disseminate its results. Domestic travel is to be justified separately from foreign travel.

<p>Section E Participant/Trainee Support Costs</p>	<p>If applicable, submit training support costs. Educational projects that intend to support trainees (precollege, college, graduate and post graduate) must list each trainee cost that includes stipend levels and amounts, cost of tuition for each trainee, cost of any travel (provide the same information as needed under the regular travel category), and costs for any related training expenses. Participant costs are those costs associated with conferences, workshops, symposia or institutes and breakout items should indicate the number of participants, cost for each participant, purpose of the conference, dates and places of meetings and any related administrative expenses.</p> <p>Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis).</p>
<p>Section F Other Direct Costs</p>	<ul style="list-style-type: none"> • Materials and Supplies: Enter total funds requested for materials and supplies in the appropriate fields. In the budget justification, indicate general categories such as glassware, and chemicals, including an amount for each category (items not identified under “Equipment”). Categories less than \$1,000 are not required to be itemized. Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis). • Publication Costs: Enter the total publication funds requested. The proposal budget may request funds for the costs of documenting, preparing, publishing or otherwise making available to others the findings and products of the work conducted under the award. In the budget justification, include supporting information. Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis). • Consultant Services: Enter total funds requested for all consultant services. In the budget justification, identify each consultant, the services he/she will perform, total number of days, travel costs, and total estimated costs. Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis). • ADP/Computer Services: Enter total funds requested for ADP/Computer Services. The cost of computer services, including computer-based retrieval of scientific, technical and education information may be requested. In the budget justification, include the established computer service rates at the proposing organization if applicable. Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis). • Subawards/Consortium/Contractual Costs: Enter total costs for all subawards/consortium organizations and other contractual costs proposed for the project. In the budget justification, justify the details.

	<ul style="list-style-type: none"> • Equipment or Facility Rental/User Fees: Enter total funds requested for Equipment or Facility Rental/User Fees. In the budget justification, identify each rental/user fee and justify. Indicate the basis for the cost estimate (quotes from vendors or suppliers, past experience of similar items, or some other basis). • Alterations and Renovations: Enter total funds requested for Alterations and Renovations. In the budget justification, itemize by category and justify the costs of alterations and renovations, including repairs, painting, removal or installation of partitions, shielding, or air conditioning. Where applicable, provide the square footage and costs. • Other: Add text to describe any other Direct Costs not requested above. Enter costs associated with “Other” item(s). Use the budget justification to further itemize and justify.
Section G Direct Costs	This represents Total Direct Costs (Sections A through F)
Section H Other Indirect Costs	Enter the Indirect Cost information for each field. Only four general categories of indirect costs are allowed/requested on this form, so please consolidate if needed. Include the cognizant Federal agency and contact information if using a negotiated rate agreement.
Section I Total Direct and Indirect Costs	This is the total of Sections G and H

BUDGET JUSTIFICATION (FIELD L ON THE FORM)

Provide the required supporting information for the following costs (See R&R Budget instructions): equipment; domestic and foreign travel; participant/trainees; materials and supplies; publication; consultant services; ADP/computer services; subaward/consortium/contractual; equipment or facility rental/user fees; alterations and renovations; and indirect cost type. Provide any other information you wish to submit to justify your budget request. **Attach a single budget justification file for the entire project period in field L.** The file automatically carries over to each budget year.

You may wish to include the indirect cost rate agreement as a part of the budget justification.

4. R&R Subaward Budget Attachment(s) Form

Budgets for Subawardees: You must provide a separate R&R budget for each subawardee. Download the R&R Budget Attachment from the R&R SUBAWARD BUDGET ATTACHMENT(S) FORM and either e-mail it to each subawardee that is required to submit a separate budget or use the collaborative features of Workspace. After the subawardee has either e-mailed its completed budget back to you or completed it within Workspace, attach it to one of the blocks provided on the form. Use up to 10 letters of the subawardee’s name (plus.pdf) as the file name (e.g., ucla.pdf or energyres.pdf). Filenames should not exceed 50 characters.

If the project involves more subawardees than there are places in the SUBAWARD BUDGET ATTACHMENT(S) FORM, the additional subaward budgets may be saved as PDF files and appended to the Budget Justification attached to Field K.

Applicants should consult their local information technology (“IT”) support resources for any necessary assistance in converting the forms downloaded from Grants.gov into plain PDF files that can be combined into one non-Portfolio PDF file (the Budget Justification).

Applicants should consult their local information technology (“IT”) support resources for any necessary assistance in converting the forms downloaded from Grants.gov into plain PDF files that can be combined into one non-Portfolio PDF file (the Budget Justification).

Ensure that any files received from subawardees are the PDF files extracted from the SUBAWARD BUDGET ATTACHMENT(S) FORM. Errors will be created if a subawardee sends a prime applicant a budget form that was not extracted from the application package.

Note: If an application proposes subawards to a DOE National Laboratory, a Federal agency, or another Federal agency’s FFRDC, the value of such proposed subawards will be deducted from any resulting award: Those classes of organizations must be paid directly by SC. However, the details of such proposed budgets are an essential for understanding and analyzing the proposed research.

5. Project/Performance Site Location(s)

Indicate the primary site where the work will be performed. If a portion of the project will be performed at any other site(s), identify the site location(s) in the blocks provided.

Note that the Project/Performance Site Congressional District is entered in the format of the 2 digit state code followed by a dash and a 3 digit Congressional district code, for example VA-001. Hover over this field for additional instructions.

Use the Next Site button to expand the form to add additional Project/Performance Site Locations.

6. Summary of Required Forms/Files

Your application must include the following items:

Name of Document	Format	Attach to
SF 424 (R&R)	Form	N/A
RESEARCH AND RELATED Other Project Information	Form	N/A
Project Summary/Abstract	PDF	Field 7
Project Narrative, including required appendices	PDF	Field 8
RESEARCH & RELATED BUDGET	Form	N/A

Budget Justification	PDF	Field L
PROJECT/PERFORMANCE SITE LOCATION(S)	Form	N/A
SF-LLL Disclosure of Lobbying Activities, if applicable	Form	N/A

E. SUBMISSIONS FROM SUCCESSFUL APPLICANTS

If selected for award, DOE 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
- 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
- Commitment Letter from Third Parties Contributing to Cost Sharing, if applicable
- Environmental Information

Applicants that are not institutions of higher education, that request indirect costs, and that do not already have an Indirect Cost Rate Agreement with their Cognizant Federal Agency or documentation of rates accepted for estimating purposes by DOE or another Federal agency, are advised to begin preparing an Indirect Cost Rate Proposal for submission, upon request, to the DOE contract specialist/grants management specialist who will evaluate your application if you are selected for award.

F. SUBMISSION DATES AND TIMES

1. Letter of Intent Due Date

Not applicable

You are encouraged to submit your Letter of Intent well before the deadline.

2. Pre-application Due Date

12/20/2018 at 5:00 PM Eastern Time

You are encouraged to submit your pre-application well before the deadline.

Pre-application responses will be by 02/06/2019 5:00 PM Eastern Time.

3. Application Due Date

3/27/2019 at 5:00 PM Eastern Time

You are encouraged to transmit your application well before the deadline.

4. Late Submissions

Delays in submitting letters of intent, pre-applications, and applications may be unavoidable. DOE has accepted late submissions when applicants have been unable to make timely submissions because of widespread technological disruptions or significant natural disasters. DOE has made accommodations for incapacitating or life-threatening illnesses and for deaths of immediate family members. Other circumstances may or may not justify late submissions.

Unacceptable justifications include the following:

- Failure to begin submission process early enough.
- Failure to provide sufficient time to complete the process.
- Failure to understand the submission process.
- Failure to understand the deadlines for submissions.
- Failure to satisfy prerequisite registrations.
- Unavailability of administrative personnel.
- Minor illnesses the week of the deadline.

You are responsible for beginning the submission process in sufficient time to accommodate reasonably foreseeable incidents, contingencies, and disruptions.

Scheduled medical events that are known at the time this FOA is published do not justify late submissions: Applicants should draft their submissions in sufficient time to meet the deadlines.

Applicants must contact the DOE PM listed in this FOA to discuss the option of a late submission. Contacting the DOE PM after the deadline may reduce the likelihood that a request will be granted.

DOE notes that not all requests for late submission will be approved.

Applicants proposing topics within SC's mission space may be able to submit their applications in response to the currently available SC Annual Solicitation. Please contact the Program Office/Manager listed in this FOA to discuss this option.

G. INTERGOVERNMENTAL REVIEW

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

H. FUNDING RESTRICTIONS

Funding for all awards and future budget periods are contingent upon the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority.

Cost Principles: Costs must be allowable, allocable and reasonable in accordance with the applicable Federal cost principles referenced in 2 CFR 200 as modified by 2 CFR 910 (DOE Financial Assistance Regulation).

Pre-award Costs: Recipients may charge to an award resulting from this FOA pre-award costs that were incurred within the ninety (90) calendar day period immediately preceding the effective date of the award, if the costs are allowable in accordance with the applicable Federal cost principles referenced in 2 CFR 200 as modified by 2 CFR 910 (DOE Financial Assistance Regulation). Recipients must obtain the prior approval of the DOE CO for any pre-award costs that are for periods greater than this 90-day calendar period.

Pre-award costs are incurred at the applicant's risk. DOE is under no obligation to reimburse such costs if for any reason the applicant does not receive an award or if the award is made for a lesser amount than the applicant expected.

I. OTHER SUBMISSION AND REGISTRATION REQUIREMENTS

1. Systems to Register In

Applicants must complete a series of registrations and enrollments to submit applications in response to this FOA. Applicants not currently registered with SAM and Grants.gov should allow **at least 4 weeks** to complete these requirements.

You should start the process as soon as possible.

You may not be able to use your preferred Internet browser: Each system has its own requirements.

Applicants must obtain a DUNS number at <https://fedgov.dnb.com/webform>.

Applicants must register with SAM at <https://www.sam.gov/>. If you had an active registration in the Central Contractor Registry (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.pdf. SAM maintains a complete user guide at https://www.sam.gov/sam/SAM_Guide/SAM_User_Guide.htm.

Applicants must provide a Taxpayer Identification Number (TIN) to complete their registration in SAM.gov. An applicant's TIN is an EIN assigned by the Internal Revenue Service (IRS). In limited circumstances, a Social Security Number (SSN) assigned by the Social Security Administration (SSA) may be used as a TIN. You may obtain an EIN from the IRS at <https://www.irs.gov/businesses/small-businesses-self-employed/apply-for-an-employer-identification-number-ein-online>.

DOE discourages the use of a SSN as a TIN. You are encouraged to obtain a TIN from the IRS using the website listed above.

Applicants must register with FedConnect at www.fedconnect.net. The full, binding version of assistance agreements will be posted to FedConnect.

Recipients must register with the Federal Funding Accountability and Transparency Act Subaward Reporting System at <https://www.fsr.gov>. This registration must be completed before an award may be made: you are advised to register while preparing your application.

2. Registering in Grants.gov

Applicants must register with grants.gov, following the instructions at <https://www.grants.gov/web/grants/applicants/registration.html>.

3. Where to Submit an Application

You must submit the application through Grants.gov at <https://www.grants.gov/>, using either the online webforms or downloaded forms. (Additional instructions are provided in Section IV A of this FOA.)

Submit electronic applications through the “Apply for Grants” function at www.grants.gov. If you have problems completing the registration process or submitting your application, call grants.gov at 1-800-518-4726 or send an email to support@grants.gov.

Please ensure that you have read the applicable instructions, guides, help notices, frequently asked questions, and other forms of technical support on grants.gov.

4. DOE SC Portfolio Analysis and Management System (PAMS)

After you submit your application through grants.gov, the application will automatically transfer into the PAMS for processing by the DOE SC. Many functions for grants and cooperative agreements can be done in PAMS, which is available at <https://pamspublic.science.energy.gov>.

You will want to “register to” your application: a process of linking yourself to the application after it has been submitted through grants.gov and processed by DOE.

You must register in PAMS to submit a pre-application or a letter of intent.

You may use the Internet Explorer, Firefox, Google Chrome, or Safari browsers to access PAMS.

Notifications sent from the PAMS system will come from the PAMS email address <PAMS.Autoreply@science.doe.gov>. Please make sure your email server/software allows delivery of emails from the PAMS email address to yours.

Registering to PAMS is a two-step process; once you create an individual account, you must associate yourself with (“register to”) your institution. Detailed steps are listed below.

1. CREATE PAMS ACCOUNT:

To register, click the “Create New PAMS Account” link on the website <https://pamspublic.science.energy.gov/>.

- Click the “No, I have never had an account” link and then the “Create Account” button.
- You will be prompted to enter your name and email address, create a username and password, and select a security question and answer. Once you have done this, click the “Save and Continue” button.
- On the next page, enter the required information (at least one phone number and your mailing address) and any optional information you wish to provide (e.g., FAX number, website, mailstop code, additional email addresses or phone numbers, Division/Department). Click the “Create Account” button.
- Read the user agreement and click the “Accept” button to indicate that you understand your responsibilities and agree to comply with the rules of behavior for PAMS.
- PAMS will take you to the “Having Trouble Logging In?” page. (If you have been an SC merit reviewer or if you have previously submitted an application, you may already be linked to an institution in PAMS. If this happens, you will be taken to the PAMS home page.)

2. REGISTER TO YOUR INSTITUTION:

- Click the link labeled “Option 2: I know my institution and I am here to register to the institution.” (Note: If you previously created a PAMS account but did not register to an institution at that time, you must click the Institutions tab and click the “Register to Institution” link.)
- PAMS will take you to the “Register to Institution” page.
- Type a word or phrase from your institution name in the field labeled, “Institution Name like,” choose the radio button next to the item that best describes your role in the system, and click the “Search” button. A “like” search in PAMS returns results that contain the word or phrase you enter; you do not need to enter the exact name of the institution, but you should enter a word or phrase contained within the institution name. (If your institution has a frequently used acronym, such as ANL for Argonne National Laboratory or UCLA for the Regents of the University of California, Los Angeles, you may find it easiest to search for the acronym under “Institution Name like.” Many institutions with acronyms are listed in PAMS with their acronyms in parentheses after their names.)
- Find your institution in the list that is returned by the search and click the “Actions” link in the Options column next to the institution name to obtain a dropdown list. Select “Add me to this institution” from the dropdown. PAMS will take you to the “Institutions – List” page.
- If you do not see your institution in the initial search results, you can search again by clicking the “Cancel” button, clicking the Option 2 link, and repeating the search.
- If, after searching, you think your institution is not currently in the database, click the “Cannot Find My Institution” button and enter the requested institution information into PAMS. Click the “Create Institution” button. PAMS will add the institution to the system,

associate your profile with the new institution, and return you to the “Institutions – List” page when you are finished.

For help with PAMS, click the “External User Guide” link on the PAMS website, <https://pamspublic.science.energy.gov/>. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, email: sc.pams-helpdesk@science.doe.gov. All submission and inquiries about this FOA should reference DE-FOA-0002023.

5. Viewing Submitted Applications

Each grants.gov application submitted to the DOE SC automatically transfers into PAMS and is subsequently assigned to a program manager. At the time of program manager assignment, the three people listed on the SF-424 (R&R) cover page will receive an email with the subject line, “Receipt of Proposal 0000xxxxxx by the DOE Office of Science.” These three people are the PI (Block 14), Authorized Representative (Block 19), and Point of Contact (Block 5). In PAMS notation, applications are known as proposals, the PI is known as the PI, the Authorized Representative is known as the Sponsored Research Officer/Business Officer/Administrative Officer (SRO/BO/AO), and the Point of Contact is known as the POC.

There will be a period of time between the application’s receipt at grants.gov and its assignment to a DOE SC program manager. Program managers are typically assigned two weeks after applications are due at grants.gov: please refrain from attempting to view the proposal in PAMS until you receive an email providing the assignment of a program manager.

Once the email is sent, the PI, SRO/BO/PO, and POC will each be able to view the submitted proposal in PAMS. Viewing the proposal is optional.

You may use the Internet Explorer, Firefox, Google Chrome, or Safari browsers to access PAMS.

Following are two sets of instructions for viewing the submitted proposal, one for individuals who already have PAMS accounts and one for those who do not.

If you already have a PAMS account, follow these instructions:

1. Log in to PAMS at <https://pamspublic.science.energy.gov/>.
2. Click the “Proposals” tab and click “Access Previously Submitted Grants.gov Proposal.”
3. Enter the following information:
 - Proposal ID: Enter the ten-digit PAMS proposal ID, including the leading zeros (e.g., 00002xxxxx). Do not use the grants.gov proposal number. Use the PAMS number previously sent to you in the email with subject line, “Receipt of Proposal ...”.
 - Email (as entered in grants.gov application): Enter your email address as it appears on the SF424(R&R) Cover Page.
 - Choose Role: Select the radio button in front of the role corresponding to the SF-424 (R&R) cover page. If your name appears in block 19 of the SF-424 (R&R) cover page as the authorizing representative, select “SRO/BO/AO (Sponsored Research

- Officer/Business Officer/Administrative Officer).” If your name appears in block 14 of the SF424 R&R cover page as the PI, select “Principal Investigator (PI).” If your name appears in block 5 of the SF424 R&R as the point of contact, select “Other (POC).”
4. Click the “Save and Continue” button. You will be taken to your “My Proposals” page. The grants.gov proposal will now appear in your list of proposals. Click the “Actions/Views” link in the options column next to this proposal to obtain a dropdown list. Select “Proposal” from the dropdown to see the proposal. Note that the steps above will work only for proposals submitted to the DOE SC since May 2012.

If you do not already have a PAMS account, follow these instructions:

1. To register, click the “Create New PAMS Account” link on the website <https://pamspublic.science.energy.gov/>.
2. Click the “No, I have never had an account” link and then the “Create Account” button.
3. You will be prompted to enter your name and email address, create a username and password, and select a security question and answer. Once you have done this, click the “Save and Continue” button.
4. On the next page, enter the required information (at least one phone number and your mailing address) and any optional information you wish to provide (e.g., FAX number, website, mailstop code, additional email addresses or phone numbers, Division/Department). Click the “Create Account” button.
5. Read the user agreement and click the “Accept” button to indicate that you understand your responsibilities and agree to comply with the rules of behavior for PAMS.
6. You will be taken to the Register to Institution page. Select the link labeled, “Option 1: My institution has submitted a proposal in grants.gov. I am here to register as an SRO, PI, or POC (Sponsored Research Officer, Principal Investigator, or Point of Contact).”
7. Enter the following information:
 - Proposal ID: Enter the ten-digit PAMS proposal ID, including the leading zeros (e.g., 00002xxxxx). Do not use the grants.gov proposal number. Use the PAMS number previously sent to you in the email with subject line, “Receipt of Proposal ...”.
 - Email (as entered in grants.gov proposal): Enter your email address as it appears on the SF424(R&R) Cover Page.
 - Choose Role: Select the radio button in front of the role corresponding to the SF-424 (R&R) cover page. If your name appears in block 19 of the SF-424 (R&R) cover page as the authorizing representative, select “SRO/BO/AO (Sponsored Research Officer/Business Officer/Administrative Officer).” If your name appears in block 14 of the SF424 R&R cover page as the PI, select “Principal Investigator (PI).” If your name appears in block 5 of the SF424 R&R as the point of contact, select “Other (POC).”
8. Click the “Save and Continue” button. You will be taken to your “My Proposals” page. The grants.gov proposal will now appear in your list of proposals. Click the “Actions/Views” link in the options column next to this proposal to obtain a dropdown list. Select “Proposal” from the dropdown to see the proposal.

If you were listed as the PI on a prior submission but you have not previously created an account, you may already be listed in PAMS. If this is the case, you will be taken to the PAMS home page after agreeing to the Rules of Behavior. If that happens, follow the instructions listed above under “If you already have a PAMS account...” to access your grants.gov proposal.

The steps above will work only for proposals submitted to the DOE SC since May 2012.

For help with PAMS, click the “External User Guide” link on the PAMS website, <https://pamspublic.science.energy.gov/>. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9:00 AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submissions and inquiries about this FOA should reference **DE-FOA-0002023**.

Section V - APPLICATION REVIEW INFORMATION

A. CRITERIA

1. Initial Review Criteria

Prior to a comprehensive merit evaluation, DOE will perform an initial review in accordance with 10 CFR 605.10(b) to determine that (1) the applicant is eligible for the award; (2) the information required by the FOA has been submitted; (3) all mandatory requirements are satisfied including having an approved pre-application and attachment with the required table listing collaborators, a biosketch, current and pending, data management plan, and letters of commitment; (4) the proposed project is responsive to the objectives of the funding opportunity announcement (including limitations on technical topics described in the Supplementary Information), and (5) the proposed project is not duplicative of ongoing or completed programmatic work. Applications that fail to pass the initial review will not be forwarded for merit review and will be eliminated from further consideration.

2. Merit Review Criteria

Applications will be subjected to scientific merit review (peer review) and will be evaluated against the following criteria, listed in descending order of importance as found in 10 CFR 605.10 (d), the Office of Science Financial Assistance Program Rule.

- Scientific and/or Technical Merit of the Project;
- Appropriateness of the Proposed Method or Approach;
- Competency of Applicant's Personnel and Adequacy of Proposed Resources; and
- Reasonableness and Appropriateness of the Proposed Budget.

In addition to the criteria established by regulation, merit reviewers will be asked to evaluate each application by the following criteria:

- Synergism among the PIs in a program and the programmatic focus of a multi-PI effort; and,
- The likelihood of success of the implementation grant.

Note that external peer reviewers are selected with regard to both their scientific expertise and the absence of conflict-of-interest issues. Both Federal and non-Federal reviewers may be used, and submission of an application constitutes agreement that this is acceptable to the investigator(s) and the submitting institution.

Site visits or reverse site visits may be used as part of the evaluation process and in the review of performance from the inception of an award through its completion.

The questions below are provided to the merit reviewers to elaborate the criteria:

SCIENTIFIC AND/OR TECHNICAL MERIT OF THE PROPOSED RESEARCH

- What is the scientific innovation of proposed research?
- What is the likelihood of achieving valuable results?

- How might the results of the proposed work impact the direction, progress, and thinking in relevant scientific fields of research?
- How does the proposed work compare with other efforts in its field, both in terms of scientific and/or technical merit and originality?
- Is the Data Management Plan suitable for the proposed research and to what extent does it support the validation of research results?

APPROPRIATENESS OF THE PROPOSED METHOD OR APPROACH

- How logical and feasible are the research approaches?
- How the proposed research employ innovative concepts or methods?
- Are the conceptual framework, methods, and analyses well justified, adequately developed, and likely to lead to scientifically valid conclusions?
- How does the applicant recognize significant potential problems and consider alternative strategies?

COMPETENCY OF APPLICANT'S PERSONNEL AND ADEQUACY OF PROPOSED RESOURCES

- What is the past performance and potential of the Principal Investigator (PI)?
- How well qualified is the research team to carry out the proposed research?
- Are the research environment and facilities adequate for performing the research?
- How does the proposed work take advantage of unique facilities and capabilities?

REASONABLENESS AND APPROPRIATENESS OF THE PROPOSED BUDGET

- Are the proposed budget and staffing levels adequate to carry out the proposed research?
- Is the budget reasonable and appropriate for the scope?
- If consultant costs are included, are the overall consultant costs are in line with the EPSCoR mission and how will the skills, expertise or capabilities provided by the consultant will be transferred in a sustainable manner to the applicant institution?

SYNERGISM AMONG THE PIS IN A PROGRAM AND THE PROGRAMMATIC FOCUS OF A MULTI-PI EFFORT

- How does the application exhibit a coherent focus on one energy-related research area bringing together multiple researchers?
- What aspects of the management plan will support coordination of multiple investigators working on a common theme including performance milestones and a timetable for achieving project goals and deliverables?

THE LIKELIHOOD OF SUCCESS OF THE IMPLEMENTATION GRANT

- How well does the application couple with the jurisdiction's strategy to develop and utilize the scientific and technological resources that reside in its research universities and the jurisdiction's industrial or economic resources?
- How does the application adequately present the opportunities for enhanced academic research and development competitiveness and if appropriate, industrial or economic competitiveness, for the jurisdiction, including plans for the acquisition of sustained non-EPSCoR support?
- What plans does the applicant have to make (or has the applicant made) competitive

faculty hires and retained outstanding faculty within the scope of the implementation award? Does the applicant have a plan to attract (or has the applicant hired) outstanding graduate students and post docs?

- What plans do the applicant have to develop (or have they developed) as part of the implementation grant unique infrastructure capabilities that are critical to the advancement of science or technology? Alternatively, are they planning to or making unique contributions to DOE oriented capabilities (e.g., building or developing unique capabilities for a DOE experiment or facility)?
- What plans do the applicant have to (or are the grantees on track to) achieve a sustainable leadership position in their discipline(s)?
- What plans do the applicant have to (or are the grantees effectively) leveraging DOE funding and capabilities with local and regional resources? Are there commitments from the applicant's jurisdiction, institution or from private sources to assist in this leveraging?

B. REVIEW AND SELECTION PROCESS

1. Merit Review

Applications that pass the initial review will be subjected to a formal merit review and will be evaluated based on the criteria codified at 10 CFR 605.10(d) in accordance with the guidance provided in the “Office of Science Merit Review System for Financial Assistance,” which is available at: <https://science.energy.gov/grants/policy-and-guidance/merit-review-system/>.

2. Program Policy Factors

The Selection Official may consider any of the following program policy factors in making the selection, listed in no order of significance:

- Availability of funds
- Relevance of the proposed activity to SC or Technology Office priorities
- Ensuring an appropriate balance of activities within SC or Technology Office programs
- Performance under current or previous awards by the PD, PI, or co-PIs
- Institutional and jurisdictional capacity to manage challenging projects as evidenced, where applicable, by prior performance under EPSCoR or other awards.
- Institutional, jurisdictional and other commitment
- Presence of tenure-track or tenure-equivalent investigators
- Providing career pathways for the next generation of researchers
- Training the next generation of researchers, i.e. graduate students
- Maximizing the use of DOE user facilities
- Ensuring opportunities to investigators not currently supported by DOE
- Quality of domestic or international collaboration
- Participation with multi-institutional teams
- For applicant institutions that are not institutions of higher education: the presence of joint appointments with academic institutions, the presence of graduate students receiving academic credit for their research participation, the existence of tenure-like appointments,

and the commitment to research of a basic and fundamental nature divorced from current commercial activity and business applications.

- Commitment to sharing the results of research

3. Selection

The Selection Official will consider the findings of the merit review and may consider any of the Program Policy Factors described above.

4. Review of Risk

Pursuant to 2 CFR 200.205, DOE will conduct an additional review of the risk posed by applications submitted under this FOA. Such review of risk will include:

- Technical merit of the application,
- Reports and findings from audits performed under 2 CFR 200 or OMB Circular A-133, and
- Systems maintained under 2 CFR 180.

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

Applicants with no prior performance of DOE awards may be asked to provide information about their financial stability and or their ability to comply with the management standards of 2 CFR 200.

REPORTING OF MATTERS RELATED TO RECIPIENT INTEGRITY AND PERFORMANCE (DECEMBER 2015)

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 §200.205 Federal awarding agency review of risk posed by applicants.

5. Discussions and Award

The Government may enter into discussions with a selected applicant for any reason deemed necessary, including but not limited to the following: (1) the budget is not appropriate or reasonable for the requirement; (2) only a portion of the application is selected for award; (3) the Government needs additional information to determine that the recipient is capable of complying

with the requirements in 2 CFR 200 as modified by 2 CFR 910 (DOE Financial Assistance Regulation); and/or (4) special terms and conditions are required. Failure to resolve satisfactorily the issues identified by the Government will preclude award to the applicant.

C. ANTICIPATED NOTICE OF SELECTION AND AWARD DATES

It is anticipated that the award selection and negotiation will be completed by September 30, 2019 and that all awards will be made in Fiscal Year 2019.

Section VI - AWARD ADMINISTRATION INFORMATION

A. AWARD NOTICES

1. Notice of Selection

Selected Applicants Notification: DOE will notify applicants selected for award. This notice of selection is not an authorization to begin performance. (See Section IV, H. with respect to the allowability of pre-award costs.)

Non-selected Notification: Organizations whose applications have not been selected will be advised as promptly as possible. This notice will explain why the application was not selected.

2. Notice of Award

An Assistance Agreement issued by the contracting officer is the authorizing award document. It normally includes, either as an attachment or by reference, the following items: (1) Special Terms and Conditions; (2) Applicable program regulations, if any; (3) Application as approved by DOE; (4) 2 CFR 200 as modified by 2 CFR 910 (DOE Financial Assistance Regulation); (5) National Policy Assurances To Be Incorporated As Award Terms; (6) Budget Summary; (7) General Terms and Conditions; and (8) Federal Assistance Reporting Checklist, which identifies the reporting requirements.

For grants and cooperative agreements made to universities, non-profits and other entities subject to Title 2 CFR, research awards made under this funding opportunity will be subject to the government-wide Research Terms and Conditions published at https://www.nsf.gov/pubs/policydocs/rtr/rcoverlay_march17.pdf and the DOE Agency Specific Standard Research Terms and Conditions published at https://www.nsf.gov/pubs/policydocs/rtr/agencyspecifics/doe_417.pdf. These Terms and Conditions will be incorporated in the award by reference.

B. ADMINISTRATIVE AND NATIONAL POLICY REQUIREMENTS

1. Administrative Requirements

The administrative requirements for DOE grants and cooperative agreements are contained in 2 CFR 200 as modified by 2 CFR 910 (DOE Financial Assistance Regulation).

NONDISCLOSURE AND CONFIDENTIALITY AGREEMENTS REPRESENTATIONS (JUNE 2015)

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

(1) It **does not and will not** require its employees or contractors to sign internal nondisclosure or confidentiality agreements or statements prohibiting or otherwise restricting its employees or contractors from lawfully reporting waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

(2) 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:

a. *“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.”*

b. 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.

c. Notwithstanding 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.

REGISTRATION REQUIREMENTS

Additional administrative requirements for DOE grants and cooperative agreements are contained in 2 CFR 25 (See: <https://www.ecfr.gov>). Prime awardees must keep their data in SAM current at <https://www.sam.gov>. SAM is the government-wide system that replaced the Central Contractor Registry (CCR). If you had an active registration in the CCR, you have an active registration in SAM. Subawardees at all tiers must obtain DUNS numbers and provide the DUNS to the prime awardee before the subaward can be issued.

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 170. (See: <https://www.ecfr.gov>). Prime awardees must register with the new FSRS database and report the required data on their first tier subawardees. Prime awardees must report the executive compensation for their own executives as part of their registration profile in SAM.

PROHIBITION ON LOBBYING ACTIVITY

By accepting funds under this award, you agree 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 USC 1913. This restriction is in addition to those prescribed elsewhere in statute and regulation.

2. Terms and Conditions

The DOE Special Terms and Conditions for Use in Most Grants and Cooperative Agreements are located at <https://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms> under Award Terms.

The standard DOE financial assistance intellectual property provisions applicable to various types of recipients are located at:

<https://energy.gov/gc/standard-intellectual-property-ip-provisions-financial-assistance-awards>

3. National Policy Assurances

The National Policy Assurances To Be Incorporated As Award Terms are located at <https://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms> under Award Terms.

4. Statement of Substantial Involvement

Not applicable.

5. Additional Conditions

CONFERENCE SPENDING (FEBRUARY 2015)

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.

CORPORATE FELONY CONVICTION AND FEDERAL TAX LIABILITY REPRESENTATIONS (MARCH 2014)

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

- It is **not** a corporation that has been convicted of a felony criminal violation under any Federal law within the preceding 24 months,
- 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.

PUBLICATIONS

The recipient is expected to publish or otherwise make publicly available the results of the work conducted under any award resulting from this FOA. Publications and other methods of public communication describing any work based on or developed under an award resulting from this FOA must contain an acknowledgment of SC support. The format for such acknowledgments is provided at <https://science.energy.gov/funding-opportunities/acknowledgements/>. The author's copy of any peer-reviewed manuscript accepted for funding must be announced to DOE's Office of Scientific and Technical Information (OSTI) and made publicly available in accordance with the instructions contained in the Reporting Requirements Checklist incorporated in all Assistance Agreements.

C. REPORTING

Reporting requirements are identified on the Federal Assistance Reporting Checklist, DOE F 4600.2, attached to the award agreement. The checklist is available at <https://energy.gov/management/office-management/operational-management/financial-assistance/financial-assistance-forms> under Award Forms.

Section VII - QUESTIONS/AGENCY CONTACTS

A. QUESTIONS

Questions relating to the grants.gov registration process, system requirements, how an application form works, or the submittal process must be directed to grants.gov at 1-800-518-4726 or support@grants.gov. DOE cannot answer these questions. Please only contact the grants.gov help desk for questions related to grants.gov.

For help with PAMS, click the “External User Guide” link on the PAMS website, <https://pamspublic.science.energy.gov/>. You may also contact the PAMS Help Desk, which can be reached Monday through Friday, 9:00AM – 5:30 PM Eastern Time. Telephone: (855) 818-1846 (toll free) or (301) 903-9610, Email: sc.pams-helpdesk@science.doe.gov. All submission and inquiries about this FOA should reference **DE-FOA-0002023**. Please only contact the PAMS help desk for technological issues with the PAMS system.

Questions regarding the specific program areas and technical requirements may be directed to the technical contacts listed for each program within the FOA or below. Please contact the program staff with all questions not directly related to the grants.gov or PAMS systems.

B. AGENCY CONTACTS

Grants.gov Customer Support	800-518-4726 (toll-free) support@grants.gov
PAMS Customer Support	855-818-1846 (toll-free) 301-903-9610 sc.pams-helpdesk@science.doe.gov
Program Manager Scientific Contact	Dr. Tim Fitzsimmons Office of Basic Energy Sciences 301-903-9830 tim.fitzsimmons@science.doe.gov

Section VIII - OTHER INFORMATION

A. MODIFICATIONS

Notices of any modifications to this FOA will be posted on grants.gov and the FedConnect portal. You can receive an email when a modification or an FOA message is posted by registering with FedConnect as an interested party for this FOA. It is recommended that you register as soon after release of the FOA as possible to ensure you receive timely notice of any modifications or other FOAs. More information is available at <https://www.fedconnect.net>.

B. GOVERNMENT RIGHT TO REJECT OR NEGOTIATE

DOE 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

(a) A DOE financial assistance award is valid only if it is in writing and is signed, either in writing or electronically, by a DOE Contracting Officer.

(b) Recipients are free to accept or reject the award. A request to draw down DOE funds constitutes the Recipient's acceptance of the terms and conditions of this Award.

D. PROPRIETARY APPLICATION INFORMATION

Patentable ideas, trade secrets, proprietary or confidential commercial or financial information, disclosure of which may harm the applicant, should be included in an application only when such information is necessary to convey an understanding of the proposed project. The use and disclosure of such data may be restricted, provided the applicant includes the following legend on the first page of the project narrative and specifies the pages of the application which are to be restricted:

“The data contained in pages _____ of this application have been submitted in confidence and contain trade secrets or proprietary information, and such data shall be used or disclosed only for evaluation purposes, provided that if this applicant receives an award as a result of or in connection with the submission of this application, DOE shall have the right to use or disclose the data herein to the extent provided in the award. This restriction does not limit the government's right to use or disclose data obtained without restriction from any source, including the applicant.”

To protect such data, each line or paragraph on the pages containing such data must be specifically identified and marked with a legend similar to the following:

“The following contains proprietary information that (name of applicant) requests not be released to persons outside the Government, except for purposes of review and evaluation.”

E. EVALUATION AND ADMINISTRATION BY NON-FEDERAL PERSONNEL

In conducting the merit review evaluation, 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 agreement prior to reviewing an application. Non-Federal personnel conducting administrative activities must sign a non-disclosure agreement.

F. INTELLECTUAL PROPERTY DEVELOPED UNDER THIS PROGRAM

Patent Rights: The government will have certain statutory rights in an invention that is conceived or first actually reduced to practice under a DOE award. 42 USC 5908 provides that title to such inventions vests in the United States, except where 35 USC 202 provides otherwise for nonprofit organizations or small business firms. However, the Secretary of Energy may waive all or any part of the rights of the United States subject to certain conditions. (See “Notice of Right to Request Patent Waiver” in paragraph G below.)

Rights in Technical Data: Normally, the government has unlimited rights in technical data created under a DOE agreement. Delivery or third party licensing of proprietary software or data developed solely at private expense will not normally be required except as specifically negotiated in a particular agreement to satisfy DOE’s own needs or to insure the commercialization of technology developed under a DOE agreement.

G. NOTICE OF RIGHT TO REQUEST PATENT WAIVER

Applicants may request a waiver of all or any part of the rights of the United States in inventions conceived or first actually reduced to practice in performance of an agreement as a result of this FOA, in advance of or within 30 days after the effective date of the award. Even if such advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver of the rights of the United States in identified inventions, i.e., individual inventions conceived or first actually reduced to practice in performance of the award. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784. For more information, see <https://energy.gov/gc/services/technology-transfer-and-procurement/office-assistant-general-counsel-technology-transf-1>

Domestic small businesses and domestic nonprofit organizations will receive the patent rights clause at 37 CFR 401.14, i.e., the implementation of the Bayh-Dole Act. This clause permits domestic small business and domestic nonprofit organizations to retain title to subject inventions. Therefore, small businesses and nonprofit organizations do not need to request a waiver.

H. NOTICE REGARDING ELIGIBLE/INELIGIBLE ACTIVITIES

Eligible activities under this program 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.

I. AVAILABILITY OF FUNDS

Funds are not presently available for this award. The Government's obligation under this award is contingent upon the availability of appropriated funds from which payment for award purposes can be made. No legal liability on the part of the Government for any payment may arise until funds are made available to the contracting officer for this award and until the awardee receives notice of such availability, to be confirmed in writing by the contracting officer.

J. ENVIRONMENTAL, SAFETY AND HEALTH (ES&H) PERFORMANCE OF WORK AT DOE FACILITIES

With respect to the performance of any portion of the work under this award which is performed at a DOE-owned or controlled site, the recipient agrees to comply with all state and Federal ES&H regulations, and with all other ES&H requirements of the operator of such site.

Prior to the performance on any work at a DOE-Owned or controlled site, the recipient shall contact the site facility manager for information on DOE and site specific ES&H requirements.

The recipient shall apply this provision to all subawardees at any tier.

K. FEDERAL, STATE, AND LOCAL REQUIREMENTS

With respect to the performance of any portion of the work under this award, the recipient agrees to comply with all applicable local, state, and Federal ES&H regulations. The recipient shall apply this provision to all sub awardees at any tier.

L. NATIONAL ENVIRONMENTAL POLICY ACT (NEPA) COMPLIANCE

If question 4.a. on the "Research and Related Other Project Information" document indicates "potential impact on the environment", or if DOE's own review indicates it, DOE may ask the applicant to provide additional information on those impacts in order to prepare an environmental critique/synopsis per 10 CFR 1021.216. Note that this pre-award environmental critique/synopsis process would be separate from the preparation of a NEPA document such as an environmental impact statement (EIS) or an environmental assessment (EA). If DOE determines the latter documentation is necessary, this process would need to be completed, funded by and with the participation of the awardee, prior to them taking any action on the proposed project that could have adverse environmental effects or that could limit the choice of reasonable alternatives. The inability to satisfy the NEPA requirements after an award would result in cancellation of the award. Note that in most cases, even where potential impact on the environment exists, preparation of such NEPA documents is rarely necessary, but DOE has the expectation that the Applicant will disclose the potential, which would serve to initiate dialog with DOE if necessary. Should the applicant have any uncertainty, they should check "yes."