

**Department of Energy (DOE)
Office of Energy Efficiency and Renewable Energy (EERE)
Single-Use Plastics Recycling (SUPR) Funding Opportunity
Announcement**

**Funding Opportunity Announcement (FOA) Number: DE-FOA-0002473
FOA Type: Initial
CFDA Number: 81.086**

FOA Issue Date:	5/25/2021
Submission Deadline for Concept Papers:	6/28/2021 5:00pm ET
Submission Deadline for Full Applications:	8/16/2021 5:00pm ET
Expected Submission Deadline for Replies to Reviewer Comments:	9/28/2021 5:00pm ET
Expected Date for EERE Selection Notifications:	Winter 2021
Expected Timeframe for Award Negotiations:	November 2021 – February 2022

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

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Appendix F – List of Acronyms 89

I. Funding Opportunity Description

A. Background and Context

i. Background and Purpose

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

The research and development (R&D) activities to be funded under this FOA will support the government-wide approach to the climate crisis by driving the innovation that can lead to the deployment of clean energy technologies, which are critical for climate protection. Specifically, this FOA will reduce demand for virgin polymer production by providing alternative starting materials such as recycled resins and biomass-based feedstocks. Novel recyclable materials and upcycling pathways will have demonstrated emissions reduction and energy savings through their lifecycle, which leads to a reduced climate impact of polymers and has the potential to create domestic recycling jobs.

The Industrial Sector is 22% of overall CO₂ emissions in the United States². In order to achieve a carbon free economy by 2050, it will be critical to develop new, low carbon and circular economy technologies to address this sector. EERE is developing strategies to address the largest and most difficult-to-decarbonize industries, including plastics and chemical production. In addition to reducing GHG emissions, these strategies will reduce energy consumption and environmental impacts associated with plastic waste. The annual plastics consumption in the U.S. accounts for 3.2 quadrillion BTUs (quads) of energy and virgin resin production accounts for 104 million metric tonnes (MT) carbon dioxide equivalents (CO₂ eq) domestically each year, with approximately 27% of plastics consumption in the form of films³. Most plastics follow a linear supply chain that starts with oil extraction, includes refining, chemical production, and plastic manufacturing, and ends in a landfill or the environment, where their embodied energy and value is wasted. Contributions to the energy consumption and CO₂ emissions associated with plastics occur throughout the supply chain and can be reduced by creating a circular supply chain that keeps plastics and their building blocks in the use. Recycling and upcycling often yield products or plastics with significantly lower embodied energy and carbon footprints over

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

² V. Sivaram, *Energizing America 2020*

³ Nicholson et al., *Joule* 5, 1–14, March 17, 2021. <https://doi.org/10.1016/j.joule.2020.12.027>

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virgin materials, with energy savings of over 50% demonstrated for recycled polyethylene terephthalate (PET)⁴ and greenhouse gas emissions being reduced by as much as 70% for recycled high density polyethylene and polypropylene⁵ compared to equivalent virgin resin. Deploying similar recycling and upcycling pathways for plastic films could lead to 0.4 quads of energy savings and over 19 million MT CO₂ eq of emissions reduction annually.

The Department of Energy (DOE) has significant interest in promoting the circular economy as part of its broader efforts to decarbonize industry. To accelerate innovations on plastic circularity, DOE offices have been coordinating funding for technology that spans discovery through development. Contributing offices include the Office of Science (SC), Fossil Energy (FE), Advanced Research Project Agency - Energy (ARPA-e), and the Office of Energy Efficiency and Renewable Energy (EERE), which includes the Advanced Manufacturing Office (AMO) and the BioEnergy Technology Office (BETO). Recent funding opportunities include:

- Clean Energy Manufacturing Innovation Institute for [Reducing Embodied-energy And Decreasing Emissions \(REMADE\) in Materials Manufacturing](#) to develop technology that increases use of recycled materials in manufacturing. (AMO)
- Bio-Optimized Technologies to keep Thermoplastics out of Landfills and the Environment ([BOTTLE](#)) consortium to design bioplastics for circularity and develop upcycling pathways for existing plastic waste. (BETO and AMO)
- [Recycle Underutilized Solids to Energy \(REUSE\)](#) to investigate the technoeconomic feasibility of modular systems that convert mixed waste to liquid products. (ARPA-e)
- [Energy Frontier Research Centers \(EFRCs\) included two centers focused on polymer upcycling – the Institute for Cooperative Upcycling of Plastics \(iCOUP\) and the Center for Plastics Innovation \(CPI\)](#) were established to probe reaction fundamentals of polymer formation, deconstruction and processing, leading to discovery of new, circular pathways for plastics. (SC – Basic Energy Sciences)
- [Enabling Gasification Of Blended Coal, Biomass And Plastic Wastes To Produce Hydrogen With Potential For Net Negative Carbon Dioxide Emissions.](#) (FE)
- [Chemical Upcycling of Polymers](#) (SC-Basic Energy Sciences)
- Systems [Biology](#) of Bioenergy-Relevant Microbes To Enable Production of Next-Generation Biofuels And Bioproducts (SC-Biological and Environmental Research)

DOE is issuing this Funding Opportunity Announcement (FOA) to address the unique economic and design circularity challenges of plastic films, enabling energy and emissions reduction through their lifecycle.

BETO develops technologies that convert domestic biomass and waste resources into fuels, products, and power to enable affordable energy, economic growth, and innovation in renewable energy and chemicals production. AMO develops technologies that drive

⁴ Rorrer et al Joule Volume 3, Issue 4, 17 April 2019, Pages 1006-1027

⁵ Association of Plastics Recyclers, 2020. *Virgin vs. Recycled Plastic Life Cycle Assessment*

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industrial decarbonization, energy productivity improvements in the U.S. manufacturing sector, efficiently utilize resources, and support the manufacture of clean energy products with benefits extending across the economy. BETO and AMO fund applied research, development, and demonstration (RD&D) to bolster the body of scientific and engineering knowledge to develop a circular economy for plastics through novel plastics development designed for circularity and establishing deconstruction and upcycling pathways for existing polymers that will generate high-value products. This FOA builds upon the FY20 BOTTLE FOA⁶ and seeks to fill a gap identified in the [2019 Plastics for a Circular Economy Workshop](#)⁷, where single-use packaging was highlighted as an important focus area. It will support high-impact technology R&D in technologies that overcome the challenges associated with the recycling of films, which are often used in single-use packaging applications.

Flexible, single-use packaging, including both single layer and multi-layer, (hereto referred to broadly as “films”) are among the most challenging plastics to recycle, upcycle, or biodegrade due to contamination and properties inherent to their use. Applications for plastic films include grocery bags, films and bags in food packaging, and wraps like cling films and pallet wrapping. Packaging is the leading contributor of plastic waste at 45%,⁸ the vast majority of which is landfilled or leaked into the environment⁹, losing the energy and value embedded in this class of materials. Films, which are primarily made up of LDPE (Low Density Polyethylene) and LLDPE (Linear Low Density Polyethylene), make up over five percent by weight (wt%) of landfilled waste in the US.² New technologies to make recycling and upcycling of films economically viable, including designing films for easy recycling, upcycling, or degradation in the environment, will have a large energy, economic, environmental, and societal impact. Moreover, improvements in recycling technology will lead to better recycling economics, increased recycling infrastructure investment, and a greater number of recycling jobs across the United States. Use of recycled plastics as feedstock could reduce the demand for virgin resin production and, consequently lessen the need for upstream refining of petrochemicals, which disproportionately impacts low income communities^{10,11}.

State of the art technologies targeting plastic film recycling are highly varied due to the inherent diversity of film materials. Very few recyclers include films in their street side pickup because they jam the rotary sorters used by most recycling facilities. Although there is alternative sorting technology that effectively sorts films, investment is not justified by the low value of recycled films. Currently, films are primarily recycled back into films or used

⁶ <https://www.energy.gov/eere/bioenergy/joint-fy20-bioenergy-and-advanced-manufacturing-foa-bottle-bio-optimized-technologies>

⁷ <https://www.energy.gov/eere/bioenergy/downloads/plastics-circular-economy-workshop-summary-report>

⁸ Geyer et al. Science Advances 19 Jul 2017: Vol. 3, no. 7, e1700782. DOI: 10.1126/sciadv.1700782

⁹ Ellen MacArthur Foundation 2016

¹⁰ Environmental Impact of the Petrochemical Industry:

https://cfpub.epa.gov/ncer_abstracts/index.cfm/fuseaction/display.files/fileID/14522

¹¹ 2017 NAACP report Fumes Across the Fenceline: http://www.catf.us/wp-content/uploads/2017/11/CATF_Pub_FumesAcrossTheFenceLine.pdf

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to make composite construction materials like those found in decks and benches¹². The market for these applications is limited due, in part, to the low cost of virgin films. Broadening the application space for recycled films to higher value products could spur collection and recycling infrastructure investment, ultimately leading to a higher fraction of plastic films being recycled.

The use of multi-layer films is increasing due to their superior properties and the ability to use less material for the same application, making them the cost effective choice. However, due to their complexity, they are among the most challenging plastic products to recycle. Research to address multilayer packaging has included single-polymer, single film substitutes, single-polymer multilayer film substitutes with each layer having specific orientation, solvent extraction to separate and recycle layers, and thermal deconstruction methods that are robust to a variety of materials. More efforts to design multi-layer packaging to address end-of-life concerns are needed now to ensure their increased use does not compound the already mounting plastic waste problem.

This FOA seeks applications that enable the recycling and upcycling of films. Challenges associated with film recycling are vast, spanning collection, sorting/separation, contamination, and lack of economic methods for recycling and upcycling. Multilayer materials present further challenges, including immiscibility of different polymer layers and inclusion of inorganic materials. Technology can help to address these challenges by developing methods for recycling, deconstruction, and upcycling films that are sufficiently economic to incentivize collection, sorting and retention. Designing films to be inherently more recyclable or biodegradable, while retaining desired properties such as flexibility, barrier properties and strength could also make recycling of films more economical.

This FOA aims to increase recycling, upcycling, or environmentally benign degradation of films by pursuing two approaches:

- 1) Development of recycling and upcycling pathways for plastic films that are economically favorable, lower green house gas (GHG) emissions, and reduce the embodied energy of plastics; and
- 2) Redesign of multi-layer films to be inherently recyclable or biodegradable.

ii. Technology Space and Strategic Goals

AMO aims to improve the energy productivity of and decarbonize the industrial sector through technology innovation. One mechanism of achieving this goal is through the use of feedstocks with lower embodied energy and emissions impacts, such as secondary, or recycled, feedstocks. AMO has been working to develop sustainable manufacturing practices through numerous efforts, including the [Reducing Embodied energy And Decreasing Emissions \(REMADE\) Institute](#), [Better Plants](#) Waste Reduction initiative, and the

¹² 2018 National Post-Consumer Plastic Bag & Film Recycling Report, MORE Recycling for ACC

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[BOTTLE Consortium](#). These efforts aim to reduce the use of plastics and to develop circular pathways for plastic production.

BETO manages a diverse portfolio of technologies covering the full spectrum of bioenergy production, from feedstock source to end use. Primary products of interest to BETO include biofuels, biogas, bioproducts, and biopower. Strategies to develop high-value bioproducts can lower the cost and accelerate the development of bioenergy technologies.

AMO and BETO have identified significant potential to reduce GHG emissions and energy consumption through promotion of a circular plastics economy. In FY2020, AMO and BETO jointly issued the BOTTLE FOA, which aimed to develop novel methods of degrading and upcycling of plastics and to redesign plastics for circularity. The BOTTLE FOA addressed plastics broadly and the vast majority of selected projects addressed rigid plastics and plastic mixtures. Plastic film recycling was identified as critical to reaching circularity in plastics in the “Plastics for a Circular Economy” workshop and is the focus of this FOA.

Films are a particularly challenging subset of plastics to recycle or upcycle and have not been designed for circularity. To realize the benefits of a circular plastics economy, applied R&D is needed to:

- develop novel films that are designed for infinite recyclability or biodegradability and that have properties that enable them to displace existing films;
- create innovative separation, processing, deconstruction and upcycling pathways for existing polymers that generate high-value products; and,
- address collection, contamination and other issues such as low weight/volume ratio that reduce the economic viability of film recycling and upcycling.

iii. Diversity, Equity, and Inclusion

It is the policy of the Biden Administration that:

[T]he Federal Government should pursue a comprehensive approach to advancing equity¹³ for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality. Affirmatively advancing equity, civil rights, racial justice, and equal opportunity is the responsibility of the whole of our Government. Because advancing equity requires a systematic approach to embedding fairness in decision-making processes,

¹³ The term “equity” means the consistent and systematic fair, just, and impartial treatment of all individuals, including individuals who belong to underserved communities that have been denied such treatment, such as Black, Latino, and Indigenous and Native American persons, Asian Americans and Pacific Islanders and other persons of color; members of religious minorities; lesbian, gay, bisexual, transgender, and queer (LGBTQ+) persons; persons with disabilities; persons who live in rural areas; and persons otherwise adversely affected by persistent poverty or inequality.

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executive departments and agencies (agencies) must recognize and work to redress inequities in their policies and programs that serve as barriers to equal opportunity.

By advancing equity across the Federal Government, we can create opportunities for the improvement of communities that have been historically underserved, which benefits everyone.¹⁴

As part of this whole of government approach, this FOA seeks to encourage the participation of underserved communities¹⁵ and underrepresented groups. Applicants are highly encouraged to include individuals from groups historically underrepresented^{16,17} in STEM on their project teams. As part of the application, applicants are required to describe how diversity, equity, and inclusion objectives will be incorporated in the project. Specifically, applicants are required to submit a Diversity, Equity, and Inclusion Plan that describes the actions the applicant will take to foster a welcoming and inclusive environment, support people from underrepresented groups in STEM, advance equity, and encourage the inclusion of individuals from these groups

¹⁴ Executive Order 13985, “Advancing Racial Equity and Support for Underserved Communities Through the Federal Government” (Jan. 20, 2021).

¹⁵ The term “underserved communities” refers to populations sharing a particular characteristic, as well as geographic communities, that have been systematically denied a full opportunity to participate in aspects of economic, social, and civic life, as exemplified by the list of in the definition of “equity.” E.O. 13985. For purposes of this FOA, as applicable to geographic communities, applicants can refer to economically distressed communities identified by the Internal Revenue Service as Qualified Opportunity Zones; communities identified as disadvantaged or underserved communities by their respective States; communities identified on the Index of Deep Disadvantage referenced at <https://news.umich.edu/new-index-ranks-americas-100-most-disadvantaged-communities/>, and communities that otherwise meet the definition of “underserved communities” stated above.

¹⁶ According to the National Science Foundation’s 2019 report titled, “Women, Minorities and Persons with Disabilities in Science and Engineering”, women, persons with disabilities, and underrepresented minority groups—blacks or African Americans, Hispanics or Latinos, and American Indians or Alaska Natives—are vastly underrepresented in the STEM (science, technology, engineering and math) fields that drive the energy sector. That is, their representation in STEM education and STEM employment is smaller than their representation in the U.S. population. <https://nces.nsf.gov/pubs/nsf19304/digest/about-this-report> For example, in the U.S., Hispanics, African Americans and American Indians or Alaska Natives make up 24 percent of the overall workforce, yet only account for 9 percent of the country’s science and engineering workforce. DOE seeks to inspire underrepresented Americans to pursue careers in energy and support their advancement into leadership positions. <https://www.energy.gov/articles/introducing-minorities-energy-initiative>

¹⁷ See also. Note that Congress recognized in section 305 of the American Innovation and Competitiveness Act of 2017, Public Law 114-329:

(1) [I]t is critical to our Nation’s economic leadership and global competitiveness that the United States educate, train, and retain more scientists, engineers, and computer scientists; (2) there is currently a disconnect between the availability of and growing demand for STEM-skilled workers; (3) historically, underrepresented populations are the largest untapped STEM talent pools in the United States; and (4) given the shifting demographic landscape, the United States should encourage full participation of individuals from underrepresented populations in STEM fields.

in the project; and the extent the project activities will be located in or benefit underserved communities. See Section IV.D.xvii. The plan should include SMART (Specific, Measurable, Assignable, Realistic and Time-Related) milestones supported by metrics to measure the success of the proposed actions. This plan will be evaluated as part of the technical review process.

Further, Minority Serving Institutions¹⁸, Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses, Veteran Owned Businesses, or entities located in an underserved community that meet the eligibility requirements (See Section III) are encouraged to apply as the prime applicant or participate on an application as a proposed partner to the prime applicant. The Selection Official may consider the inclusion of these types of entities as part of the selection decision See Section V.C.i.

B. Topic Areas

Topic Areas	Topic Area Titles
1	Novel Approaches to Recycle and Upcycle Films
2	Redesign of Multi-layer Films for Infinite Recyclability or Biodegradability

i. Topic Area 1: Novel Approaches to Recycling and Upcycle Films

Single-use films present a particularly difficult circularity challenge. Their low mass and high surface area impairs their collection and prevents them from being co-processed in municipal recycling facilities (MRFs) along with other plastics. In fact, manual sorters remove films at the beginning of recycling lines to prevent them from jamming and damaging sorting equipment. Due to these challenges, films generally are not collected through conventional MRFs and when they are, it comes at substantial cost to the MRF. Films that are recovered by MRFs are often low quality, particularly in single stream facilities. In addition, recycled films can be challenging to process, limiting their potential to be remanufactured or reprocessed to valuable products.

This topic seeks technology that will make the recycling of polymer films more economical by developing novel degradation, recycling and upcycling methods. Proposed work should demonstrate an advancement in at least one aspect of the recycling/upcycling supply chain that leads to improved economics, reduced greenhouse gas (GHG) emissions, energy savings, and retained carbon. Applicants should propose a complete process from waste films to a valued product, including a description of the source of the feedstock and how

¹⁸ Minority Serving Institutions (MSIs), including Historically Black Colleges and Universities/Other Minority Institutions) as educational entities recognized by the Office of Civil Rights (OCR), U.S. Department of Education, and identified on the OCR's Department of Education U.S. accredited postsecondary minorities' institution list. See <https://www2.ed.gov/about/offices/list/ocr/edlite-minorityinst.html>.

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product processing requirements will be met. Preliminary economics should be included to demonstrate economic viability of the aggregate processes. Reduction in GHG emissions and energy consumption through waste diversion should be measured through LCA.

Topic Area 1 Specific Areas of Interest:

- Valorization of conventional waste films into higher value products, and identification of an appropriate market for said product.
- Methods to recover pure polymer resin from conventional multilayer packaging.
- Methods to deconstruct conventional multilayer packaging to valuable chemicals for upcycling or same-cycling.
- Approaches that improve the economics of same-cycling conventional films, including technologies promote retention of polymer properties after processing.
- Cost competitive degradable substitutes for conventional films, with comparable properties.

All technologies should consider the following:

- Technologies that enable the economical recycling or upcycling of films
- Technologies that address the distributed nature and low density of single use plastics. This includes distributed manufacturing processes for degradation, densification, and upcycling near the source and methods of recycling and upcycling that can aggregate small streams to form a high value product in larger quantities.
- Recycling and upcycling of films that would lead to a reduction of virgin polymer production, reduction of GHG emissions and retention of embodied energy and carbon in the value chain.
- Recycling and upcycling solutions that are scalable.

Topic Area 1 Specific Requirements:

The following requirements must be addressed in the narrative of the application, and the strength of the applicant's narrative will be evaluated by the independent technical review panel for scientific merit (see evaluation criteria in Section V.A.ii.).

- Techno-economic analysis and life cycle assessment, including energy and emissions impacts, of the proposed technology must be part of the proposed scope of work. Processes that have no path to economic feasibility or that have no GHG emissions benefit will not be considered. As a part of this analysis the potential market size and carbon and energy savings over the incumbent technology must be discussed.
- A relevant state of the art must be identified. The applicant must clearly state how the proposed technology advances the state of the art.
- Propose a salable product with expected market size and include an estimate of economic viability.

- Discuss the scalability of the process, including a strategy for scale-up or numbering up in the context of the distributed nature of waste films. Modular systems should be considered.
- Demonstrate the process on a real recycling stream.

Topic Area 1 Metrics:

The application must propose to meet all the minimum targets in the table below by the end of the project. Applicants will be required to clearly demonstrate how the proposed work will achieve the metric and should highlight critical technical factors that influence whether or not the metric will be successfully met. A baseline comparison for the technology will need to be indicated as well as the current state of the proposed technology. Process improvement baselines would be the existing process(es) or status quo in the absence of the new process. The technical approach should indicate how progress towards these metrics will be made. Milestones in the Statement of Project Objectives (SOP) should also clearly describe the approach to address metrics listed here.

Metric	Unit	Minimum	Stretch Target
Energy savings compared to conventional manufacturing of equivalent virgin material	% energy savings relative to a baseline	50%	70%
GHG reduction compared to virgin plastics production	% GHG reduction relative to baseline*	50%	80%
Post-use carbon management	wt% carbon that is recovered and utilized	50%	90%
Economically incentivized	% cost savings relative to baseline	10%	20%

* Comparison of GHG emissions will use a single cycle of production of the final product using virgin feedstocks as a starting material vs. using recycled film as a feedstock. For an example, see: Rorrer et al Joule Volume 3, Issue 4, 17 April 2019, Pages 1006-1027.

ii. Topic Area 2: Redesign of Multi-layer Films for Infinite Recyclability or Biodegradability

Most commodity polymers used today were developed over 50 years ago and did not consider end of life in their design. As a result, polymers stay in the environment and landfills well beyond their useful life and can be challenging to reprocess, recycle or degrade. Films are designed for a set of desired characteristics and can be layered to achieve a multitude of characteristics. Multi-layered films pose unique challenges to recycling above and beyond single-layer films. Designing polymer films to be inherently recyclable or biodegradable could significantly reduce the film that is sent to landfills while

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preserving the embodied energy and reducing the lifecycle impacts of the film. Moreover, it is well understood that the use of a recycled material greatly decreases the GHG and energy footprint over a virgin resin.

Multilayer packaging generally consists of disparate films laminated to one another through a binding layer. They can have as few as three layers but often contain up to 12, and consist of different polymers, fibers, and metal foils. By selecting various film materials for their packaging, a company can benefit from each material's optimized properties, such as mechanical durability or low oxygen permeability. The multilayer framework also minimizes the amount of material needed, reducing cost and cutting transportation weight. Due to the lamination of these chemically different layers, recycling of multilayer films into pure, usable resin is exceptionally challenging, and is not feasible using current recycling technology.

There are emerging recycling technologies that can recover, recycle and decompose multi-layer packaging, which we hope to develop further through Topic Area 1. Alternatively, recycling and decomposition of multi-layer materials could be drastically reduced through redesigning multilayer materials to be inherently recyclable or biodegradable. One state-of-the-art approach gaining traction is the utilization of a single polymer chemistry, such as several polyethylenes of varying degrees of branching, to preserve the improved multilayer properties while generating a material that is directly recyclable.

This topic seeks to develop novel polymer films and film design solutions that are cost- and performance-competitive with commercial multi-layer films and that are inherently recyclable or biodegradable. Solutions could include:

- Material and/or manufacturing developments that can replicate desired properties of multi-layer packaging but lead to substantially recyclable or degradable products; and
- Biodegradable or compostable films that can replace multi-layer packages.

Topic Area 2 Specific Areas of Interest:

- New substitute multilayer materials designed for recyclability or biodegradability.
- Biodegradable substitute materials yielding benign degradation products.
- Bio-based plastics capable of use in multi-layer package applications that are infinitely recyclable and/or biodegradable.

Topic Area 2 Specific Requirements:

The following requirements must be addressed in the narrative of the application, and the strength of the applicant's narrative will be evaluated by the independent technical review panel for scientific merit (see evaluation criteria in Section V.A.ii.).

- Techno-economic analysis and life cycle assessment, including energy and emissions impacts, of the proposed technology must be part of the proposed scope of work. Processes that have no path to economic feasibility will not be considered. As a part of

this analysis, the potential market size and carbon and energy savings over landfilling must be discussed.

- A relevant state of the art, including reported but not yet commercialized technology, must be identified. The applicant must clearly state how the proposed technology advances the state of the art.
- Novel materials proposed must:
 - Demonstrate through the literature or preliminary data that the proposed material has properties comparable to modern multilayer packaging.
 - Discuss the end of life disposition for the proposed material and quantify the lifecycle benefits of this technology over landfilling. If the material degrades, the method of degradation and degradation products must be identified.
 - Include an assessment of the manufacturability and processibility of the product that includes the likely method of processing and necessary characteristics needed to ensure processing via this method.
- The intended application of the proposed material must be identified. Required characteristics for the intended application should be clearly stated and should be met by the proposed material.

Topic Area 2 Metrics:

The application must propose to meet all the minimum targets in the table below by the end of the project. Applicants will be required to clearly demonstrate how the proposed work will achieve the metric and should highlight critical technical factors that influence whether or not the metric will be successfully met. A baseline comparison for the proposed technology will need to be indicated as well as the current state of proposed technology. For example, if a novel material will be proposed, a reasonable baseline would be the material(s) that it would replace. The technical approach should indicate how progress towards these metrics will be made. Milestones in the SOPO should also clearly describe the approach to address metrics listed here.

Metric	Unit	Minimum	Stretch Target
Product Performance	Material properties meet or exceed characteristics required for application	Meets Characteristics	Exceeds Characteristics
Economically incentivized	Cost of polymer and/or use of technology compared to multi-layer film use for application	Cost parity	20% Cost improvement

Additional Metrics for Recyclable Films (excludes compostable/biodegradable films):

Metric	Unit	Minimum	Stretch Target
Carbon utilization	wt% carbon recycled in final product	50%	100%

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Energy savings using recycled film vs. virgin feedstocks	% Energy savings relative to baseline	50%	60%
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Additional Metrics for Compostable and Biodegradable Films (excludes recyclable films):

Metric	Unit	Minimum	Stretch Target
Biodegradable/Compostable: Ability to biodegrade in relevant conditions or compost in industrially-relevant conditions. Applicants must propose a relevant standardized test for testing biodegradability/compostability	Conversion of plastic carbon into products beneficial to soil, CO ₂ , and CH ₄ as measured by % carbon (applicant must specify the environmental conditions for testing).	Biodegradable: 60% after 180 days. Compostable: 60% after 180 days.	Biodegradable: 90% after 180 days. Compostable: 90% after 180 days.

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 (e.g., violates the laws of thermodynamics).
- Processes and materials that will not be economical when scaled to industrially relevant size.
- Upcycling processes that can only work on near-pure (>99%) plastic substrates.
- Processes proposing deconstruction and upcycling of a stream other than waste plastic films.
- Novel materials and processes that increase the energy and emission lifecycle impacts of films.

D. Verification

All applications selected for award negotiations under this FOA will be required to participate in a verification process led by DOE’s identified external third-party non-conflicted verification team. This independent third-party verification team (VT) may be led by the National Renewable Energy Laboratory’s (NREL) Systems Integration team,

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DOE's independent engineering contractor, or another non-conflicted contractor. Personnel involved in verifications sign project specific Non-Disclosure Agreements and Conflict of Interest statements. This verification process provides technical assistance to both BETO or AMO, and the selected project by providing an in-depth analysis of key technical and economic metrics to ensure transparency and increase the likelihood of project success.

The objectives of the verification effort are to:

- Verify the applicant's technical data, performance metrics, baseline and targets as described in the original application.
- Establish a framework to evaluate and track progress over.
- Update or provide data in the Technical Datasheets (described below), which successful applicants will be required to submit after their applications are selected for award negotiations.
- Identify potential major showstoppers and discuss risk mitigation strategies.
- Align project goals with DOE's expectations.

Typical verification includes three types of verification periods throughout the lifetime of the project: the "Initial Verification," conducted at the beginning of the project (months 0-3); the "Intermediate Verification(s)," conducted around Go/No-Go milestones; and the "Final Verification," conducted at the end of the project (within 3 months of closeout). The VT will perform some or all of these verifications at the recipient's facility to initially verify the data included in the application or Technical Datasheets that will be required after an application is selected for negotiation of award, and subsequently in conjunction with site visits to monitor progress.

The specific objectives of these verifications are set forth below:

- The Initial Verification is to confirm the benchmark data and assumptions provided in the application, which will establish the project baseline against which future performance and cost improvements will be evaluated. During the Initial Verification, the VT will work closely with the project team to discuss the project effort in detail; initiate the review of application data, metrics, and procedures as provided in the original application; and set the date for the on-site meeting. This is an iterative process between the two teams and establishes the agenda for the on-site meeting. The initial verification will verify the applicant's proposed technical baseline by direct observation and reproduction of laboratory tests, as well as verification of experimental procedures and data records. The project baseline will be set in this verification period, either through revision of the application data or by submission of additional/new data. The verification results are used by DOE in its sole discretion, among other factors, in making the Go/No-Go decision to proceed with Budget Period 2 (BP2). See section II.A.ii for information on period of performance and Go/No-Go decisions.

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- An Intermediate Verification will be conducted toward the end of BP2. Intermediate Verification assesses progress towards the project's BP2 Go/No-Go decision point and any other applicable targets. The verification results are used by DOE in its sole discretion, among other factors, in making the Go/No-Go decision to proceed with BP3.
 - The Final Verification will be held prior to the end of the project. The objective of this Final Verification is to assess whether the final targets were achieved, document the challenges overcome, and record the technical or economic challenges that remain.

Technical Datasheet:

The Technical Datasheet to be submitted after selection for negotiation of award, is designed to guide applicants in providing information to assess the technical validity of the technology being developed within the selected project. In addition, the data provided will be used as the basis for review and discussion during the initial verification and will be considered the project's baseline. As such, it is expected the project will be able to reproduce this data if/when the VT travels to the site to perform the Initial Verification. It is also expected the data will have been experimentally produced by the applicant in the applicant's facilities. However, if literature data needs to be used for parts of the process, those metrics based on literature data should be marked appropriately.

Verification Timeline:

The Initial Verification period, including on-site observation of experiments (if applicable) and report creation, can take up to three months. Applicants must include this time in their schedule. Selected projects that receive a 'Go' decision at the conclusion of the Initial Verification period will be subject to both an Intermediate and a Final Verification. The time required for the Intermediate and Final Verifications will be considerably less than the Initial Verification. However, the applicant must also consider that time should be allocated to collect data for these verifications.

Verification Conflict of Interest/Proprietary Information:

All of the technical and economic information requested will be disclosed to non-conflicted DOE National Renewable Energy Laboratory (NREL) personnel and/or external third-party non-conflicted contractors performing the verifications (BETO's and AMO's verification teams) as well as non-conflicted third-party reviewers potentially participating in the Go/No-Go review process and/or interim review meetings. It is expected that developments and advancements in technical performance made during the course of the project will be shared with the public via technical publications in journals or conference proceedings. It is also anticipated the Initial Verification may, if necessary, involve pre-existing intellectual property of which DOE will not require publication. Data access,

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deliverables, and dissemination requirements will be negotiated and set forth in the Statement of Project Objectives and will be consistent with Section VIII. L. of this FOA. DOE and those working on DOE's behalf, such as support service contractors, NREL personnel, Independent Engineers, validators, and reviewers, must be able to have sufficient access to these data, including but not limited to raw technical and financial data, to assess the baseline performance of the technology – subject to appropriate non-disclosure agreements or other protections.

Key Verification Requirements:

During the Initial Verification effort (months 0-3 of the project), no additional experimental or project work, beyond that associated with the verification, may commence. Only work associated with the verification – typically project management and data gathering activities – is allowed during the verification. The budget associated with the verification effort should correspond only to these types of activities and is typically minimal compared to the remaining project scope and budget.

It is anticipated that the Intermediate and Final Verifications will include the recipient presenting the project progress toward the targets established during the Initial Verification. Both the Intermediate and Final Verifications must be noted and accounted for within the scope, schedule, and budget, so that if a project is selected for award negotiations and receives a 'Go' decision at the conclusion of the Initial Verification effort, the schedule and budget will already account for the Intermediate and Final Verifications.

E. Authorizing Statutes

The programmatic authorizing statutes for both Topic Areas 1 and 2 are:

Activities funded by Advanced Manufacturing Office under this FOA are authorized under § 911 (a)(2)(C) of EPAAct 2005, as codified at 42 U.S.C. § 16191(a)(2)(C), and those funded by the Bioenergy Technologies Office are authorized by the Energy Policy Act of 2005 (EPAAct 2005), § 932, as codified at 42 U.S.C § 16232 (b).

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 \$14.5M of federal funding available for new awards under this FOA, subject to the availability of

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appropriated funds. EERE anticipates making approximately 6-8 awards under this FOA. EERE may issue one, multiple, or no awards. Individual awards may vary between \$1.5M and \$2.5M.

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

Topic Area Number	Topic Area Title	Anticipated Number of Awards	Anticipated Minimum Award Size for Any One Individual Award (Fed Share)	Anticipated Maximum Award Size for Any One Individual Award (Fed Share)	Approximate Total Federal Funding Available for All Awards	Anticipated Period of Performance (months)
1	Novel Approaches to Recycle and Upcycle Films	4-5	\$1.5M	\$2.5M	\$9.5M	36
2	Redesign of Multi-layer Films for Infinite Recyclability or Biodegradability	2-3	\$1.5M	\$2.5M	\$5M	36

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

ii. Period of Performance

EERE anticipates making awards that will run from 24 months up to 36 months in length, comprised of two or more budget periods. Project continuation will be contingent upon several elements, including 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. Regardless of these arrangements, the entity that applied as the prime recipient for the project will remain the prime recipient for the project.

III. Eligibility Information

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

A. Eligible Applicants

i. Domestic Entities

The proposed prime recipients and subrecipients must be domestic entities. The following types of domestic entities are eligible to participate as a prime recipient or subrecipient of this FOA:

1. Institutions of higher education;
2. For-profit entities;
3. Non-profit entities;
4. DOE National Laboratories (eligible as a subrecipient, but not eligible as a prime recipient);
5. State, local, and tribal governments; and
6. Federal agencies and instrumentalities other than DOE (eligible as a subrecipient, but not eligible as a prime recipient).

To qualify as a domestic entity, the applicant must be incorporated (or otherwise formed) under the laws of a particular State or territory of the United States with majority domestic ownership or control and have a physical place of business in the United States.

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 for funding under this FOA.

Entities banned from doing business with the U.S. government such as entities debarred, suspended, or otherwise excluded from or ineligible for participating in Federal programs are not eligible.

Entities identified on a Department of Homeland Security (DHS), Binding Operational Directives (BOD) as an entity publicly banned from doing business with the United States government are not eligible. See <https://cyber.dhs.gov/directives/>.

ii. Foreign Entities

If a foreign entity applies for funding as a prime recipient, it must designate in the Full Application a subsidiary or affiliate that qualifies as a domestic entity 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 or affiliate that qualifies as a domestic entity to be 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. Likewise, if the applicant seeks to include a foreign entity as a subrecipient, the applicant must submit a separate explicit written waiver request in the Full Application for each proposed foreign subrecipient.

Appendix C lists the 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.

B. Cost Sharing

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

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

i. Legal Responsibility

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

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

ii. Cost Share Allocation

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

iii. Cost Share Types and Allowability

Every cost share contribution must be allowable under the applicable federal cost principles, as described in Section IV.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); or
- Expenditures that were reimbursed under a separate federal program.

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

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

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

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

iv. Cost Share Contributions by FFRDCs

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

v. Cost Share Verification

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

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

vi. Cost Share Payment

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

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

complied with its cost share obligations to date. The Contracting Officer must approve all such requests before they go into effect.

C. Compliance Criteria

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

D. Responsiveness Criteria

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

E. Other Eligibility Requirements

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

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

i. *Authorization for non-DOE/NNSA FFRDCs*

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

ii. *Authorization for DOE/NNSA FFRDCs*

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

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

iii. *Value/Funding*

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

iv. *Cost Share*

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

v. *Responsibility*

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

vi. *Limit on FFRDC Effort*

The FFRDC effort, in aggregate, shall not exceed 50% of the total estimated cost of the project, including the applicant's and the FFRDC's portions of the effort.

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

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

G. Questions Regarding Eligibility

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

IV. Application and Submission Information

A. Application Process

The application process will include two phases: a Concept Paper phase, and a Full Application phase. **Only applicants who have submitted an eligible Concept Paper will be eligible to submit a Full Application.**

At each phase, EERE performs an initial eligibility review of the applicant submissions to determine whether they meet the eligibility requirements of Section III of the FOA. EERE will not review or consider submissions that do not meet the eligibility requirements of Section III. All submissions must conform to the following form and content requirements, including maximum page lengths (described below) and must be submitted via EERE Exchange at <https://eere-Exchange.energy.gov>, unless specifically stated otherwise. **EERE will not review or consider submissions submitted through means other than EERE Exchange,**

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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 Calibri typeface, a black font color, and a font size of 12 point or larger (except in figures or tables, which may be 10 point font). A symbol font may be used to insert Greek letters or special characters, but the font size requirement still applies. References must be included as footnotes or endnotes in a font size of 10 or larger. Footnotes and endnotes are counted toward the maximum page requirement;
- The Control Number must be prominently displayed on the upper right corner of the header of every page. Page numbers must be included in the footer of every page; and
- Each submission must not exceed the specified maximum page limit, including cover page, charts, graphs, maps, and photographs when printed using the formatting requirements set forth above and single spaced. If applicants exceed the maximum page lengths indicated below, EERE will review only the authorized number of pages and disregard any additional pages.

Applicants are responsible for meeting each submission deadline. **Applicants are strongly encouraged to submit their Concept Papers, Full Applications, and Replies to Reviewer Comments 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, Full Applications, and Replies to Reviewer Comments to allow sufficient time for the submission of

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required information and documents. All Full Applications that pass the initial eligibility review will undergo comprehensive technical merit review according to the criteria identified in Section V.A.ii. of the FOA.

i. Additional Information on EERE Exchange

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

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

B. Application Forms

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

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

TechnicalVolume_Part_1
TechnicalVolume_Part_2

C. Content and Form of the Concept Paper

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

i. Concept Paper Content Requirements

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

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

The Concept Paper must conform to the following content requirements:

Section	Page Limit	Description
Cover Page	1 page maximum	The cover page should include the project title, the specific announcement Topic Area being addressed (if applicable), both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality.
Technology Description	4 pages maximum	<p>Applicants are required to describe succinctly:</p> <ul style="list-style-type: none"> • The proposed technology, including its basic operating principles and how it advances state of the art; • The proposed technology’s performance against relevant metrics that are found in Section I.B.i for Topic Area 1 and Section I.B.ii for Topic Area 2 (applicants should provide technical data or other support to show how the proposed metrics could be met); • The current state-of-the-art (commercially practiced) in the relevant field and application, including key shortcomings, limitations, and challenges; • How the proposed technology will overcome the shortcomings, limitations, and challenges in the relevant field and application; • The potential impact that the proposed project would have on the relevant field and application; • The key technical risks/issues associated with the proposed technology development plan; and • The impact that EERE funding would have on the proposed project, including a discussion of the current state of proposed technology and how funding would advance it.
Addendum	1 pages maximum	<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 (PI) and Project Team have the skill and expertise needed to successfully execute the project plan; • Whether the applicant has prior experience which demonstrates an ability to perform tasks of similar risk and complexity; • Whether the applicant has worked together with its teaming partners on prior projects or programs; and • Whether the applicant has adequate access to equipment and facilities necessary to accomplish the effort and/or clearly explain how it intends to obtain access to the necessary equipment and facilities.

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| | | <ul style="list-style-type: none">• Applicants may provide graphs, charts, or other data to supplement their Technology Description. |
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EERE makes an independent assessment of each Concept Paper based on the criteria in Section V.A.i. of the FOA. EERE will encourage a subset of applicants to submit Full Applications. Other applicants will be discouraged from submitting a Full Application. An applicant who receives a “discouraged” notification may still submit a Full Application. EERE will review all eligible Full Applications. However, by discouraging the submission of a Full Application, EERE intends to convey its lack of programmatic interest in the proposed project in an effort to save the applicant the time and expense of preparing an application that is unlikely to be selected for award negotiations.

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

D. Content and Form of the Full Application

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

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

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

i. Full Application Content Requirements

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

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

Component	File Format	Page Limit	File Name
Technical Volume	PDF	25	ControlNumber_LeadOrganization_TechnicalVolume
Resumes	PDF	1 each	ControlNumber_LeadOrganization_Resumes
Letters of Commitment	PDF	1 each	ControlNumber_LeadOrganization_LOCs
Statement of Project Objectives	MS Word	10	ControlNumber_LeadOrganization_SOPO
SF-424	PDF	n/a	ControlNumber_LeadOrganization_App424
Budget Justification Workbook	MS Excel	n/a	ControlNumber_LeadOrganization_Budget_Justification
Summary/Abstract for Public Release	PDF	1	ControlNumber_LeadOrganization_Summary
Summary Slide	MS Powerpoint	1	ControlNumber_LeadOrganization_Slide
Subrecipient Budget Justification	MS Excel	n/a	ControlNumber_LeadOrganization_Subrecipient_Budget_Justification
DOE Work Proposal for FFRDC, if applicable (see DOE O 412.1A, Attachment 3)	PDF	n/a	ControlNumber_LeadOrganization_WP
Authorization from cognizant Contracting Officer for FFRDC	PDF	n/a	ControlNumber_LeadOrganization_FFRDCAuth
SF-LLL Disclosure of Lobbying Activities	PDF	n/a	ControlNumber_LeadOrganization_SF-LLL
Foreign Entities and Foreign Work Waivers	PDF	n/a	ControlNumber_LeadOrganization_Waiver
U.S. Manufacturing Plan	PDF		ControlNumber_LeadOrganization_USMP
Data Management Plan	MS Word	n/a	ControlNumber_LeadOrganization_DMP
Diversity, Equity, and Inclusion Plan	PDF	5	ControlNumber_LeadOrganization_DEIP

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

TechnicalVolume_Part_1
TechnicalVolume_Part_2

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

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

ii. Technical Volume

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

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

The Technical Volume to the Full Application may not be more than 25 pages, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all of the information in the table below. The applicant should consider the weighting of each of the evaluation criteria (see Section V.A.ii of the FOA) when preparing the Technical Volume.

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

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

<p>Project Overview (Approximately 10% of the Technical Volume)</p>	<p>The Project Overview should contain the following information:</p> <ul style="list-style-type: none"> • Background: The applicant should discuss the background of their organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Full Application. • Project Goal: The applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal. • DOE Impact: The applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.
<p>Technical Description, Innovation, and Impact (Approximately 30% of the Technical Volume)</p>	<p>The Technical Description should contain the following information:</p> <ul style="list-style-type: none"> • Relevance and Outcomes: The applicant should provide a detailed description of the technology, including the scientific and other principles and objectives that will be pursued during the project. This section should describe the complete recycling/upcycling process or novel material design and its relevance to the goals and objectives of the FOA, including the potential to meet specific DOE technical targets found in Section I.B.i for Topic Area 1 and in Section I.B.ii for Topic Area 2 or other relevant performance targets. Relative metrics should have clearly identified and justified baselines. The applicant should clearly specify the expected outcomes of the project. • Feasibility: The applicant should demonstrate the technical feasibility of the proposed technology and capability of achieving the anticipated performance targets, including a description of previous work done and prior results. • Innovation and Impacts: The applicant should describe the current state-of-the-art in the applicable field, the specific innovation of the proposed technology, the advantages of proposed technology over current and emerging technologies, and the overall impact on advancing the state-of-the-art/technical baseline if the project is successful. A preliminary LCA and TEA, if available, should be included with a discussion of the critical advancements needed to reach desired metrics.
<p>Workplan and Market Transformation Plan (Approximately 40% of the Technical Volume)</p>	<p>The Workplan should include a summary of the Project Objectives, Technical Scope, Work Breakdown Structure (WBS), Milestones, Go/No-Go Decision Points, and Project Schedule. A detailed SOPO is separately requested. The Workplan should contain the following information:</p> <ul style="list-style-type: none"> • Project Objectives: The applicant should provide a clear and concise (high-level) statement of the goals and objectives of the project as well as the expected outcomes.

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	<ul style="list-style-type: none"> • Technical Scope Summary: The applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). The overall work scope is to be divided by performance periods that are separated by discrete, approximately annual decision points (see below for more information on Go/No-Go decision points). The applicant should describe the specific expected end result of each performance period and explain its relevance to achieving project and FOA objectives. • WBS and Task Description Summary: The Workplan should describe the work to be accomplished and how the applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. The Workplan is to be structured with a hierarchy of performance period (approximately annual), task and subtasks, which is typical of a standard WBS for any project. The first performance period, budget period 1 (BP1), will last 3 months and should be limited to verification tasks as described in Section I.D. The Workplan shall contain a concise description of the specific activities to be conducted over the life of the project. The description shall be a full explanation and disclosure of the project being proposed (i.e., a statement such as “we will then complete a proprietary process” is unacceptable). It is the applicant’s responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this FOA. The summary provided should be consistent with the SOPO. The SOPO will contain a more detailed description of the WBS and tasks. • Milestone Summary: The applicant should provide a summary of appropriate milestones throughout the project to demonstrate success. A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be Specific, Measurable, Achievable, Relevant, and Timely, and must demonstrate a technical achievement rather than simply completing a task. The minimum requirement is that each project must have at least one milestone per quarter for the duration of the project with at least one SMART technical milestone per year (depending on the project, more milestones may be necessary to comprehensively demonstrate progress). Milestones should demonstrate progress towards the end of project goal(s) and towards meeting project metrics. The applicant should also provide the means by which the milestone will be verified. The summary provided should be consistent with the Milestone Summary Table in the SOPO. • Go/No-Go Decision Points: The applicant should provide a summary of project-wide Go/No-Go decision points at appropriate points in the Workplan. A Go/No-Go decision point is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance,
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technical success is definitively achieved and potential for success in future phases or periods of performance is evaluated, prior to actually beginning the execution of future phases. At a minimum, each project must have at least one project-wide Go/No-Go decision point for each budget period (12 to 18-month period) of the project. See Section VI.B.xiv. The applicant should also provide the specific technical criteria to be used to evaluate the project at the Go/No-Go decision point. The summary provided should be consistent with the SOPO. Go/No-Go decision points are considered "SMART" and can fulfill the requirement for an annual SMART milestone.

- End of Project Goal: The applicant should provide a summary of the end of project goal(s). At a minimum, each project must have one SMART end of project goal. The summary provided should be consistent with the SOPO.
- Project Schedule (Gantt Chart or similar): The applicant should provide a schedule for the entire project, including task and subtask durations, milestones, and Go/No-Go decision points.
- Project Management: The applicant should discuss the team's proposed management plan, including the following:
 - The overall approach to and organization for managing the work
 - The roles of each project team member
 - Any critical handoffs/interdependencies among project team members
 - The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices
 - The approach to project risk management
 - A description of how project changes will be handled
 - If applicable, the approach to Quality Assurance/Control
 - How communications will be maintained among project team members
- Market Transformation Plan: The applicant should provide a market transformation plan, including the following:
 - Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including a mitigation plan
 - Identification of a product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including

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	<p>intellectual property, infrastructure requirements, data dissemination, U.S. Manufacturing Plan, and product distribution.</p>
<p>Technical Qualifications and Resources (Approximately 20% of the Technical Volume)</p>	<p>The Technical Qualifications and Resources should contain the following information:</p> <ul style="list-style-type: none"> • Describe the project team’s unique qualifications and expertise, including those of key subrecipients. • Describe the project team’s existing equipment and facilities that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project. • This section should also include relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives. • Describe the time commitment of the key team members to support the project. • Describe the technical services to be provided by DOE/NNSA FFRDCs, if applicable. • For multi-organizational or multi-investigator projects, describe succinctly: <ul style="list-style-type: none"> ○ The roles and the work to be performed by each PI and 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>Diversity, Equity, Inclusion (Address in the Diversity, Equity, and Inclusion Plan)</p>	<p>The Diversity, Equity, and Inclusion Plan should contain the following information:</p> <ul style="list-style-type: none"> • Equity Impacts: the impacts of the proposed project on underserved communities, including social and environmental impacts. • Benefits: The overall benefits of the proposed project, if funded, to underserved communities; and • How diversity, equity, and inclusion objectives will be incorporated in the project.

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	See Section IV.D.xvii for more information on the contents of the Diversity, Equity, and Inclusion Plan.
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iii. Resumes

Applicants are required to submit one-page resumes for key participating team members. Multi-page resumes are not allowed. Save the resumes in a single PDF file using the following convention for the title “ControlNumber_LeadOrganization_Resumes”.

iv. Letters of Commitment

Submit letters of commitment from all subrecipient and third party cost share providers. If applicable, also include any letters of commitment from partners/end users (one-page maximum per letter). Save the letters of commitment in a single PDF file using the following convention for the title “ControlNumber_LeadOrganization_LOCs”.

v. Statement of Project Objectives (SOPO)

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

vi. 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_424”.

vii. Budget Justification Workbook

Applicants are required to complete the Budget Justification Workbook. This form is available on EERE Exchange at <https://eere-Exchange.energy.gov/>. Prime recipients must complete each tab of the Budget Justification Workbook for the project as a whole, including all work to be performed by the prime recipient and its subrecipients and contractors. Applicants should include costs associated with required annual audits and incurred cost proposals in their proposed budget documents. The “Instructions and Summary” included with the Budget

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Justification Workbook will auto-populate as the applicant enters information into the Workbook. Applicants must carefully read the “Instructions and Summary” tab provided within the Budget Justification Workbook. Save the Budget Justification Workbook in a single Microsoft Excel file using the following convention for the title “ControlNumber_LeadOrganization_Budget_Justification”.

viii. Summary/Abstract for Public Release

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

ix. Summary Slide

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

The Summary Slide template requires the following information:

- A technology summary;
- A description of the technology’s impact;
- Proposed project goals;
- 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.

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

x. Subrecipient Budget Justification (if applicable)

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

xi. 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-chg1-AdmChg> Save the WP in a single PDF file using the following convention for the title “ControlNumber_LeadOrganization_WP”.

xii. 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”.

xiii. 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.

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

xiv. 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 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”.

xv. U.S. Manufacturing Commitments

Pursuant to the DOE Determination of Exceptional Circumstances (DEC) dated September 9, 2013, each applicant 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.

Due to the lower technology readiness levels of this FOA, DOE does not expect the U.S. Manufacturing Plans to be tied to a specific product or technology. However, 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 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.J. 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".

xvi. 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 DMPs 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

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publications. DOE Public Access Plan dated July 24, 2014 provides additional guidance and information on DMPs.

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.

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".

xvii. Diversity, Equity, and Inclusion Plan

As part of the application, applicants are required to describe how diversity, equity, and inclusion objectives will be incorporated in the project. Specifically, applicants are required to submit a Diversity, Equity, and Inclusion Plan that describes the actions the applicant will take to foster a welcoming and inclusive environment, support people from groups underrepresented in STEM, advance equity, and encourage the inclusion of individuals from these groups in the project; and the extent the project activities will be located in or benefit underserved communities (also see Section I.A.iii). The plan should include SMART milestones supported by metrics to measure the success of the proposed actions.

The following is a non-exhaustive list of actions that can serve as examples of ways the proposed project could incorporate diversity, equity, and inclusion elements. These examples should not be considered either comprehensive or

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prescriptive. Applicants may include appropriate actions not covered by these examples.

- a. Include persons from groups underrepresented in STEM as PI, co-PI, and/or other senior personnel;
- b. Include persons from groups underrepresented in STEM as student researchers or post-doctoral researchers;
- c. Include faculty or students from Minority Serving Institutions as PI/co-PI, senior personnel, and/or student researchers, as applicable;
- d. Enhance or collaborate with existing diversity programs at your home organization and/or nearby organizations;
- e. Collaborate with students, researchers, and staff in Minority Serving Institutions;
- f. Disseminate results of research and development in Minority Serving Institutions or other appropriate institutions serving underserved communities;
- g. Implement evidence-based, diversity-focused education programs (such as implicit bias training for staff) in your organization;
- h. Identify Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses and Veteran Owned Businesses to solicit as vendors and sub-contractors for bids on supplies, services and equipment.

Save the Diversity, Equity and Inclusion Plan in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_DEIP".

E. Content and Form of Replies to Reviewer Comments

If replies to reviewer comments are applicable, 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.

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

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

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

F. Post 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; and
- Environmental Questionnaire.
- [List any additional requirements here]

G. 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

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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.

H. Submission Dates and Times

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

I. Intergovernmental Review

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

J. 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.

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

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

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

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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 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. 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 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

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qualification or financial integrity information, such as SAM Exclusions and “Do Not Pay.”

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

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

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.

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.

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

This criterion involves consideration of the following factors:

- The applicant clearly describes the proposed technology, describes how the technology is unique and innovative, its energy and emissions impacts, economic viability, 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. All sub-criteria are of equal weight.

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

This criterion involves consideration of the following factors:

Technical Merit and Innovation

- Extent to which the proposed technology or process is innovative and the description of how it fits into the full lifecycle is complete;
- Degree to which the current state of the technology and the proposed advancement are clearly described and are responsive for FOA metrics that are found in Section I.B.i for Topic Area 1 and Section I.B.ii for Topic Area 2, including energy savings, emissions reduction, and economic viability;
- Extent to which the application specifically and convincingly demonstrates how the applicant will move the state-of-the-art to the proposed advancement; and
- Sufficiency of technical detail in the application to assess whether the proposed work is scientifically meritorious and revolutionary, including relevant data, calculations and discussion of prior work in the literature with analyses that support the viability of the proposed work.

Impact of Technology Advancement

- How the project supports the topic area objectives and metrics, including GHG impacts, economic feasibility, energy efficiency and carbon reduction of recycled materials; and

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-
- The potential impact of the project on advancing the state-of-the-art.

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

This criterion involves consideration of the following factors:

Research Approach, Workplan and SOPO

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

Identification of Technical Risks

- Discussion and demonstrated understanding of the key technical risk areas involved in the proposed work and the quality of the mitigation strategies to address them; and
- Extent to which potential issues such as densification and distribution of the feedstock are addressed.

Baseline, Metrics, and Deliverables

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

Market Transformation Plan

- Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including mitigation plan; and
- Comprehensiveness of market transformation plan including but not limited to product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, [U.S. manufacturing plan](#), and product distribution.

Criterion 3: Team and Resources (15%)

This criterion involves consideration of the following factors:

- The capability of the Principal Investigator(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team;
- The sufficiency of the facilities to support the work;
- The degree to which the proposed consortia/team demonstrates the ability to facilitate and expedite further development and commercial deployment of the proposed technologies;

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-
- The level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan; and
 - The reasonableness of the budget and spend plan for the proposed project and objectives.

Criterion 4: Diversity, Equity, and Inclusion (10%)

This criterion involves consideration of the following factors:

- The quality and manner in which the measures incorporate diversity, equity and inclusion goals in the project; and
- Extent to which the project benefits underserved communities.

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 September 2020, which is available at:

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

C. Other Selection Factors**i. Program Policy Factors**

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

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

-
- The level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers;
 - The degree to which the proposed project is likely to lead to increased employment and manufacturing in the United States;
 - The degree to which the proposed project, or group of projects, represent a desired geographic distribution (considering past awards and current applications);
 - The degree to which the proposed project incorporates diversity, equity, and inclusion elements, including but not limited to team members from Minority Serving Institutions (e.g. Historically Black Colleges and Universities (HBCUs)/Other Minority Institutions), Minority Business Enterprises, Minority Owned Businesses, Woman Owned Businesses, Veteran Owned Businesses, or members within underserved communities.

Diversity (other than technological)

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

Market Impact

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

D. Evaluation and Selection Process

i. Overview

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

ii. Pre-Selection Clarification

EERE may determine that pre-selection clarifications are necessary from one or more applicants. 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-

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selection clarification will be carried out through either written responses to EERE's written clarification questions or video or conference calls with EERE representatives.

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

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

iii. Recipient Integrity and Performance Matters

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

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

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

iv. Selection

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

E. Anticipated Notice of Selection and Award 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.

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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.

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. Pending and Current Sources of Support

Current and pending support is intended to allow the identification of potential duplication, overcommitment, potential conflicts of interest or commitment, and all other sources of support. If selected for award negotiations, the principal investigator and each senior/key person at the recipient and subrecipient level must provide a list of all sponsored activities, awards, and appointments, whether paid or unpaid; provided as a gift with terms or conditions or provided

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as a gift without terms or conditions; full-time, part-time, or voluntary; faculty, visiting, adjunct, or honorary; cash or in-kind; foreign or domestic; governmental or private-sector; directly supporting the individual's research or indirectly supporting the individual by supporting students, research staff, space, equipment, or other research expenses. All foreign government-sponsored talent recruitment programs must be identified in current and pending support. The information may be provided in the format approved by the National Science Foundation (NSF), which may be generated by the Science Experts Network Curriculum Vita (SciENCv), a cooperative venture maintained at <https://www.ncbi.nlm.nih.gov/sciencv/>, and is also available at <https://www.nsf.gov/bfa/dias/policy/nsfapprovedformats/cps.pdf>. The use of a format required by another agency is intended to reduce the administrative burden to researchers by promoting the use of common formats.

For every activity, list the following items:

- The sponsor of the activity or the source of funding
- The award or other identifying number
- The title of the award or activity. If the title of the award or activity is not descriptive, add a brief description of the research being performed that would identify any overlaps or synergies with the proposed research.
- The total cost or value of the award or activity, including direct and indirect costs and cost share. For pending proposals, provide the total amount of requested funding.
- The award period (start date – end date).
- The person-months of effort per year being dedicated to the award or activity
- If required to identify overlap, duplication of effort, or synergistic efforts, append a description of the other award or activity to the current and pending support.
- Details of any obligations, contractual or otherwise, to any program, entity, or organization sponsored by a foreign government must be provided on request to either the applicant institution or DOE.

ii. **Registration Requirements**

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

1. **EERE Exchange**

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Register and create an account on EERE Exchange at <https://eere-Exchange.energy.gov>. This account will then allow the user to register for any open EERE FOAs that are currently in EERE Exchange. It is recommended that each organization or business unit, whether acting as a team or a single entity, use only one account as the contact point for each submission. Applicants should also designate backup points of contact so they may be easily contacted if deemed necessary. **This step is required to apply to this FOA.** The EERE Exchange registration does not have a delay; however, **the remaining registration requirements below could take several weeks to process and are necessary for a potential applicant to receive an award under this FOA.**

2. DUNS Number

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

3. 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.

4. FedConnect

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

5. Grants.gov

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

6. Electronic Authorization of Applications and Award Documents

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

iii. 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.

iv. Foreign National Access

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 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.

v. 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.

vi. 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.isp>.

vii. 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.

viii. Applicant Representations and Certifications

1. Lobbying Restrictions

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

2. Corporate Felony Conviction and Federal Tax Liability Representations

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

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

For purposes of these representations the following definitions apply:

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

3. Nondisclosure and Confidentiality Agreements Representations

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

- a. It **does not and will not** require its employees or contractors to sign internal nondisclosure or confidentiality agreements or statements prohibiting or otherwise restricting its employees or contractors from lawfully reporting waste, fraud, or abuse to a designated investigative or

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law enforcement representative of a federal department or agency authorized to receive such information.

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

ix. 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.

x. 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.

xi. Intellectual Property Management Plan (IPMP)

As a quarter 1 milestone if selected for award, applicants may be required to submit an executed IPMP between the members of the consortia or team.

The award will set forth the treatment of and obligations related to intellectual property rights between EERE and the individual members. The IPMP should describe how the members will handle intellectual property rights and issues between themselves while ensuring compliance with federal intellectual property laws, regulations, and policies (see Sections VIII.J.-VIII.N. of this FOA for more details on applicable federal intellectual property laws and regulations). Guidance regarding the contents of IPMP is available from EERE upon request.

The following is a non-exhaustive list of examples of items that the IPMP may cover:

- The treatment of confidential information between members (e.g., the use of NDAs);
- The treatment of background intellectual property (e.g., any requirements for identifying it or making it available);
- The treatment of inventions made under the award (e.g., any requirements for disclosing to the other members on an application, filing patent applications, paying for patent prosecution, and cross-licensing or other licensing arrangements between the members);
- The treatment of data produced, including software, under the award (e.g., any publication process or other dissemination strategies, copyrighting strategy or arrangement between members);
- Any technology transfer and commercialization requirements or arrangements between the members;
- The treatment of any intellectual property issues that may arise due to a change in membership of the consortia or team; and
- The handling of disputes related to intellectual property between the members.

xii. 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.

xiii. 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>.

xiv. 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.

Additional reporting requirements for projects selected by this FOA include:

- Attendance at the EERE Peer Reviews as necessary so that external subject matter experts can review project accomplishments and provide feedback to ensure optimal use of EERE funds.
- Technical data sheet and/or block flow diagram templates are included with the FOA for given topic areas. Recipient will be required to provide the requested data for initial verification purposes and update the submission each annually and/or each interim budget period for interim and final verification purposes.

xv. 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.

xvi. Conference Spending

The recipient shall not expend any funds on a conference not directly and programmatically related to the purpose for which the grant or cooperative agreement was awarded that would defray the cost to the United States government of a conference held by any Executive branch department, agency, board, commission, or office for which the cost to the United States government would otherwise exceed \$20,000, thereby circumventing the required notification by the head of any such Executive Branch department, agency, board, commission, or office to the Inspector General (or senior ethics official for any entity without an Inspector General), of the date, location, and number of employees attending such conference.

xvii. 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.

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

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

xix. 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

subrecipient level. The table should include the individuals' names, job titles, role in the project and their organization. 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: SUPRFOA@ee.doe.gov. Questions must be submitted not later than 3 business days prior to the application due date and time. Please note, feedback on individual concepts will not be provided through Q&A.

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

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.

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

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 for Domestic Large Businesses: DOE has issued a class patent waiver that applies to this FOA. Under this class patent waiver, domestic large businesses may elect title to their subject inventions similar to the right provided to the domestic small businesses, educational institutions, and nonprofits by law. In order to avail itself of the class patent waiver, a domestic large business must agree that any products embodying or produced through the use of 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; and
- Advance and Identified Patent Waivers: For applicants that don't fall under the class patent waiver or the Bayh-Dole Act, those applicants may request a patent waiver that will cover subject inventions that may be invented under the award, in advance of or within 30 days after the effective date of the award. Even if an advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver for identified inventions, i.e., individual subject inventions that are disclosed to EERE within the timeframes set forth in the award's intellectual property terms and conditions. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784.
- Each applicant is required to submit a U.S. Manufacturing Plan as part of its application. If selected, the U.S. Manufacturing Plan shall be incorporated into

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the award terms and conditions for domestic small businesses and nonprofit organizations. DOE has determined that exceptional circumstances exist that warrants the modification of the standard patent rights clause for small businesses and non-profit awardees under Bayh-Dole to the extent necessary to implement and enforce the U.S. Manufacturing Plan. 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;
- 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.

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 CFR 910.501 and Subpart F.

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

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

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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.

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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

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will be consumed in the performance of the award or fully depreciated by the end of the award. In cases where the full value of a donated capital asset is to be applied as cost sharing or matching, that full value must be the lesser or the following:

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

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

- (5)** Documentation. The following requirements pertain to the recipient's supporting records for in-kind contributions from third parties:
 - a.** Volunteer services must be documented and, to the extent feasible, supported by the same methods used by the recipient for its own employees.

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

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

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

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

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

Each task must be calculated individually as follows:

Task 1

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

Task 1 Cost minus federal share = non-federal share

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

Task 2

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

Task 2 Cost minus federal share = non-federal share

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

Task 3

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

Task 3 Cost minus federal share = non-federal share

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

Task 4

Federal share = \$100,000

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

The calculation may then be completed as follows:

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

Blended Cost Share %

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

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

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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 and Subrecipients

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

Waiver Criteria

EERE invests in R&D as part of the DOE’s broad portfolio approach to addressing our Nation’s energy and environmental challenges. EERE seeks to address gaps in domestic supply chains for critical materials by validating and/or demonstrating improvements to current industrial extraction, separation and processing technologies and developing next-generation technologies to shift the paradigm of the industry. To ensure that purpose is not frustrated by foreign involvement, foreign entities seeking to participate in a project funded under this FOA must demonstrate to the satisfaction EERE that:

- Its participation is in the best interest of the U.S. industry and U.S. economic development;
- The project team has appropriate measures in place to control sensitive information and protect against unauthorized transfer of scientific and technical information;
- Adequate protocols exist between the U.S. subsidiary and its foreign parent organization to comply with export control laws and any obligations to protect proprietary information from the foreign parent organization;
- The work is conducted within the U.S. and the entity acknowledges and demonstrates that it has the intent and ability to comply with the U.S. Manufacturing Plan; and
- The foreign entity will satisfy other conditions that may be deemed necessary by EERE to protect U.S. interests.

Content for Waiver Request

A Foreign Entity Participation waiver request must include the following:

- a. Information about the entity: name, point of contact, and proposed type of involvement with the Institute, and DUNS number for the proposed foreign participant and any foreign parent organization;

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- b. Country of incorporation, the extent of the ownership/level control by foreign entities, whether the entity is state owned or controlled, a summary of the ownership breakdown of the foreign entity and the percentage of ownership/control by foreign entities, foreign shareholders, foreign state or foreign individuals;
 - c. The rationale for proposing a foreign entity participate (must address the waiver criteria stated above);
 - d. A description of the project's anticipated contributions to the U.S. economy:
 - i. How the foreign entity's participation 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.;
 - ii. How the foreign entity's participation will promote domestic manufacturing of products and/or services;
 - e. A description of why the foreign entity's participation is essential to the project;
 - f. A description of the likelihood of Intellectual Property (IP) being created from the work and the treatment of any such IP; and
 - g. Countries where the work will be performed (Note: if any work is proposed to be conducted outside the U.S., the applicant must also complete a separate request for a foreign work waiver).

EERE may also require:

- A risk assessment with respect to IP and data protection protocols that includes the export control risk based on the data protection protocols, the technology being developed and the foreign entity and country. These submissions could be prepared by the project lead, but the prime recipient must make a representation to DOE as to whether it believes the data protection protocols are adequate and make a representation of the risk assessment – high, medium or low risk of data leakage to a foreign entity.
- Additional language be added to any agreement or subagreement to protect IP, mitigate risk or other related purposes.

EERE may require additional information before considering the waiver request.

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

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

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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 measures in place to control sensitive information and protect against unauthorized transfer of scientific and technical information;
- The countries in which the foreign work is proposed to be performed; and
- The name of the entity that would perform the foreign work.

EERE may require additional information before considering the waiver request.

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

APPENDIX D – 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.

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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

Insert other acronyms applicable to this FOA (e.g., technology office name, technical terms or metrics)

AMO	Advanced Manufacturing Office
BETO	Bioenergy Technology Office
BP	Budget Period
CH4	Methane
CO2	Carbon Dioxide
CO2 eq	Carbon Dioxide Equivalents
COI	Conflict of Interest
DEC	Determination of Exceptional Circumstances
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
GHG	Greenhouse Gas
HBCU	Historically Black Colleges and Universities
IPMP	Intellectual Property Management Plan
LCA	Life Cycle Analysis
LDPE	Low Density Polyethylene
LLDPE	Linear Low Density Polyethylene
M&O	Management and Operating
MPIN	Marketing Partner ID Number
MSI	Minority Serving Institutions
MT	Metric Tonnes
MRF	Municipal Recycling Facility
MYPP	Multi-Year Program Plan
NDA	Non-Disclosure Acknowledgement
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Agency
NREL	National Renewable Energy Lab
OMB	Office of Management and Budget
OMI	Other Minority Institution
OSTI	Office of Scientific and Technical Information
PI	Principle Investigator
PII	Personal Identifiable Information

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R&D	Research and Development
REMADE	Reducing Embodied Energy and Decreasing Emissions
RFI	Request for Information
RFP	Request for Proposal
SAM	System for Award Management
SMART	Specific, Measureable, Achievable, Relevant, and Timely
SOPO	Statement of Project Objectives
SPOC	Single Point of Contact
STEM	Science Technology Engineering and Math
TIA	Technology Investment Agreement
TRL	Technology Readiness Level
UCC	Uniform Commercial Code
VT	Interdisciplinary third party verification team
WBS	Work Breakdown Structure
WP	Work Proposal

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