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Office of Energy Efficiency and Renewable Energy (EERE)

Solar Energy Technologies Office
Fiscal Year 2020 Perovskite Funding Program

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FOA Issue Date:	8/13/2020
Informational Webinar:	8/21/2020 3:00 p.m. ET
Submission Deadline for Concept Papers:	9/23/2020 5:00 p.m. ET
Submission Deadline for Full Applications:	12/7/2020 5:00 p.m. ET
Expected Submission Deadline for Replies to Reviewer Comments:	1/15/2021 5:00 p.m. ET
Expected Date for EERE Selection Notifications:	3/2021
Expected Timeframe for Award Negotiations:	4/2021 – 6/2021

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

Modifications

All modifications to the FOA are highlighted in the body of the FOA. Changes from modification 000001 are highlighted in yellow. Changes from modification 0002 are highlighted in green.

Mod. No.	Date	Description of Modification
000001	9/9/2020	Addition of Section IV.I.xi: Prohibition related to Foreign Government-Sponsored Talent Recruitment Programs; see page 53. Addition of Section VI.B.xvi: Conflict of Interest Disclosure Statements; see page 67. Addition of Section VI.B.xvii: Table of Personnel; see page 67. Addition of Appendix G: Prohibition related to Foreign Government-Sponsored Talent Recruitment Programs; see page 89.
000002	11/3/2020	Modified the Full Application Deadline, expected date for Selection Notifications, and expected timeframe for Award Negotiations; see the cover page of the FOA

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I. Funding Opportunity Description

A. Background and Context

i. Overview and Purpose

This funding opportunity announcement (FOA) is being issued by the U.S. Department of Energy's (DOE) Office of Energy Efficiency and Renewable Energy (EERE) Solar Energy Technologies Office (SETO). SETO supports solar energy research and development (R&D) with the goal of improving the affordability, reliability, and domestic benefit of solar technologies on the grid. This section describes the overall goals of the Solar Energy Technologies Office Fiscal Year 2020 Perovskite funding program and the types of projects being solicited for funding support through this FOA.

The photovoltaics (PV) industry is expanding and evolving rapidly. In 2010, solar represented a tiny fraction of the country's electricity supply, with about 2.5 gigawatts (GW) of solar capacity.¹ Now, as we near the end of the decade, solar energy provides about 2.6% of U.S. electricity², with over 70 GW installed and more than 2 million solar energy systems.³ In some states and regions, solar represents over 10% of annual electricity generation.⁴ Instantaneous solar generation can reach a much higher level, nearly 50% in some cases.⁵

PV generation technologies have the potential to alter the energy landscape and enhance energy system resilience and sustainability. Existing solar technologies are at grid parity (producing electricity at or below the cost from other generation technologies) in many locations and solar installations are a large percentage of new generation capacity on the electric grid⁶. However, PV today still utilizes incentives to maintain this high rate of deployment—further lowering costs can enable more cost-effective integration and contribute to greater energy affordability.

The expansion of solar generation has historically relied heavily on silicon modules produced abroad. To maximize manufacturing value, energy security, and industry jobs, SETO supports R&D of technologies that are promising for being manufactured competitively domestically.

¹ Wood Mackenzie/SEIA: Solar Market Insight Report.

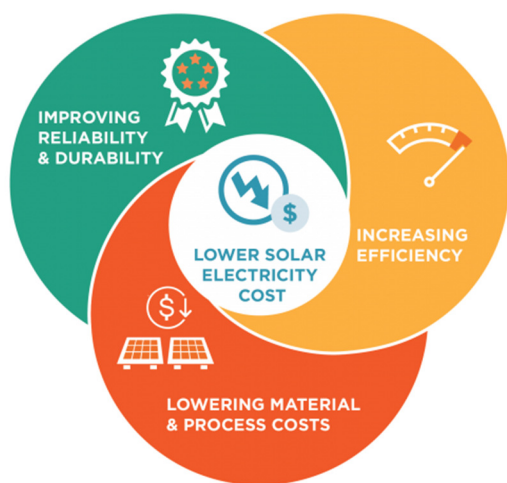
² U.S. Energy Information Administration (EIA): "Electric Power Monthly" Tables 6.1, 6.2B, 1.1, 1.1A; February 2020.

³ Wood Mackenzie/SEIA: U.S. Solar Market Insight: Q2 2020.

⁴ U.S. Energy Information Administration (EIA). In California, solar has reached 19%.

⁵ For example, in March 2018, the California Independent System Operator (CAISO) saw an all-time peak percentage of demand served by solar: 49.95%. See <https://www.greentechmedia.com/articles/read/california-sets-two-new-solar-records>.

⁶ U.S. Energy Information Administration (EIA): <https://www.eia.gov/todayinenergy/detail.php?id=42495>



For PV technologies, SETO structures R&D programs around three primary efforts that contribute to lower solar electricity cost: increasing efficiency, improving reliability and durability, and lowering material and process costs. SETO supports a wide range of PV R&D, including advancing commercial technologies, such as silicon and cadmium telluride (CdTe), and investigating pre-commercial technologies, such as organic photovoltaics (OPV) and perovskites.

Perovskite photovoltaics are a family of related materials and device architectures produced using various fabrication methods. They are named after the crystal structure of the absorber layer, which is typically an organic-inorganic hybrid, including lead

or tin. These materials have shown potential for both high performance and very low production costs. Research results from university, national laboratory, and industry groups have shown rapid increases in the efficiency of perovskite devices over the past several years. The record efficiencies have exceeded other thin-film technologies, such as OPV, copper indium gallium diselenide (CIGS), and CdTe. While device stability and scaling issues remain, these efficiency results show the potential for a high-performance technology.

Perovskite photovoltaics can be fabricated using high-throughput approaches like roll-to-roll coating, which could reduce both direct module production costs and capital intensity for production facilities. As such, they may significantly contribute to achieving SETO's low-cost solar PV electricity goals and may enable faster scaling of domestic solar manufacturing capacity, relative to silicon or CdTe technologies. SETO has been strategically and increasingly investing in perovskite PV R&D over the past decade, most recently through the [SETO FY2018](#) and [FY2019](#) funding programs⁷.

The SETO 2020 Perovskite Funding Program seeks to advance perovskite photovoltaic technology development and competitiveness through projects in advanced device and manufacturing R&D and performance validation. The primary goals are to improve understanding of stability; establish methods to produce high-efficiency, stable devices using industry-relevant fabrication techniques; and develop test protocols that enable high confidence in long-duration field performance of perovskite-based photovoltaic technologies.

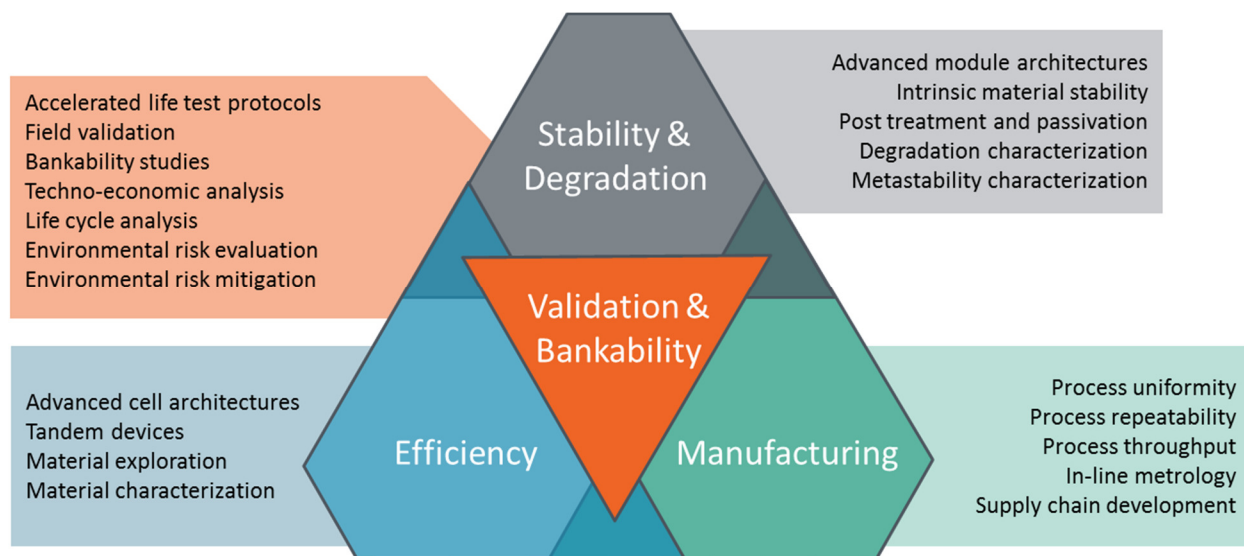
⁷ Perovskite PV R&D was also of interest for the [SETO FY2020](#) funding program (in progress).

ii. Technology Space and Strategic Goals

Perovskite R&D Challenges:

SETO has identified four primary challenges that must be simultaneously addressed for perovskite technologies to be commercially successful. While the four categories are not independent, each represents a unique set of barriers and requires specific technical and commercial targets to be achieved.

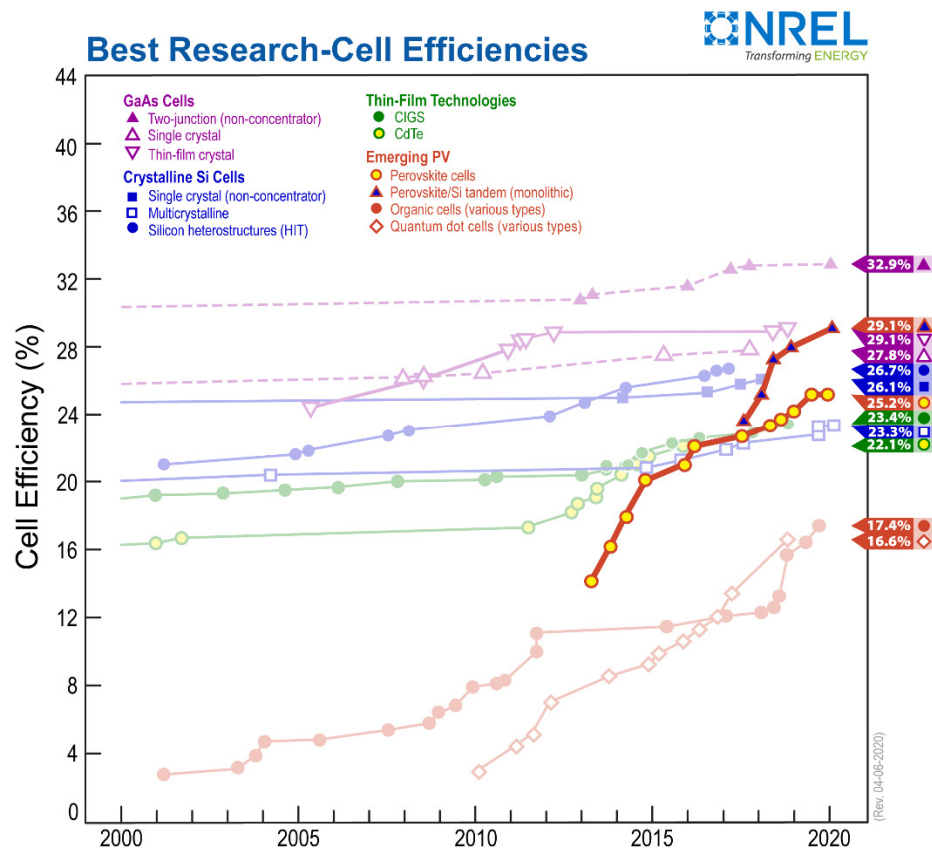
The basic challenge framework is shown below, including some examples of prior and current project efforts that address each challenge.



Overview of Challenge Areas

- 1. Power Conversion Efficiency:** Perovskite devices have shown high performance, exceeding all thin-film technologies other than III-V technologies, indicating potential commercial viability. However, high-efficiency devices have not necessarily been paired with viable stability and fabrication characteristics. As work in stability and scaling continue, the community must ensure that resultant devices retain high performance. Additionally, continued progress could be particularly valuable in mobile, disaster response or operational energy markets where high power-to-mass ratios are critical.

Perovskite photovoltaics have shown rapid improvements in device efficiencies over the past five years. Despite the challenge of stability (which results in limitations when performing head-to-head comparisons), the record cell efficiencies for perovskites have nearly doubled, and they hold the efficiency record for polycrystalline thin-film technologies (which also include CIGS and CdTe).



Efficiency Records Chart with Perovskite Cells reaching 25.2% Single Junction; 29.1 Tandem⁸

Perovskite bandgaps can be tuned by changing material composition, and a variety of formulations show strong performance. The bandgap flexibility enables optimized tandem architectures, and there are multiple opportunities to produce perovskite-only and hybrid absorber (e.g. perovskite-silicon or perovskite-CdTe) tandems with power conversion efficiencies above 30%. Perovskite-only tandems could be particularly competitive in the mobile, disaster response, and defense operational energy areas, as they can be produced on flexible substrates with high power-to-mass ratios.

- 2. Stability and Degradation:** *Stability and degradation are critical challenges facing perovskite technologies. Despite significant progress, current operational lifetimes are not commercially viable. Mobile markets may tolerate a shorter operational life, but stability during storage (prior to use) is also a key performance criterion for this sector. For power generation, technologies that cannot operate for more than two decades are unlikely to be viable regardless of other benefits, and longer operations may be required even with low production costs.*

⁸Derived from <https://www.nrel.gov/pv/cell-efficiency.html>

Stability and degradation are among the most significant challenges for perovskite technologies. Perovskite and charge transport materials can be sensitive to water, oxygen, high temperatures, and ultraviolet light, all of which will be encountered during field operations. These sensitivities may manifest as both reversible meta-stability phenomena and permanent performance degradation, which ultimately complicate energy-yield prediction and performance.

Early perovskite devices degraded rapidly, but numerous researchers and companies have demonstrated substantial progress. A few years ago, typical perovskite devices would degrade within minutes or hours to non-functional states. Now multiple groups have demonstrated T80 lifetimes (i.e., the length of time in operation until measured output power is 80% of original output power) of over 1,000 hours (several months of operation). For commercially competitive, grid-level electricity production, SETO is targeting an operational lifetime of at least 20 years. The perovskite PV R&D community is heavily focused on this topic and considering multiple approaches to understand and improve intrinsic and extrinsic stability and degradation. Efforts include mixed dimensionality and passivation of absorber layers; alternative materials and formulations for absorber layers, charge transport layers, and electrodes; and advanced encapsulation materials and approaches to mitigate degradation sources during fabrication and operation.

One issue with assessing degradation in perovskites relates to testing and validation methodologies. Research groups frequently report performance results based on varied test conditions, including variability in encapsulation approaches, atmospheric composition, illumination, electrical bias, and other parameters. While such varied test conditions can provide insights and valuable data, the lack of standardization makes it challenging to directly compare results and difficult to predict field performance from test results.⁹ This affects the entire perovskite R&D community, independent of any specific research area, material set, or stability improvement approach.

- 3. *Manufacturability:*** *Production-cost models illustrate that module size and fabrication throughput are major drivers for cost reductions. It is critical to develop and validate manufacturing processes and tools that enable high-throughput fabrication of large-format modules with low cell to module conversion losses. This area involves the manufacturing, tool development, and commercialization communities more extensively than efficiency and stability do.*

A range of methods have been used to produce lab-scale perovskite devices, including spin-coating, blade-coating, thermal evaporation, vapor transport, and others. Many of these methods are not easily scalable to commercially relevant throughput or would result in high production costs. However, there are also significant efforts to apply highly scalable

⁹ Consensus on ISOS Protocols for Stability Assessment and Reporting for Perovskite Photovoltaics

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approaches to perovskite fabrication. For thin-film technologies, these can be split into two major types of capital production line:

1. **Sheet-to-Sheet:** Device layers are deposited on a rigid substrate, which typically acts as the front surface of the fully encapsulated module. This approach is commonly used in the CdTe industry.
2. **Roll-to-Roll:** Device layers are deposited on a flexible substrate, which can then be used as either an interior or exterior portion of the encapsulated module, depending on barrier properties. This approach has been previously attempted for other photovoltaic technologies but did not gain significant commercial traction due to barriers to technology efficiencies (independent of fabrication approach) and is widely used to produce photographic and chemical film and paper products, such as newspapers.

The scalability of these fabrication approaches give perovskites the potential to alter the relative contributions of capital and operational expenses (CapEx and OpEx) for solar modules. As facility throughput increases, module costs are increasingly dominated by OpEx (specifically, material costs) due to amortization of CapEx across a large amount of product. This could enable faster capacity expansion compared to silicon photovoltaics due to reduced financial exposure, as initial capital requirements are lower and ongoing expenditures can be considered relative to plant revenue. The processes under consideration are well established in the film and display industry, among others; therefore, knowledge and supply chains around the tooling and components can be leveraged to further reduce scaling costs and risk.

4. **Technology Validation and Bankability:** *Variability in testing protocols and minimal field data limits comparability across perovskite PV variants as well as community confidence in long-term operational behavior. It is critical to develop and validate testing protocols that can be used to establish bankability for perovskite PV technologies.*

While the first three challenges are technical, there is a commercial and financial challenge related to confidence and trust. Current test protocols were developed for other PV technologies; they vary and rely heavily on indoor testing. They may yield valid results, but they are not necessarily comparable to each other or to outdoor field performance. Understanding of operational field performance is limited, and accelerated test protocols to assess module lifetime are not sufficiently developed for perovskite technology. Individual R&D entities and perovskite businesses may lack the incentive, objectivity, or scale to develop common protocols and approaches that can be used by the entire community. Cost modeling in the literature has typically focused on specific device structures and fabrication approaches, and used varying assumptions for the analysis. All of this limits comparability across perovskite technologies and overall perovskite bankability (i.e., willingness of financial institutions to finance a project or proposal at reasonable interest rates). Objective, trusted validation of characterization and test protocols, as well as long-term technology

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performance, is critical to obtaining sufficient confidence in perovskite technologies to enable investment in production scale-up and deployment. The increasing performance of perovskite devices and the rapidly changing material and device compositions have made standardized validation highly important.

Strategic Goals and Topics:

Perovskite photovoltaic technologies show the potential for high-efficiency operation and low production costs. As such, they may significantly contribute to achieving SETO's goals for low-cost domestic solar PV electricity. The R&D community has demonstrated high-performance devices at small scale, as well as the applicability of high-throughput manufacturing approaches, such as roll-to-roll fabrication. For commercial success, perovskite technologies must simultaneously achieve high performance, high stability, low cost, and verifiable performance.

Based on the current state of perovskite R&D and the challenges identified by SETO, this funding program will fund projects to advance the state of the art in device and manufacturing R&D, establish an objective, independent effort to validate performance results, and develop accelerated and commissioning test protocols.

There are three priority areas identified in this FOA:

Topic Area 1: Device R&D (Efficiency and Stability)

This topic area will fund research projects to advance perovskite efficiency and stability at the cell or mini-module scale beyond the current state of the art. Projects may include intrinsic and extrinsic approaches to improve stability, methods to understand and characterize degradation, alternative materials or processes to improve performance or reduce costs, or advanced device architecture, including tandems. Teams may be led by academic, national laboratory, or industry researchers, and should include diverse participants from the R&D community to maximize relevance and utilization of results.

Topic Area 2: Manufacturing R&D

This topic area will fund research projects to address challenges with manufacturing perovskite modules at relevant scale and throughput. Key areas will include process uniformity and repeatability, cell to module conversion losses, and encapsulation approaches. Teams must be led by a for-profit business, and should include substantial involvement by established manufacturing and process engineering entities with proven expertise in the area.

Topic Area 3: Validation and Bankability Center

This topic area seeks to establish a neutral, independent validation center that can be used to verify perovskite device performance and address acceptance and bankability challenges. Independence and neutrality are required to ensure there are no conflicts of interest between this effort and other projects seeking to demonstrate high-performance

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devices. This center will be responsible for developing and refining test protocols, including accelerated life testing that closely correlates with long-term fielded performance. The center will also be responsible for operating an extensive field testing effort using devices produced by the R&D community to iteratively refine all test protocols and improve community understanding of remaining stability and performance issues. The center will investigate the environmental impact of perovskite technologies and serve as an objective source of information and analysis for the investment and finance communities. Teams must be led by a DOE/National Nuclear Security Agency (NNSA) Federally Funded Research and Development Center (FFRDC)/National Laboratory.

SETO has funded a broad range work in perovskite PV and remains interested in both single-junction and tandem devices. Tandem devices of interest include perovskite-perovskite devices and hybrid devices that combine a perovskite absorber layer with a dissimilar photovoltaic technology, such as silicon.

SETO is interested in any and all material sets, device architectures, and module formats, but all proposed approaches must show a potential route to commercialization in terms of cost, manufacturability, stability, and performance.

Projects funded by SETO are expected to produce high-impact outcomes with a view toward commercialization and wide dissemination, including publication of the results in high-visibility, high-impact, peer-reviewed journals.

iii. Teaming Partner List

Successful applications to many of the topics in this FOA will consist of research teams with partners across different industries and sectors. To facilitate the formation of teams, SETO is providing a forum where interested parties can add themselves to a Teaming Partner List, which allows organizations that may wish to apply to the FOA but not as the prime applicant, to express interest to potential partners.

The Teaming Partner List and instructions will be available on EERE Exchange at <https://eere-Exchange.energy.gov> under FOA DE-FOA-0002357 during the FOA application period. The list will be updated at least weekly until the close of the full application period, to reflect new teaming partners who have provided their information.

Disclaimer: By submitting a request to be included on the Teaming Partner List, the requesting organization consents to the publication of its contact information. By enabling and publishing the Teaming Partner List, EERE is not endorsing, sponsoring, or otherwise evaluating the qualifications of the

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individuals and organizations that are identifying themselves for placement on this Teaming Partner List. EERE will not pay for the provision of any information, nor will it compensate any applicants or requesting organizations for the development of such information.

B. Topic Areas

i. Topic Area 1: Device R&D (Efficiency and Stability)

This topic area will fund research projects to advance perovskite efficiency and stability beyond the current state of the art.

Perovskite photovoltaics have demonstrated high conversion efficiencies at the cell level and have recently shown significant improvements in operational stability. Multiple research groups have demonstrated perovskite devices that maintain 80% of the initial performance (T80) after 1,000 hours under continuous illumination. Still, this advancement is insufficient for cost-effective field operations. We need to continue to improve device stability (targeting T80 at or above 20 years) while simultaneously maintaining or improving efficiency (targeting power conversion efficiencies of 18% or above for single-junction devices or 25% or above for tandem devices) and manufacturing costs.

Projects that explore material combinations, interface design, passivation, other post-treatment approaches or similar topics are critical to identifying and demonstrating high-performance, stable perovskite devices. Additionally, projects that seek to develop and apply new metrology and characterization techniques to accelerate cycles of learning on efficiency and stability are highly valuable to this effort.

All proposals that seek to improve understanding of performance and degradation, as well as those that present a reasonable approach to producing commercially competitive devices, will be considered. Some potential areas of investigation are:

- Intrinsic material stability, including alternative material formulations or fabrication approaches;
- Extrinsic device stability, including alternative stack materials, interface design, fabrication and post-treatment approaches, and encapsulation;
- Electrical “metastability” characterization, including transient behavior due to dark-storage exposure, open circuit operation, and ambient temperature variation;
- Development and application of metrology and degradation characterization techniques, including those that accelerate degradation mechanisms, reduce required testing time, improve fundamental

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understanding of relevant mechanisms, and reduce uncertainty in testing results; and

- Advanced device designs, including perovskite single-junction devices and perovskite-only and hybrid (e.g., perovskite and silicon, perovskite and CdTe, etc.) tandem devices.

Applicants are encouraged to assemble project teams capable of addressing the proposed technical scope and considering the commercial applicability of the technology. Team formation may include partnerships with national labs, academic researchers, small businesses, established manufacturers, engineering firms, testing laboratories, bankability suppliers, or similar.

Successful projects in this area will improve the understanding of perovskite performance and degradation mechanisms. Projects focused on advanced device fabrication should clearly present the technical potential of the proposed approach: At minimum, proposals must present a compelling argument that a T80 greater than 20 years is achievable with single-junction module efficiency above 18% or tandem module efficiency above 25%. Applicants should clearly present technology performance potential above and beyond these performance floors; simply meeting these values is unlikely to be sufficient. Applicants must also consider the path to commercial viability and justify that the proposed structure can provide a cost-competitive PV technology.

Topic Area 1 has a minimum cost share requirement of 20% of the total project costs.

ii. Topic Area 2: Manufacturing R&D

This topic area will fund research projects to address challenges with manufacturing perovskite modules at relevant scale and throughput.

This topic area is restricted to for-profit business entities as prime recipients, as these entities are best positioned to rapidly commercialize new technologies related to innovations in manufacturing.

Perovskite photovoltaics have shown potential for high performance and low manufacturing costs, but much of the research has addressed small-format devices. Full device fabrication at commercially relevant sizes and process throughput is needed to fully understand and address manufacturing challenges, improve process control, reduce cell to module efficiency losses, and validate production cost estimates. This topic runs parallel with Topic Area 1: Device R&D to enable information sharing and accelerate community cycles of learning on perovskite efficiency, stability, and manufacturability.

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Proposals in this topic area should address key manufacturing challenges for perovskite photovoltaics. Proposals may address full device fabrication processes or target specific high-risk steps within known process flows. Projects should seek to demonstrate viability of their approach at a level that shows a clear path to commercialization. Some potential areas of investigation are:

- Development of new deposition or post-treatment processes or equipment for any or all layers within perovskite modules;
- Demonstration at scale of deposition or post-treatment processes or equipment for any or all layers within perovskite modules;
- Process uniformity and repeatability for solution or vapor fabrication approaches;
- Cell to module conversion approaches that maintain high device efficiencies with high geometric fill factors;
- Module encapsulation approaches that produce devices with high efficiencies and long operational lifetimes at low cost; and
- Supply chain consistency, including low-cost synthesis of precursor or module materials, refinement of material specifications to ensure sufficient precision for repeatable device fabrication, and similar.

Applicants are strongly encouraged to assemble project teams with all necessary expertise to be capable of demonstrating commercially relevant manufacturing processes and a reasonable path to technology commercialization. Substantial involvement by established manufacturing experts, either as prime or subrecipients, is encouraged. Manufacturing experts could be established solar hardware manufacturers with active production, established equipment manufacturers serving either the solar industry or relevant other industries (e.g., light-emitting diode, battery, or film manufacturers), engineering firms providing systems or process engineering services, or similar. Teams may also include academic researchers, National Labs, or other relevant participants as subrecipients. The teams should have direct and continuous access to expertise that will accelerate process development and build confidence that a clear path to commercialization exists for perovskite photovoltaics.

Successful proposals in this area will clearly explain:

- Project goals and development plan, including quantitative milestones for technical, business, and stakeholder engagement activities such as dissemination of results, technology requirements development with potential customers or suppliers, or similar;
- Projections for price and/or performance improvements supported by a preliminary cost model that reference a relevant benchmark and consider state-of-the-art and potential competing technologies;

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- The technical potential of the proposed approach: at minimum proposals should present a compelling argument that a T80 greater than 20 years is achievable with single-junction module efficiency above 18% and tandem module efficiency above 25%. Applicants should clearly present technology performance potential above and beyond these performance floors, as a goal of this FOA is to fund work that will exceed these values.
- How the proposed innovation is differentiated with respect to existing commercially available PV products or solutions;
- How the team will apply process and systems engineering best practices to efficiently and effectively advance the proposed technology toward commercialization;
- How the team will apply industrial hygiene best practices to ensure quality control and which team members will be primarily responsible; and
- How federal funding to address the technical risks identified in the application will increase the likelihood of securing private investment following the award period and technology commercialization.

Cost share is required for all projects, but the cost share percentage may vary depending on the nature of the work in a task. A minimum 20% recipient cost share is required for R&D tasks; a minimum 50% recipient cost share is required for demonstration tasks. Individual tasks will be cost-shared at either a 20% or 50% rate, depending on the type of work to be performed. (See Appendix B for more information on how to calculate cost share.) Generally, R&D tasks are focused on gaining a greater understanding of a process or technology and include the testing, refinement, and development of a prototype. Demonstration tasks generally consist of empirically or physically validating the technical feasibility and economic potential of a technology at a commercially relevant scale. However, as each project is different, DOE will make a final determination as to the appropriate classification of each task.

SETO encourages applicants to classify each activity as R&D or demonstration and identify the proposed budget and the corresponding cost share for the work proposed. This FOA seeks to leverage non-federal funding to the maximum extent possible. See Section V.C.i for the program policy factors that might be applied to determine which full applications SETO will select for award negotiations.

iii. Topic Area 3: Validation and Bankability Center

This topic area seeks to establish a neutral, independent validation center that can verify perovskite device performance and address bankability challenges.

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This topic area is restricted to DOE/NNSA FFRDCs/National Laboratories as prime recipients, as these entities are best suited to provide this service to the R&D community, both in terms of existing infrastructure and mission alignment.

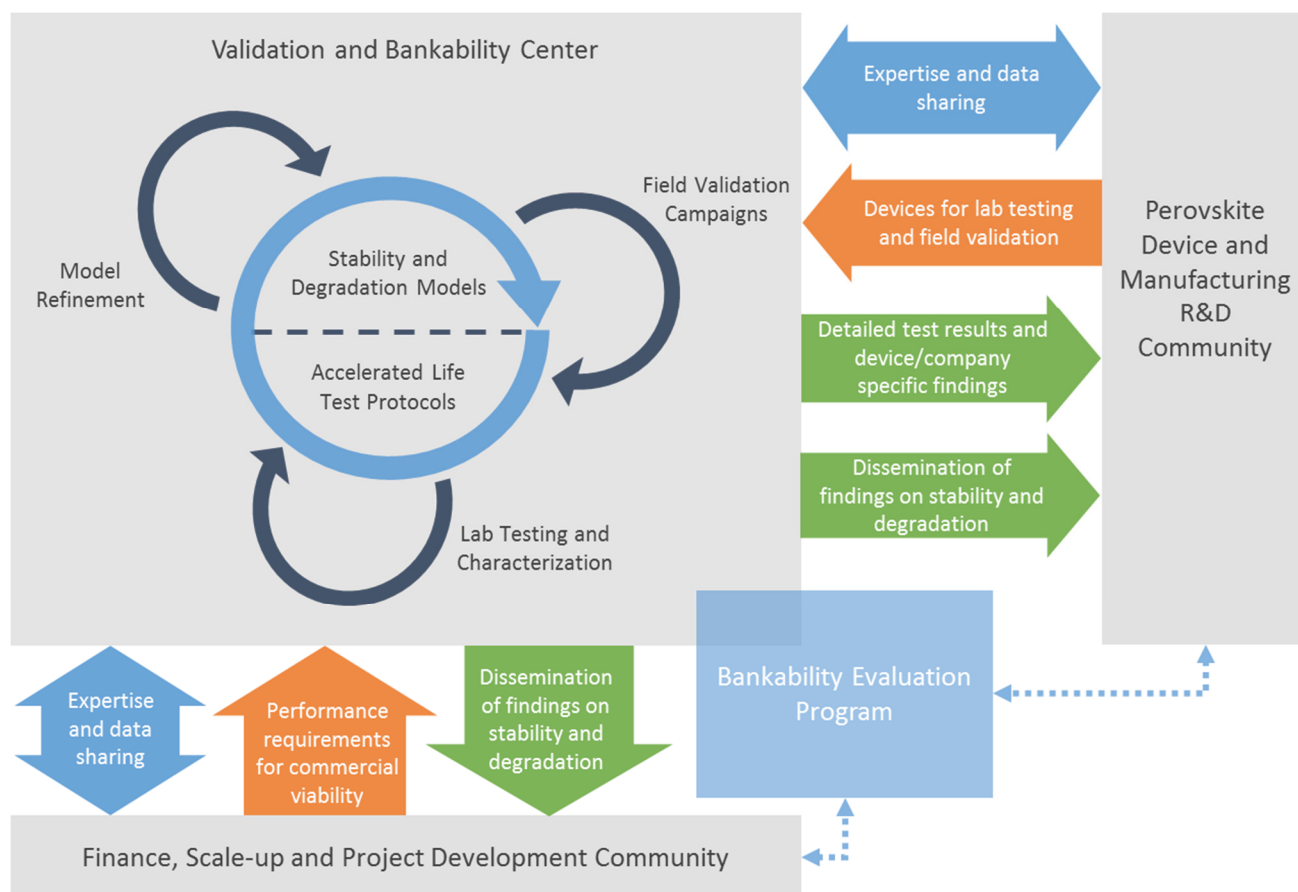
As previously stated, perovskite photovoltaics degradation rates have decreased in recent years, and researchers have achieved T80 above 1,000 hours. However, because a range of test protocols and conditions led to these results, this limits direct comparison of different material and device structures. Additionally, there is very little data on field performance of perovskite technologies, so standard test protocols developed for other photovoltaic technologies may not apply to perovskite solar technologies. Degradation mechanisms and acceleration factors differ among technologies, so protocols that generate confidence in the long-term performance of silicon or CdTe modules cannot currently generate the same confidence for perovskites. In addition to lifetime performance considerations, environmental impacts of fielded perovskite photovoltaics are not fully understood or quantified.

There is a need to create, refine, and validate testing protocols for perovskite photovoltaic technologies that can provide confidence in their long-term, fielded performance. This will be needed for future investments in manufacturing capabilities and project development. Ideally this would involve an iterative feedback loop between lab-scale testing and characterization, protocol development, and field validation.

Center Responsibilities and Scope:

Proposals in this topic area should present a clear plan to establish a perovskite photovoltaics validation center that will collaborate with the perovskite PV and extended reliability community to establish test protocols for characterization, acceptance, accelerated life testing, and field validation of perovskite technologies. The center must be able to support a broad range of perovskite technologies and R&D community members. Proposals should target five-year operations and must, at minimum:

1. Provide objective validation services to inform model and protocol development, including both laboratory and field testing, for the perovskite R&D community;
2. Develop and refine test protocols, including commissioning, acceptance, and accelerated life tests; and
3. Conduct field performance validation campaigns to confirm test protocol adequacy.



Potential Center Scope, Interfaces, and Iterative Activities

Applicants are encouraged to consider structures similar to the Jet Propulsion Lab block-buy program^{10,11}, where award funds or center services would be offered as a cost share mechanism to any R&D or industry group that could produce a relevant quantity (kW-scale) of high-performance perovskite devices to be utilized for laboratory and field validation.

Technical Objectives:

One desired outcome of this work is to definitively differentiate so-called metastability behavior from degradation phenomena in perovskite cells and modules. In this context, “metastability” refers to transient power changes (gains or losses) that are a function of temperature, irradiance, or bias within a module’s normal operation conditions, including storage and pre-grid connection. “Degradation” refers to power loss due to permanent changes in the materials or structure of the module. Proposals may include plans to:

¹⁰ <https://www.nrel.gov/docs/fy14osti/60950.pdf>; section 2

¹¹ https://www2.jpl.nasa.gov/adv_tech/photovol/Pub_blockbuys.htm

- ***Develop or identify facilities and methods to characterize metastable behavior in the field and correlate it to the same behavior in the lab.*** Generally, the time constants of metastable field behaviors are expected to be hours to months and, therefore, should be practical to demonstrate in the course of the project. Tests to consider may be an open circuit field test; “dark soak” storage exposure, followed by an operational field test; and seasonal operational tests to capture behaviors dependent on temperature or irradiance.
- ***Develop or identify facilities and methods to pinpoint degradation modes and mechanisms that are a continuous function of stress across ranges of temperature, bias, and other environmental conditions in the field.*** Typically, these degradation modes can be modeled using the Arrhenius relationship, but any suitable model may be used. In the absence of power loss or other easily identified field observations, proposals may offer contingency plans for materials analysis and other forensic investigations to validate predictive models developed in the lab. For example, while power loss may not be observed yet, forensic analysis may reveal changes in molecular structure that are consistent with a given thermal degradation model.
- ***Develop or identify facilities and methods to pinpoint failure modes that depend on exceeding a critical stress.*** Examples of such failure modes are voltage breakdown/arcing, adhesion failure/delamination, and fracture phenomena. These studies should aim to identify or validate the relative robustness of the cell or module by comparing the failure threshold to the maximum operational stress level in the field. (Field demonstration is not required unless the predicted failure threshold exists within the normal operational field stress profile.)
- ***Develop test vehicles that enable controlled, differential application of various stressors and the characterization of degraded cells and cell materials after field exposure.*** Examples of test vehicles may include innovative packaging to control environmental variables (e.g., insulating packages to provide incremental changes in cell temperature), easily deconstructed packages for failure or materials analysis, or applying a controlled electrical bias (regardless of insolation) to study corrosion behavior. Such constructions should enable control of certain experimental factors while allowing natural field exposure of others. For example, incorporating a well-understood edge seal into the test vehicle may allow for a photo-oxidation experiment that controls gas and moisture permeation while simultaneously exposing the test vehicle to natural temperature and irradiance variations.

Improved understanding and differentiation of these mechanisms and failure modes should enable the development of accelerated life test protocols.

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These protocols should apply to a broad range of perovskite photovoltaic devices and be validated against field tests for modules with known failure modes and a range of operational lifetimes. Multiple R&D community members should produce modules and devices for test development and validation, and they should target relevant campaign scales (replication) and device formats (module sizes, etc.).

Proposal Content:

Successful proposals in this area will clearly explain their goals, plans, and resources in the following areas (non-exhaustive):

Testing Services:

- What characterization and test services will be provided to the community, considering both performance and environmental aspects;
- Why these services are the most appropriate and valuable to the R&D community;
- How the team will engage with the community to ensure that these capabilities are utilized;
- How the team will prioritize requests from multiple community members and equitably manage resource allocation.

Validation Protocols and Campaigns:

- Level of predictive accuracy for acceptance and accelerated life test protocols that the team believes can be achieved through this project;
- Scope, scale, and duration of field validation campaigns that will be conducted during the project. SETO is interested in mixed duration, multi-year efforts capable of simultaneously evaluating more than 50kW of perovskite devices;
- Methods to ensure there are enough test modules and that the modules are diverse in materials, architectures, fabrication approach, encapsulation, etc., such that reasonable conclusions can be drawn and direct comparisons made between technology approaches.
 - This will require a strategy to obtain and utilize modules produced by the perovskite community;
 - Structures similar to a block-buy program and utilization of program funds as cost share mechanisms for device fabrication are encouraged, as previously noted.
 - This will also require a strategy to protect the intellectual property and performance data for early participants while ensuring sufficient transparency in the test campaigns.

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- Protocols and knowledge bases used as the initial development points for commissioning, acceptance, and accelerated life test protocols;
- Methods to use field data to refine test protocols;
- Methods to use model development and lab characterization to refine test protocols;
- Methods to use short-operational-life modules with known failure modes to accelerate protocol development;
- Methods to solicit and incorporate community feedback on resulting protocols and module test results.

Facilities:

- What laboratory facilities are available to the team to support this project;
- What field testing facilities and sites are available to the team;
- What additional capabilities will be needed for successful project completion.

Objectivity and Data Management:

- How the management structure will avoid conflicts of interest and competing incentives with programs seeking to demonstrate high-performance perovskite devices;
- How to protect the performance data, intellectual property, and trade secrets for early participants in the validation campaigns while maintaining sufficient data transparency to build community confidence;
- How findings will be disseminated to relevant stakeholders and incorporate feedback to improve adoption and acceptance;
- Long-term data management strategy.

Center Management Plan:

- How the center will offer services fairly to any potential community participant;
- What the outreach strategy will be to the community;
- What mechanisms the center will use to encourage the community to participate and supply material;
- How the center will update over time to provide the best possible services to the community;

Bankability Add-on:

Proposals in this topic area may apply for up to \$8 million in federal funds addressing only the scope described above for Topic Area 3. However, a total of \$10 million (i.e., an additional \$2 million) in federal funding may be available if

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the proposal includes a detailed, reasonable strategy to provide bankability assessments to community members whose technology has demonstrated a threshold level of performance. To be considered for this increase in funding, proposals should:

- Include an established, commercial bankability service provider as a partner;
- Define the specific bankability assessments that would be available;
- Define the performance level that a team or technology must demonstrate to access these bankability services;
- Explain how results of the bankability assessments would be used and/or disseminated.
- Explain how the bankability service would be provided to the community member.

Areas Specifically Not of Interest:

A validation center awarded under this topic would be responsible for improving the understanding of degradation mechanisms in perovskite photovoltaics and increasing community confidence that acceptance and accelerated life test protocols yield results representative of field performance.

As such, the center must remain objective and independent from parallel efforts to produce high-performance, stable perovskite devices. To ensure objectivity, applications that propose activities to directly improve perovskite performance, rather than simply understanding and predicting performance, will not be considered for funding.

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

C. Applications Specifically Not of Interest

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

- Applications that fall outside the technical parameters specified in Section I.A and I.B of the FOA
- Applications for proposed technologies that are not based on sound scientific principles, i.e., applications that violate the laws of thermodynamics
- Applications for solar technologies other than perovskite photovoltaics (except where combined with perovskites)
- Applications for perovskite technologies not intended for use in solar generation systems
- Other topic areas designated specifically not of interest can be found within each Topic Area description in Section I.B, above.

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D. Authorizing Statutes

The programmatic authorizing statute is EPACT 2005, Section 931 (a)(2)(A).

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

II. Award Information

A. Award Overview

i. Estimated Funding

EERE expects to make a total of approximately \$20 million of federal funding available for new awards under this FOA, subject to the availability of appropriated funds. EERE anticipates making approximately 6-10 awards under this FOA. EERE may issue one, multiple, or no awards. Individual awards may vary between \$500,000 and \$10 million.

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

Topic Area 1: Device R&D (Efficiency and Stability): EERE may issue approximately 3-6 awards in this topic area. Individual awards may vary between \$500,000 and \$1.5 million.

Topic Area 2: Manufacturing R&D: EERE may issue approximately 2-4 awards in this topic area. Individual awards may vary between \$1.5 million and \$2.5 million.

Topic Area 3: Validation and Bankability: EERE may issue approximately 1 award in this topic area. Individual awards may vary between \$8 million and \$10 million.

EERE may establish more than one budget period for each award and fund only the initial budget period(s). Funding for all budget periods, including the initial budget period, is not guaranteed. Before the expiration of the initial budget period(s), EERE may perform a down-select among different recipients and provide additional funding only to a subset of recipients.

ii. Period of Performance

EERE anticipates making awards that will run up to 36 months for Topic Areas 1 and 2 and 60 months for Topic Area 3, comprised of one or more budget periods. Project continuation will be contingent upon several elements, including

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satisfactory performance and Go/No-Go decision review. For a complete list, see Section VI.B.xiv. At the Go/No-Go decision points, EERE will evaluate project performance, project schedule adherence, the extent milestone objectives are met, compliance with reporting requirements, and overall contribution to the program goals and objectives. As a result of this evaluation, EERE may, at its discretion, authorize the following actions: (1) continue to fund the project, contingent upon the availability of funds appropriated by Congress for the purpose of this program and the availability of future-year budget authority; (2) recommend redirection of work under the project; (3) place a hold on federal funding for the project, pending further supporting data or funding; or (4) discontinue funding the project because of insufficient progress, change in strategic direction, or lack of funding.

iii. New Applications Only

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

B. EERE Funding Agreements

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

i. Cooperative Agreements

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

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

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

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

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

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Regardless of these arrangements, the entity that applied as the prime recipient for the project will remain the prime recipient for the project.

iii. Grants

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

III. Eligibility Information

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

The eligibility requirements under Section III.A of this section apply to all applicants of this FOA, except:

Topic Area 2 Eligibility Restriction: Eligibility is restricted to for-profit business entities as the prime recipient of awards. The reason for this restriction is that these entities are best positioned to rapidly commercialize new technologies related to innovations in manufacturing. For Topic Area 2, the scope of work performed by the prime recipient shall not be less than the scope of work performed by the subrecipients who are ineligible to be prime applicants, as measured by the total project costs. The requirement for the prime recipient's share of total project costs can be met with the prime's percentage being greater than the individual contribution of each subrecipient even if the prime applicant's share is less than 50% of the scope of work. For example a project allocation of 40% prime applicant and three subapplicants each utilizing 20% of the budget is allowable.

Topic Area 3 Eligibility Restriction: Eligibility is restricted to DOE and National Nuclear Security Agency (NNSA) Federally Funded Research and Development Centers (FFRDCs)/National laboratories. The reason for this restriction is that SETO seeks to establish an objective validation capability, and the FFRDCs and national laboratories are best suited to provide this service to the R&D community, both in terms of existing infrastructure and mission alignment.

A. Eligible Applicants

i. Individuals

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

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ii. Domestic Entities

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

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

DOE/NNSA FFRDCs are eligible to apply for funding as a prime recipient or subrecipient, except under Topic Area 2, where they cannot apply as prime, as described above.

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

Federal agencies and instrumentalities (other than DOE) are eligible to apply for funding as a subrecipient, but are not eligible to apply as a prime recipient.

iii. Foreign Entities

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

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

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

A foreign entity may receive funding as a subrecipient.

iv. Incorporated Consortia

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

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

v. Unincorporated Consortia

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

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

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

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B. Cost Sharing

For Topics 1 and 2, the cost share must be at least 20% of the total allowable costs (i.e., the sum of the government share, including FFRDC costs if applicable, and the recipient share of allowable costs equals the total allowable cost of the project) for research and development projects and 50% of the total allowable costs for demonstration and commercial application projects and must come from non-federal sources unless otherwise allowed by law. (See 2 CFR 200.306 and 2 CFR 910.130 for the applicable cost sharing requirements.)

For Topic 3, cost share is not required, although it is encouraged.

Topic 1: Device R&D	20% cost share
Topic 2: Manufacturing R&D	20%-50% cost share, depending on project activities
Topic 3: Validation and Bankability	Cost share encouraged but not required

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

i. Legal Responsibility

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

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

ii. Cost Share Allocation

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

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iii. Cost Share Types and Allowability

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

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

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

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

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

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

- Revenues or royalties from the prospective operation of an activity beyond the project period;
- Proceeds from the prospective sale of an asset of an activity;
- Federal funding or property (e.g., federal grants, equipment owned by the federal government);
- Expenditures that were reimbursed under a separate federal program; or
- Costs of software licenses. Costs for the purchase of off-the-shelf software offered commercially to the general public will be considered on a case-by-case basis. Third party donation of off-the-shelf software will be considered on a case-by-case basis. Software licenses for software owned by prime or sub-recipients will not be considered allowable as cost share.

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

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

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

iv. Cost Share Contributions by FFRDCs

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

v. Cost Share Verification

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

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

vi. Cost Share Payment

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

In limited circumstances, and where it is in the government's interest, the EERE Contracting Officer may approve a request by the prime recipient to meet its cost share requirements on a less frequent basis, such as monthly or quarterly.

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Regardless of the interval requested, the prime recipient must be up-to-date on cost share at each interval. Such requests must be sent to the Contracting Officer during award negotiations and include the following information: (1) a detailed justification for the request; (2) a proposed schedule of payments, including amounts and dates; (3) a written commitment to meet that schedule; and (4) such evidence as necessary to demonstrate that the prime recipient has complied with its cost share obligations to date. The Contracting Officer must approve all such requests before they go into effect.

C. Compliance Criteria

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

i. Compliance Criteria

i. Concept Papers

Concept Papers are deemed compliant if:

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

ii. Full Applications

Full Applications are deemed compliant if:

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

iii. Replies to Reviewer Comments

Replies to Reviewer Comments are deemed compliant if:

- The Reply to Reviewer Comments complies with the content and form requirements in Section IV.E. of the FOA; and

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- The applicant successfully uploaded all required documents to EERE Exchange by the deadline stated in the FOA.

D. Responsiveness Criteria

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

E. Other Eligibility Requirements

i. Requirements for DOE/National Nuclear Security Agency (NNSA) Federally Funded Research and Development Centers (FFRDC) Listed as the applicant

A DOE/NNSA FFRDC is eligible to apply for funding under this FOA if its cognizant Contracting Officer provides written authorization and this authorization is submitted with the application.

The following wording is acceptable for the authorization:

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

If a DOE/NNSA FFRDC is selected for award negotiation, the proposed work will be authorized under the DOE work authorization process and performed under the laboratory’s Management and Operating (M&O) contract.

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

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

i. Authorization for non-DOE/NNSA FFRDCs

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

ii. Authorization for DOE/NNSA FFRDCs

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

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

iii. Value/Funding

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

iv. Cost Share

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

v. Responsibility

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

vi. Limit on FFRDC Effort

The scope of work to be performed by the FFRDC may not be more significant than the scope of work to be performed by the applicant.

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

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

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G. Questions Regarding Eligibility

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

IV. Application and Submission Information

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

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

The Concept Paper, Full Application, and Reply to Reviewer Comments must conform to the following requirements:

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

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formatting requirements set forth above and single spaced. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages.

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

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

i. Additional Information on EERE Exchange

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

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

A. Application Forms

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

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

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ControlNumber_LeadOrganization_Project_Part_1

ControlNumber_LeadOrganization_Project_Part_2

B. Content and Form of the Concept Paper

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

i. Concept Paper Content Requirements

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

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

The Concept Paper must conform to the following content requirements:

Section	Page Limit	Description
Cover Page	One (1) page maximum	The cover page should include the project title, the specific FOA Topic Area being addressed, both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Technical Description and Impacts	Four (4) pages maximum	Applicants are required to describe succinctly: <ul style="list-style-type: none"> • The proposed technology and/or approach, including its basic operating principles and how it is unique and innovative; • The proposed technology's target level of performance (applicants should provide technical data or other support to show how the proposed target could be met); • The current state of the art in the relevant field and application, including key shortcomings, limitations, and challenges; • How the proposed technology and/or approach will overcome the shortcomings, limitations, and challenges in the relevant field and application; • The potential impact that the proposed project would have on the relevant field and application; • The key technical risks/issues associated with the proposed technology development plan; and • The impact that EERE funding would have on the proposed project.

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

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

C. Content and Form of the Full Application

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

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

Questions about this FOA? Email seto.pvsk.foa@ee.doe.gov

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

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

i. Full Application Content Requirements

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

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

Submission	Components	File Name
Full Application (PDF, unless stated otherwise)	Technical Volume (PDF format. See Chart in Section IV.D.ii.) 15-page limit (25-page limit for Topic Area 3)	ControlNumber_LeadOrganization_TechnicalVolume
	SF-424 Application for Federal Assistance (PDF format)	ControlNumber_LeadOrganization_App424
	Budget Justification (Microsoft Excel format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_Budget_Justification
	Summary for Public Release (PDF format. 1-page limit)	ControlNumber_LeadOrganization_Summary
	Summary Slide (Microsoft PowerPoint format. 1-page limit)	ControlNumber_LeadOrganization_Slide
	Subrecipient Budget Justification, if applicable (Microsoft Excel format. Applicants must use the template available in EERE Exchange)	ControlNumber_LeadOrganization_Subrecipient_Budget_Justification
	DOE WP for FFRDC, if applicable (PDF format. See DOE O 412.1A, Attachment 3)	ControlNumber_LeadOrganization_WP
	Authorization from cognizant Contracting Officer for FFRDC, if applicable (PDF format)	ControlNumber_LeadOrganization_FFRDCAuth
	SF-LLL Disclosure of Lobbying Activities (PDF format)	ControlNumber_LeadOrganization_SF-LLL
	Foreign Entity and Foreign Work waiver requests, if applicable (PDF format)	ControlNumber_LeadOrganization_Waiver
	U.S. Manufacturing Plan (PDF format) (only for Topic Areas 1 and 2)	ControlNumber_LeadOrganization_USMP

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

ControlNumber_LeadOrganization_TechnicalVolume_Part_1

ControlNumber_LeadOrganization_TechnicalVolume_Part_2

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

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

ii. Technical Volume

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

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

The Technical Volume to the Full Application for Topic Areas 1 and 2 may not be more than 15 pages, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all of the information in the table below. The applicant should consider the weighting of each of the evaluation criteria (see Section V.A.ii of the FOA) when preparing the Technical Volume.

For Topic Area 3, the technical volume may not be more than 25 pages, including the information listed above, and applicants should include all information requested in the Topic Area 3 description, in Section I.B.iii, above.

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

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SECTION/SUGGESTED PAGE MAXIMUMS	DESCRIPTION
Cover Page All Topics: 1 page	<ul style="list-style-type: none"> • Project Title • The specific FOA Topic Area being addressed and Project Focus Area(s): e.g., Photovoltaics, CdTe deposition, Reliability <ul style="list-style-type: none"> ○ (Note: This will help sort applications and determine reviewer expertise areas needed for each application, so careful consideration here is helpful.) • The Project Team and contact information, including: <ul style="list-style-type: none"> ○ The Principal Investigator for the Prime Recipient (Technical Point of Contact). ○ Team Members (i.e., Subrecipients); and ○ Key Participants (i.e., individuals who contribute in a substantive, measureable way to the execution of the proposed project); and • Any statements regarding confidentiality • No additional information, such as an application abstract, should be included on this page
Project Overview Topics 1&2: 4 pages Topic 3: 3 pages	<p>The Project Overview should contain the following information:</p> <ul style="list-style-type: none"> • Background: The applicant should discuss the background of their organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the full application. • Project Objectives/Goals: The applicant should provide a clear and concise (high-level) statement of the goals and objectives of the project as well as the expected outcomes. The applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal. • Relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives. • DOE Impact: The applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.
Project Description, Innovation, and Impact Topics 1&2: 4 pages Topic 3: 3 pages	<p>The Project Description should contain the following information:</p> <ul style="list-style-type: none"> • Relevance and Outcomes: The applicant should provide a detailed description of the project for the first and final years, including the activities, objectives, and outcomes that will be pursued during the project. This section should describe the relevance of the proposed project to the goals and objectives of the FOA, including the potential to meet specific DOE mission targets or other relevant performance targets. • Feasibility: The applicant should demonstrate the feasibility of the proposed project and capability of achieving the anticipated performance targets for the first and final years, including a description of previous work done and prior results.

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	<ul style="list-style-type: none">• Innovation and Impact: The applicant should describe the current state of the applicable field, the specific innovation of the proposed solution, the advantages of the proposed solution over current and emerging areas, and the overall impact on advancing the current state/ baseline if the project is successful. The application should include a justification for the impact assessment approach and impact claim (e.g. performance improvement expectations and ramifications, cost model with references, future market opportunity size, etc.) as well as a description of the pathway to achieve stated impact after the end of the proposed project's period of performance.
Industry Engagement and Center Management Plans (Topic 3 ONLY) Topics 1&2: NA Topic 3: 10 pages	<p>Provide a detailed description of the proposed structure and operational strategy of the program team and validation center (if utilized).</p> <p>This section should allow reviewers to evaluate the ability of the proposal to enable:</p> <ul style="list-style-type: none">• Effective test protocol development and validation;• Equitable community engagement;• Sustainable operations;• Dissemination of results and minimization of acceptance risks;• Impactful bankability evaluations. <p>This section should include detailed strategies regarding:</p> <ul style="list-style-type: none">• Plans to ensure sufficient data transparency while incentivizing community participation in early trials;• Plans to obtain sufficient devices (in number, size, and diversity) to ensure broadly applicable results;• Plans for long-term data management;• Plans to effectively engage with current and new entrants to the perovskite photovoltaics R&D community;• Plans to execute on the proposed goals of the center while leveraging existing capabilities and minimizing the development of capabilities redundant to the private sector. <p>Proposed strategies and structures in this section should be reflected in the Statement of Project Objectives (SOPO) and Team Qualification and Resources sections of the proposal to clearly describe the implementation plans and existing team resources vs required additions.</p>
Summary Statement of Project Objectives (SOPO) Topics 1&2: 4 pages Topic 3: 3 pages	<p>Provide a succinct description of the specific activities to be conducted over the proposed period of performance. Descriptions should contain enough detail to convey and disclose the work occurring. (Vague statements such as "We will then complete a proprietary process" are unacceptable.) A summary of the general work involved is helpful for the review process, however, spending a tremendous amount of time outlining every detail of the project is not warranted until after selection. It is the applicant's responsibility to prepare an adequately detailed summary SOPO to convince reviewers that the proposed project and team can meet the goals of the funding program. The Summary SOPO should contain the following information:</p>

- **Scope Summary:** The applicant should provide a summary description of the overall work scope and approach to achieving the project objectives/goals. The scope summary should describe the work to be accomplished and how the applicant will achieve the milestones and achieve the final project goal(s).
- **Tasks:** It is critical that the overall project objective is broken into separate task sections that are clearly linked to, and combine to result in, the project milestone and final objective. A task is an executable or an operation that is enabled by the collection of subtasks associated with it. As such, tasks represent something more than just the collection of data. Each task description should include a budget amount for each year of proposed work. Projects with a mixture of R&D and demonstration activities (with corresponding recipient cost share) should clearly delineate the proposed cost share for each activity or task.
- **(Optional) Sub-tasks** may be included if further detail of the breakdown of the work is needed. Each Task may be broken out into component Subtask sections to specify the activities that will be conducted to accomplish the task. A Subtask describes a specific activity that is designed to deliver a device, tool, or technique to collect data. The approach through which the activity is performed is designed to allow the associated task to have a determinant outcome.
- **Project Schedule (Gantt Chart or similar):** The applicant should provide a schedule for the entire project, including task and subtask durations, milestones, and go/no-go decision points.
- **Milestone Summary Table, or List:**
- The applicant should provide a summary of appropriate performance targets for the project, termed "milestones." There should be a sufficient number of milestones to demonstrate the applicant understands the steps it will take to achieve the project objectives.
- A milestone summary is often helpful for review. Milestones may be consolidated into a single table, list, and/or listed separately at the bottom of the task/subtask description they are relevant to. It is up to the applicant to display milestones in the way that is most appropriate to their proposal.
- **Include the baseline capability of the applicant team.** It is important to document what the team has demonstrated or is building off of to achieve the project objectives. The baseline capability is the effort that can be reliably controlled with an end result that is repeatable.
- **Include a Go/No-Go Decision Point:** The applicant should provide a summary of project-wide go/no-go decision points at the end of each budget period in the Summary SOPO. A go/no-go decision point is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance, project success is definitively achieved and potential for success in future phases or periods of performance is evaluated, prior to actually beginning the execution of future phases. The Applicant should also provide the specific technical criteria to be used to make the go/no-go decision. The

summary provided should be consistent with the SOPO. Go/no-go decision points are considered “SMART” and can fulfill the requirement for an annual SMART milestone.

- Include an End of Project Goal: The applicant should provide a summary of the end of project goal(s).
- Milestones should not be activity-based (i.e., provide a report, talk to customers, perform experiments); they should instead be SMART milestones (Specific, Measurable, Achievable, Relevant, and Timely) and must demonstrate a definitive achievement of progress rather than simply performing work.
- Milestones should represent achievement of a specific mission-related outcome as opposed to completion of task that may or may not achieve progress towards FOA related goals. “Make 100 phone calls” or “explore three materials” are tasks that could be achieved without any measurable progress toward substantive goals. SETO is not interested in these types of milestones. Conversely, “sell 10 widgets” or “achieve X% efficiency” relies on validation from entities/principles outside of the team’s and represent measurable progress towards substantive goals related to the FOA.
- Although reports are required as part of the cooperative agreement, they cannot be used as milestones. Reports summarize observations, and milestones validate functionality.
- The applicant should also provide the means by which the milestone will be verified. Third-party or unbiased validation is superior to self-verification of results.
- These milestones will be carefully reviewed, and their quality is tied to the scoring criteria of this FOA. Imprecise or unambitious milestones will therefore likely result in low scores and non-selection.

Example Summary SOPO Structure

Scope Summary

[Information articulated in other sections of the Application can be referenced and do not need to be repeated here. Include any new information that is needed to help define and understand the scope of the work required to complete the project. If needed, this space could be used to provide a brief description of the rationale for why the applicant has organized the tasks in the way they have.]

Milestone and Go/No-Go Summary Table

[Optional example format, however, milestones, go/no-go decision points, and end of project goals should be included somewhere in the SOPO Summary in the format most appropriate to the applicant’s proposal. Go/no-go decisions points should describe quantifiable metrics that will be achieved at the end of each budget period to demonstrate progress toward achieving overall project goals.]

Milestone #	Months After Project Start		Method to Verify Measurable Result
	0	Define Beginning capability	A method that could not be falsely claimed that shows the result is valid
1	3	Measurable result that retires risk or validates a critical assumption	A method that could not be falsely claimed that shows the result is valid
2	6	II	II
3	6	II	II
4	9	II	II
GO/No-Go Decision Point #1	12	II	II
GO/No-Go Decision Point #2	12	II	II
GO/No-Go Decision Point #3	12	II	II
4	15	II	II
5	18	II	II
6	18	II	II
7	18	II	II
8	21	II	II
End of Project Goal #1	24	II	II
End of Project Goal #2	24	II	II
End of Project Goal #3	24	II	II

Project Schedule:
[Insert Project Schedule (Gantt Chart or similar), applicants may list milestones (with verification process) under the relevant tasks or subtasks and then include in the schedule rather than creating a separate milestone table]

Task 1: Distinctive Title, Date range of the task in months (M1-M4), Estimated total task budget

Task Description: Task summaries shall explicitly identify:

- A concise statement of the objectives of that task
- The work that is to be accomplished and how it will be accomplished (write: “we will” often to structure this in the right way). Tasks should be designed to retire significant risks, such as technology, and manufacturability risks for hardware applications. Each task can address one or multiple risk categories.

(Optional) Subtask 1.1: Distinctive title, Date range (M1-M2)

(Optional) Subtask description: Subtask descriptions:

- Explicitly identify the task objectives/outcomes being addressed and a concise statement of the objectives of that subtask.

	<ul style="list-style-type: none"> Describe the work and techniques that will be used and the expected result that will be generated from the effort. <p>(Optional) Subtask 1.2: Distinctive title, Date range (M2-M7) (Continue until all Task 1 subtasks are listed)</p> <p>Task 2: (Continue in the format above until all tasks and subtasks are listed)</p>
<p>Team Qualifications and Resources</p> <p>Topics 1&2: 2 pages Topic 3: 5 pages</p>	<p>The Team Qualifications and Resources should contain information such as:</p> <ul style="list-style-type: none"> Project Team’s unique qualifications and expertise, including those of key Subrecipients (if applicable). Project Team’s existing equipment and facilities that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project. The time commitment of the key team members to support the project. The technical services to be provided by DOE/NNSA FFRDCs, if applicable. The overall approach to and organization for managing the work The roles of each Project Team member For multi-organizational or multi-investigator projects: The roles and the work to be performed by each PI and Key Participant; Business agreements between the applicant and each PI and Key Participant; How the various efforts will be integrated and managed; Process for making decisions on scientific/technical direction; Publication arrangements; Intellectual Property issues; and Communication plans
<p>Appendices</p> <p>All Topics: No total page limit</p>	<ul style="list-style-type: none"> Applicants should attach letters of commitment from all Subrecipient/third party cost share providers as an appendix. Letters of commitment do not count towards the page limit. Applicants may attach one-page letters of support from other relevant entities (i.e. end users of the proposed solution) as an appendix. Letters of support do not count towards the page limit. Multi-page letters of support are not allowed and will not be reviewed. Applicants may attach one or two-page resumes for key participating team members as an appendix. Resumes do not count towards the page limit. Resumes over two pages are not allowed and will not be reviewed. Note: Footnotes and endnotes are counted toward the maximum page requirement. Applicants may not include a list of references as an appendix. References and outside links to additional content may be considered by reviewers, however, applications should not require references or outside content to be understood and reviewed.

iii. SF-424: Application for Federal Assistance

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

iv. Budget Justification Workbook

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

v. Summary/Abstract for Public Release

Applicants are required to submit a one-page summary/abstract of their project. The project summary/abstract must contain a summary of the proposed activity suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the project director/principal investigator(s), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (e.g., benefits, outcomes), and major participants (for collaborative projects). This document must not include any proprietary or sensitive business

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information as DOE may make it available to the public after selections are made. The project summary must not exceed one page when printed using standard 8.5 x 11 paper with 1" margins (top, bottom, left, and right) with font not smaller than 12 point. Save the Summary for Public Release in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Summary."

vi. Summary Slide

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

The Summary Slide template requires the following information:

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

vii. Subrecipient Budget Justification (if applicable)

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

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

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

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

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

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

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

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

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

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

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

xi. Waiver Requests: Foreign Entities and Foreign Work (if applicable)

i. Foreign Entity Participation:

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

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

As set forth in Section IV.J.iii., all work under EERE funding agreements must be performed in the United States. This requirement does not apply to the

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purchase of supplies and equipment, so a waiver is not required for foreign purchases of these items. However, the prime recipient should make every effort to purchase supplies and equipment within the United States.

Appendix C lists the necessary information that must be included in a foreign work waiver request.

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

xii. U.S. Manufacturing Commitments

Pursuant to the DOE Determination of Exceptional Circumstances (DEC) dated September 9, 2013, each applicant to Topic Areas 1 and 2 is required to submit a U.S. Manufacturing Plan as part of its application.. The U.S. Manufacturing Plan represents the applicant's measurable commitment to support U.S. manufacturing as a result of its award.

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

In lieu of the U.S. Competitiveness Provision, an applicant may propose a U.S. Manufacturing Plan with more specific commitments that would be beneficial to the U.S. economy and competitiveness. For example, an applicant may commit specific products to be manufactured in the U.S., commit to a specific investment in a new or existing U.S. manufacturing facility, keep certain activities based in the U.S. or support a certain number of jobs in the U.S. related to the technology. An applicant which is likely to license the technology to others, especially universities for which licensing may be the exclusive means of commercialization the technology, the U.S. Manufacturing Plan may indicate the applicant's plan and commitment to use a specific licensing strategy that would likely support U.S. manufacturing.

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

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shall be incorporated as part of the terms and conditions of the award as the U.S. Manufacturing Plan for that award.

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

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

For Topic Areas 3, applicants are not required to submit a USMP. To avoid an error message in EERE Exchange, applicants should submit a blank page that says "USMP not required."

xiii. Data Management Plan (DMP)

Applicants whose Full Applications are selected for award negotiations will be required to submit a DMP during the award negotiations phase.

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

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

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

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

D. Content and Form of Replies to Reviewer Comments

EERE will provide applicants with reviewer comments following the evaluation of all eligible Full Applications. Applicants will have a brief opportunity to review the comments and to prepare a short Reply to Reviewer Comments responding to the comments however they desire or supplementing their Full Application. The Reply to Reviewer Comments is an optional submission; applicants are not required to submit a Reply to Reviewer Comments. EERE will post the Reviewer Comments in EERE Exchange. The expected submission deadline is on the cover page of the FOA; however, it is the applicant's responsibility to monitor EERE Exchange in the event that the expected date changes. The deadline will not be extended for applicants who are unable to timely submit their reply due to failure to check EERE Exchange or relying on the expected date alone. Applicants should anticipate having approximately three (3) business days to submit Replies to Reviewer Comments.

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

Replies to Reviewer Comments must conform to the following content and form requirements, including maximum page lengths, described below. If a Reply to Reviewer Comments is more than the designated number of pages, EERE will review only the first pages up to the designated page limit and disregard any additional pages.

SECTION	PAGE LIMIT	DESCRIPTION
Text	Three (3) pages for Topic Areas 1 and 2	Applicants may respond to reviewer comments or supplement their Full Application with graphs, charts, or other data.

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	Five (5) pages for Topic Area 3	
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E. Post Selection Information Requests

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

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

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

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

G. Submission Dates and Times

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

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H. Intergovernmental Review

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

I. Funding Restrictions

i. Allowable Costs

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

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

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

ii. Pre-Award Costs

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

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

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

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

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

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limit the choice of reasonable alternatives prior to EERE completing the NEPA review process.

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

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

1. Requirement

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

2. Failure to Comply

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

3. Waiver

There may be limited circumstances where it is in the interest of the project to perform a portion of the work outside the United States. To seek a foreign

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

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

iv. Construction

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

v. Foreign Travel

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

vi. Equipment and Supplies

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

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

vii. Domestic Preference – Infrastructure Projects

As appropriate and to the extent consistent with law, Applicants shall ensure that, to the greatest extent practicable, iron and aluminum as well as steel, cement, and other manufactured products (items and construction materials composed in whole or in part of non-ferrous metals such as aluminum; plastics

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and polymer-based products such as polyvinyl chloride pipe; aggregates such as concrete; glass, including optical fiber; and lumber) used in the proposed project shall be produced in the United States. This requirement shall flow down to all sub-awards including all contracts, subcontracts and purchase orders for work performed under the proposed project.

viii. Lobbying

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

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

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

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

ix. Risk Assessment

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

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

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

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suspended or otherwise excluded from or ineligible for participation in federal programs or activities.

x. Invoice Review and Approval

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

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

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

Persons participating in a Foreign Government-Sponsored Talent Recruitment Program of a Foreign Country of Risk (COR) are prohibited from participating in projects selected for federal funding under this FOA. The purpose of this prohibition is to ensure the protection of U.S. competitive and national security interests and DOE program objectives; prevent potential conflicts of interest; and limit unauthorized transfers of scientific and technical information. See Appendix G for more information regarding the requirements that correspond with the prohibition.

V. Application Review Information

A. Technical Review Criteria

i. Concept Papers

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

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

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This criterion involves consideration of the following sub-criteria:

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

ii. Full Applications

Applications will be evaluated against the merit review criteria shown below.

Criterion 1: Innovation and Impact

The project is innovative and impactful, assuming the stated outcomes can be achieved as written. The project is differentiated with respect to existing commercial products, solutions, or technologies. If successful, the project is scalable to have a broader impact and maintained at a sufficiently large scale after project completion.

Criterion 2: Quality and Likelihood of Completion of Stated Goals

The application demonstrates an understanding and appreciation of project risks and challenges the proposed work will face and incorporates reasonable assumptions related to the execution of the project (i.e. market size, customer participation, costs, speed of proposed scale-up or adoption). The information included for the project is validated through customer trials, data from prior work, report references, technical baselines established, etc. The stated goals of the project are SMART (Specific, Measurable, Achievable, Relevant, and Timely) and likely to be accomplished within the scope of this project. The proposed budget is reasonable to achieve the objectives proposed.

Criterion 3: Capability and Resources of the Applicant/Project Team

The team is well qualified and has the capability and resources necessary to successfully complete the project. The team (including proposed subrecipients) has the training and experience to achieve the final results on time and to specification. The project team is fully assembled and committed to the project (verified through letters of support) and has a demonstrated record of successful past performance.

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Topic areas will utilize the same criteria with varying weights as detailed below:

Criterion	Topic Area 1	Topic Area 2	Topic Area 3
<u>Criterion 1: Innovation and Impact</u>	50%	50%	20%
<u>Criterion 2: Quality and Likelihood of Completion of Stated Goals</u>	30%	30%	50%
<u>Criterion 3: Capability and Resources of the Applicant/Project Team</u>	20%	20%	30%

iii. Criteria for Replies to Reviewer Comments

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

B. Standards for Application Evaluation

Applications that are determined to be eligible will be evaluated in accordance with this FOA, by the standards set forth in EERE's Notice of Objective Merit Review Procedure (76 Fed. Reg. 17846, March 31, 2011) and the guidance provided in the "DOE Merit Review Guide for Financial Assistance," effective April 14, 2017, which is available at: <https://energy.gov/management/downloads/merit-review-guide-financial-assistance-and-unsolicited-proposals-current>.

C. Other Selection Factors

i. Program Policy Factors

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

- The degree to which the proposed project exhibits technological diversity when compared to the existing DOE project portfolio and other projects selected from the subject FOA;
- The degree to which the proposed project, including proposed cost share, optimizes the use of available EERE funding to achieve programmatic objectives;

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- The level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers
- Based on the commitments made in the U.S. Manufacturing Plan, the degree to which the proposed project is likely to lead to increased employment and manufacturing in the United States or provide other economic benefit to U.S. taxpayers
- The degree to which the proposed project will accelerate transformational technological or other advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty
- The degree to which the proposed project, or group of projects, represent a desired geographic distribution (considering past awards and current applications)
- The degree to which the proposed project avoids duplication/overlap with other publicly or privately funded work
- The degree to which the proposed project enables new and expanding market segments
- The degree to which the project promotes increased coordination with nongovernmental entities for demonstration of technologies and research applications to facilitate technology transfer
- Whether the proposed project will occur in a Qualified Opportunity Zone or otherwise advance the goals of Qualified Opportunity Zones. The goals include spurring economic development and job creation in distressed communities throughout the United States.

D. Evaluation and Selection Process

i. Overview

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

ii. Pre-Selection Interviews

As part of the evaluation and selection process, EERE may invite one or more applicants to participate in Pre-Selection Interviews. Pre-Selection Interviews are distinct from and more formal than pre-selection clarifications (See Section V.D.iii of the FOA). The invited applicant(s) will meet with EERE representatives to provide clarification on the contents of the Full Applications and to provide EERE an opportunity to ask questions regarding the proposed project. The

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information provided by applicants to EERE through Pre-Selection Interviews contributes to EERE's selection decisions.

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

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

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

iii. Pre-Selection Clarification

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

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

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

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iv. Recipient Integrity and Performance Matters

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

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

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

v. Selection

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

E. Anticipated Notice of Selection and Award Negotiation Dates

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

VI. Award Administration Information**A. Award Notices****i. Ineligible Submissions**

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

ii. Concept Paper Notifications

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

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

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

iii. Full Application Notifications

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

iv. Successful Applicants

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

The award negotiation process will take approximately 60 days. Applicants must designate a primary and a backup point-of-contact in EERE Exchange with whom EERE will communicate to conduct award negotiations. The applicant must be responsive during award negotiations (i.e., provide requested documentation) and meet the negotiation deadlines. If the applicant fails to do so or if award negotiations are otherwise unsuccessful, EERE will cancel the award negotiations and rescind the Selection. EERE reserves the right to terminate award negotiations at any time for any reason.

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

v. Alternate Selection Determinations

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

vi. Unsuccessful Applicants

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

B. Administrative and National Policy Requirements

i. Registration Requirements

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

i. EERE Exchange

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

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

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

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ii. DUNS Number

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

iii. System for Award Management

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

iv. FedConnect

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

v. Grants.gov

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

vi. Electronic Authorization of Applications and Award Documents

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

ii. Award Administrative Requirements

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

iii. Foreign National Access Under DOE Order 142.3A, "Unclassified Foreign Visits and Assignments Program"

All applicants selected for an award under this FOA may be required to provide information to DOE in order to satisfy requirements for foreign nationals' access to DOE sites, information, technologies, equipment, programs or personnel. A foreign national is defined as any person who is not a U.S. citizen by birth or naturalization. If a selected applicant (including any of its subrecipients, contractors or vendors) anticipates involving foreign nationals in the

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performance of its award, the selected applicant may be required to provide DOE with specific information about each foreign national to ensure compliance with the requirements for access approval. National laboratory personnel already cleared for site access may be excluded. Access approval for foreign nationals from countries identified on the U.S. Department of State's list of [State Sponsors of Terrorism](#) must receive final approval authority from the Secretary of Energy or the Secretary's assignee before they commence any work under the award.

iv. Subaward and Executive Reporting

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

v. National Policy Requirements

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

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

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

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

vii. Applicant Representations and Certifications

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1. Lobbying Restrictions

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

2. Corporate Felony Conviction and Federal Tax Liability Representations

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

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

For purposes of these representations the following definitions apply:

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

3. Nondisclosure and Confidentiality Agreements Representations

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

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

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

viii. Statement of Federal Stewardship

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

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ix. Statement of Substantial Involvement

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

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

x. Subject Invention Utilization Reporting

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

xi. Intellectual Property Provisions

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

xii. Reporting

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

Checklist, after clicking on "Model Cooperative Agreement" under the Award Package section.

xiii. Go/No-Go Review

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

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

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

xiv. Conference Spending

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

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any entity without an Inspector General), of the date, location, and number of employees attending such conference.

xv. Uniform Commercial Code (UCC) Financing Statements

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

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

xvi. Conflict of Interest Disclosure Statements

Upon selection of award negotiations, DOE may require the selectee submit signed conflict of interest disclosure statements for personnel (prime recipient and subrecipient level) proposed to participate in the award negotiations or the project itself.

xvii. Table of Personnel

If selected for award negotiations, the selected applicant must submit a list of personnel who are proposed to work on the project, both at the recipient and sub-recipient level. The table should include the individuals' names, job titles, and their organization. The personnel that fall in one or more of the following categories must be included:

- Principal Investigator
- Business Agent
- Co-Principal Investigator
- Co-Investigator(s)
- Postdoctoral associate

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- Other professional or researcher
- Collaborator

Recipients will have an ongoing responsibility to notify DOE of changes to the personnel and submit an updated list during the life of the award as there are changes to the personnel working on the project.

VII. Questions/Agency Contacts

Upon the issuance of a FOA, EERE personnel are prohibited from communicating (in writing or otherwise) with applicants regarding the FOA except through the established question and answer process as described below. Specifically, questions regarding the content of this FOA must be submitted to: seto.pvsk.foa@ee.doe.gov. Questions must be submitted not later than three (3) business days prior to the application due date and time. Please note, feedback on individual concepts will not be provided through Q&A.

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

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

VIII. Other Information

A. FOA Modifications

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

B. Government Right to Reject or Negotiate

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

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C. Commitment of Public Funds

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

D. Treatment of Application Information

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

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

Concept Papers, Full Applications, Replies to Reviewer Comments, and other submissions containing confidential, proprietary, or privileged information must be marked as described below. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise. The U.S. Government is not liable for the disclosure or use of unmarked information, and may use or disclose such information for any purpose.

The cover sheet of the Concept Paper, Full Application, Reply to Reviewer Comments, or other submission must be marked as follows and identify the specific pages containing trade secrets, confidential, proprietary, or privileged information:

Notice of Restriction on Disclosure and Use of Data:

Pages [list applicable pages] of this document may contain trade secrets, confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for evaluation purposes or in accordance with a financial assistance or loan agreement between the submitter and the Government. The Government may use or

disclose any information that is not appropriately marked or otherwise restricted, regardless of source. [End of Notice]

The header and footer of every page that contains confidential, proprietary, or privileged information must be marked as follows: “Contains Trade Secrets, Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure.” In addition, each line or paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting.

E. Evaluation and Administration by Non-Federal Personnel

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

F. Notice Regarding Eligible/Ineligible Activities

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

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

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

H. Requirement for Full and Complete Disclosure

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

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

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

I. Retention of Submissions

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

J. Title to Subject Inventions

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

- Domestic Small Businesses, Educational Institutions, and Nonprofits: Under the Bayh-Dole Act (35 U.S.C. § 200 et seq.), domestic small businesses, educational institutions, and nonprofits may elect to retain title to their subject inventions;
- All other parties: The federal Non-Nuclear Energy Act of 1974, 42 U.S.C. 5908, provides that the government obtains title to new inventions unless a waiver is granted (see below);
- Class Patent Waiver: DOE has issued a class waiver that applies to this FOA. Under this class waiver, domestic large businesses may elect title to their subject inventions similar to the right provided to the domestic small businesses, educational institutions, and nonprofits by law. In order to avail itself of the class waiver, a domestic large business must agree that any products embodying or produced through the use of a subject invention first created or reduced to practice under this program will be substantially manufactured in the United States, unless DOE agrees that the commitments proposed in the U.S. Manufacturing Plan are sufficient.
- Advance and Identified Waivers: For an applicant not covered by the Class Patent Waiver or the Bayh-Dole Act, the applicant may request a patent waiver that will cover subject inventions that may be invented under the award, in advance of or within 30 days after the effective date of the award. Even if an advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver for identified inventions, i.e., individual subject inventions that are disclosed

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

- DEC: Each applicant to Topic Areas 1 and 2 is required to submit a U.S. Manufacturing Plan as part of its application. If selected, the U.S. Manufacturing Plan shall be incorporated into the award terms and conditions for domestic small businesses and nonprofit organizations. DOE has determined that exceptional circumstances exist that warrants the modification of the standard patent rights clause for small businesses and nonprofit awardees under Bayh-Dole to the extent necessary to implement and enforce the U.S. Manufacturing Plan. Any Bayh-Dole entity (domestic small business or nonprofit organization) affected by this DEC has the right to appeal it.

K. Government Rights in Subject Inventions

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

i. Government Use License

The U.S. government retains a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States any subject invention throughout the world. This license extends to contractors doing work on behalf of the government.

ii. March-In Rights

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

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

- The owner or licensee has not taken or is not expected to take effective steps to achieve practical application of the invention within a reasonable time;
- The owner or licensee has not taken action to alleviate health or safety needs in a reasonably satisfied manner;

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- The owner has not met public use requirements specified by federal statutes in a reasonably satisfied manner; or
- The U.S. manufacturing requirement has not been met.

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

L. Rights in Technical Data

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

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

Government Rights in Technical Data Produced Under Awards: The U.S. government normally retains unlimited rights in technical data produced under government financial assistance awards, including the right to distribute to the public. However, pursuant to special statutory authority, certain categories of data generated under EERE awards may be protected from public disclosure for up to five years after the data is generated (“Protected Data”). For awards permitting Protected Data, the protected data must be marked as set forth in the awards intellectual property terms and conditions and a listing of unlimited rights data (i.e., non-protected data) must be inserted into the data clause in the award. In addition, invention disclosures may be protected from public disclosure for a reasonable time in order to allow for filing a patent application.

M. Copyright

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

N. Export Control

The U.S. government regulates the transfer of information, commodities, technology, and software considered to be strategically important to the U.S. to protect national security, foreign policy, and economic interests without imposing undue regulatory burdens on legitimate international trade. There is a network of federal agencies and regulations that govern exports that are collectively referred to as “Export Controls.” To ensure compliance with Export Controls, it is the prime recipient’s responsibility to determine when its project activities trigger Export Controls and to ensure compliance.

Export Controls may apply to individual projects, depending on the nature of the tasks. When Export Controls apply, the recipient must take the appropriate steps to obtain any required governmental licenses, monitor and control access to restricted information, and safeguard all controlled materials. Under no circumstances may foreign entities (organizations, companies or persons) receive access to export controlled information unless proper export procedures have been satisfied and such access is authorized pursuant to law or regulation.

Applicants are advised that some of the results of the research conducted under this FOA are expected to be restricted for proprietary reasons and not published or shared broadly within the scientific community.

O. Personally Identifiable Information (PII)

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

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

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

P. Annual Independent Audits

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

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

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

Q. Informational Webinar

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

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

APPENDIX A – COST SHARE INFORMATION

Cost Sharing or Cost Matching

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

How Cost Sharing Is Calculated

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

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

What Qualifies For Cost Sharing

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

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

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

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

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

General Cost Sharing Rules on a DOE Award

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

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

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

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

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

(B) Valuing and documenting contributions

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

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the award. In cases where the full value of a donated capital asset is to be applied as cost sharing or matching, that full value must be the lesser or the following:

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

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comparable space and facilities in a privately-owned building in the same locality.

- ii. The value of loaned equipment must not exceed its fair rental value.

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

- a. Volunteer services must be documented and, to the extent feasible, supported by the same methods used by the recipient for its own employees.
- b. The basis for determining the valuation for personal services and property must be documented.

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

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

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

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

Each task must be calculated individually as follows:

Task 1

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

Task 1 Cost minus federal share = non-federal share

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

Task 2

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

Task 2 Cost minus federal share = non-federal share

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

Task 3

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

Task 3 Cost minus federal share = non-federal share

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

Task 4

Federal share = \$100,000

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

The calculation may then be completed as follows:

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

Blended Cost Share %

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

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

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

1. Waiver for Foreign Entity Participation as the Prime Recipient

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

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

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

EERE may require additional information before considering the waiver request.

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

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

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

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

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

EERE may require additional information before considering the waiver request.

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

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APPENDIX D – GLOSSARY

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

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

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

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

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

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

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

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

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

APPENDIX E – DEFINITION OF TECHNOLOGY READINESS LEVELS

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

APPENDIX F – LIST OF ACRONYMS

ALT	Accelerated Life Test
COI	Conflict of Interest
DEC	Determination of Exceptional Circumstances
DER	Distributed Energy Resources
DMP	Data Management Plan
DOE	Department of Energy
DOI	Digital Object Identifier
EERE	Energy Efficiency and Renewable Energy
FAR	Federal Acquisition Regulation
FFATA	Federal Funding and Transparency Act of 2006
FOA	Funding Opportunity Announcement
FOIA	Freedom of Information Act
FFRDC	Federally Funded Research and Development Center
GAAP	Generally Accepted Accounting Principles
IPMP	Intellectual Property Management Plan
LCOE	Levelized Cost of Energy
MPIN	Marketing Partner Identification Number
MYPP	Multi-Year Program Plan
NDA	Non-Disclosure Acknowledgement
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Agency
OMB	Office of Management and Budget
OSTI	Office of Scientific and Technical Information
PII	Personal Identifiable Information
PI&I	Permitting, Inspection, and Interconnection
PV	Photovoltaic
PVSK	Perovskite
R&D	Research and Development
RFI	Request for Information
RFP	Request for Proposal
RtR	Roll-to-Roll
SAM	System for Award Management
SETO	Solar Energy Technologies Office
SOPO	Statement of Project Objectives
SPOC	Single Point of Contact
TIA	Technology Investment Agreement
TRL	Technology Readiness Level
UCC	Uniform Commercial Code
WBS	Work Breakdown Structure
WP	Work Proposal

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APPENDIX G – PROHIBITION RELATED TO FOREIGN GOVERNMENT-SPONSORED TALENT RECRUITMENT PROGRAMS

a. Definitions

1. Foreign Government-Sponsored Talent Recruitment Program. An effort directly or indirectly organized, managed, or funded by a foreign government to recruit science and technology professionals or students (regardless of citizenship or national origin, and whether having a full-time or part-time position). Some foreign government-sponsored talent recruitment programs operate with the intent to import or otherwise acquire from abroad, sometimes through illicit means, proprietary technology or software, unpublished data and methods, and intellectual property to further the military modernization goals and/or economic goals of a foreign government. Many, but not all, programs aim to incentivize the targeted individual to physically relocate to the foreign state for the above purpose. Some programs allow for or encourage continued employment at U.S. research facilities or receipt of Federal research funds while concurrently working at and/or receiving compensation from a foreign institution, and some direct participants not to disclose their participation to U.S. entities. Compensation could take many forms including cash, research funding, complimentary foreign travel, honorific titles, career advancement opportunities, promised future compensation, or other types of remuneration or consideration, including in-kind compensation.

2. Foreign Country of Risk. Any foreign country determined to be of risk by the Office of Science in consultation with the Under Secretary for Science; the Under Secretary of Energy; the Under Secretary for Nuclear Security; and the Office of Intelligence and Counterintelligence. Currently, DOE has designated the following countries as foreign countries of risk: Iran, North Korea, Russia, and China.

3. Scientific and Technical Information. Information products deemed by the originator to be useful beyond the originating site (i.e., intended to be published or disseminated), in any format or medium, which contain findings and technological innovations resulting from research and development (R&D) efforts and scientific and technological work of scientists, researchers, and engineers. Scientific findings are communicated through various media – e.g., textual, multimedia, audiovisual, and digital – and are produced in a range of products such as technical reports, scientific/technical conference papers, journal articles, workshop reports, program documents, invention reports, patent applications, patents, publicly available scientific research datasets, or other forms of scientific and technical information.

b. Policy

Persons participating in a Foreign Government-Sponsored Talent Recruitment Program of a Foreign Country of Risk (COR) are prohibited from participating in projects selected for

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federal funding under this FOA. The purpose of this prohibition is to ensure the protection of U.S. competitive and national security interests and DOE program objectives; prevent potential conflicts of interest; and limit unauthorized transfers of scientific and technical information.

c. Procedures

Prior to award, the selectee must certify to DOE, based on its knowledge and due diligence, that no individuals on the project team, including individuals at the recipient, subrecipient, and contractor level, are participating in a Foreign Government-Sponsored Talent Recruitment Program of a COR. Further, the selectee must obtain similar certifications from each individual on the project team. Prior to award, the selectee must provide DOE with the certifications submitted by principal investigators and co-principal investigators, at the prime and subrecipient level. The recipient is responsible for maintaining all certifications in accordance with 2 CFR 200.333, and making the certifications available to DOE upon request.

If an award results from an application submitted under this FOA, the recipient must exercise continuing due diligence to reasonably ensure that no project team members are participating in a Foreign Government-Sponsored Talent Recruitment Program of a COR, and the recipient must provide an updated certification as part of its regular progress reports to DOE. Further, prior to adding new individuals to the project the team, the recipient must require that each new individual complete a certification, and the recipient must provide DOE with the certifications submitted by PIs and Co-PIs.