U.S. Department of Energy (DOE)
Office of Energy Efficiency and Renewable Energy (EERE)

Materials, Operation, and Recycling of Photovoltaics (MORE PV)

Funded in part by the Bipartisan Infrastructure Law

Funding Opportunity Announcement (FOA) Number: DE-FOA-0002985
FOA Type: Mod 000001
Assistance Listing Number: 81.087

FOA Issue Date:	07/21/2023
Submission Deadline for Letter of Intent:	09/06/2023 5:00 p.m. ET
Informational Webinar:	07/26/2023 1:00 p.m. ET
Submission Deadline for Concept Papers:	09/13/2023 5:00 p.m. ET
Submission Deadline for Full Applications:	11/30/2023 5:00 p.m. ET
Expected Submission Deadline for Replies to Reviewer Comments:	01/16/2024 5:00 p.m. ET
Expected Date for DOE Selection Notifications:	April 2024
Expected Timeframe for Award Negotiations:	April – August 2024

- Applicants must submit a Letter of Intent and a Concept Paper by 5 p.m. ET on the due date listed above to be eligible to submit a Full Application.

- To apply to this FOA, applicants must register with and submit application materials through EERE eXCHANGE at https://eere-eXCHANGE.energy.gov/, EERE's online application portal.

- Applicants must designate primary and backup points-of-contact in EERE eXCHANGE with whom EERE will communicate to conduct award negotiations. If an application is selected for award negotiations, it is not a commitment to issue an award. It is imperative that the applicant/selectee be responsive during award negotiations and meet negotiation deadlines. Failure to do so may result in cancelation of further award negotiations and rescission of the selection.

- **Unique Entity Identifier (UEI) and System for Award Management (SAM)** - Each applicant (unless the applicant is excepted from those requirements under 2 CFR 25.110) is required to: (1) register in the SAM at https://www.sam.gov before submitting an application; (2) provide a valid UEI number in the application; and (3)

maintain an active SAM registration with current information when the applicant has an active federal award or an application or plan under consideration by a federal awarding agency. DOE may not make a federal award to an applicant until the applicant has complied with all applicable UEI and SAM requirements and, if an applicant has not fully complied with the requirements by the time DOE is ready to make a federal award, DOE will determine that the applicant is not qualified to receive a federal award and use that determination as a basis for making a federal award to another applicant.

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

Modifications

All modifications to the FOA are HIGHLIGHTED in the body of the FOA.

Mod. No.	Date	Description of Modification
000001	11/20/2023	To change the submission deadline for Full Applications to 11/30/2023.

Table of Contents

I. Overview of Key Information

Agency: Department of Energy, Office of Energy Efficiency and Renewable Energy

Overview: Through this Funding Opportunity Announcement (FOA), the Solar Energy Technologies Office (SETO) will provide funding for research and development to reduce material usage, improve installation quality and resilience of photovoltaic (PV) systems, and address handling of PV systems at the end of life.

Topic Area 1: MORE Connection: Connecting PV Materials, Design, Installation, Performance, and End of Life

This Topic Area will use $12 million of non- Bipartisan Infrastructure Law (BIL) funding to fund collaborations of diverse stakeholders who can bring expertise from all life stages of the PV system lifecycle to reduce cost and lifecycle impacts of a PV system and its components, including co-located storage. Projects funded in this topic area will develop technology and design solutions to optimize the interconnected energy, economic, and environmental impact metrics in pursuit of rapid and sustainable scale-up of PV technologies.

Specific areas of interest include:

- Design of PV systems and PV system components that minimizes the use of materials, especially critical materials.
- Development of characterization and non-destructive testing of bill of materials (BOM) of PV system components throughout their life.
- Development and implementation of holistic design for engineering, procurement, and construction (EPC) of PV systems that can simultaneously optimize energy, economic, and environmental metrics during the system's useful life under relevant operating conditions, in a high deployment environment.
- Scalable hardware and software solutions for robust, error-free, low-maintenance tools, components, and methods for installation, quality management, and maintenance.

Topic Area 2: Solar Partnership to Advance Recycling and Circularity (Solar PARC)

This topic area uses funds designated by the BIL and seeks to fund one research partnership at a maximum of $8 million dedicated to improving materials recovery efficiency and developing safe end-of-life (EOL) practices for PV system components, including modules, inverters, and other balance-of-system (BOS) components. The partnership will focus on technologies and methods to enable low-cost reuse, refurbishing, repair, and recycling of photovoltaic materials, and best practices for safe disposal of these materials, and will include data collection, analysis, and working groups to enable effective collaborations and technology transfer.

Deadlines:

- **September 13, 2023, at 5pm ET**: Concept papers due
- **November 28, 2023, at 5pm ET:** Full Applications due

Funding Overview: It is anticipated that this FOA will provide federal funding of $20 million over three to five years, including $8 million of BIL funding and $12 million of non-BIL funding.

Eligible Applicants: The prime recipient and subrecipient(s) 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. Nonprofit entities; and
4. State and local governmental entities and Indian Tribes.

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

Key Benefits and Metrics:

- **Increased material supply and reduced environmental impact** enabled by recycling technologies.
- **Reduced material and energy use** enabled by optimized use of materials, designs for recyclability, and recycling and reuse technologies and practices.
- **Rapid and sustainable scale-up of PV technologies** will be aided by holistic optimization of interconnected energy, economic, and environmental impact metrics over all life stages of PV systems. This FOA requires the evaluation of energy inputs (such as embodied energy), economic inputs (such as total lifecycle cost), and environmental inputs (such as embodied greenhouse gas) related to the solar energy output for the developed technological advances throughout all four stages of PV system life: materials and supply chain, project development and installation, energy generation, and end of service.

II. Funding Opportunity Description

A. Background and Context

The U.S. Department of Energy's (DOE) Solar Energy Technologies Office is issuing the Materials, Operation, and Recycling of Photovoltaics (MORE PV) Funding Opportunity Announcement. Awards made under this FOA will be funded, in whole or in part, with

funds appropriated by the Infrastructure Investment and Jobs Act,[1] more commonly known as the Bipartisan Infrastructure Law.

BIL is a once-in-a-generation investment in modernizing and upgrading American infrastructure to enhance U.S. competitiveness, drive the creation of good-paying union jobs, tackle the climate crisis, and ensure strong access to economic, environmental, and other benefits for disadvantaged communities.[2] BIL appropriates more than $62 billion to DOE[3] to invest in American manufacturing and workers; expand access to energy efficiency and clean energy; deliver reliable, clean, and affordable power to more Americans; and demonstrate and deploy the technologies of tomorrow through clean energy demonstrations.

DOE's BIL investments will support efforts to build a clean and equitable energy economy that achieves a zero-carbon electricity system by 2035, and to put the United States on a path to achieve net-zero emissions economy-wide by no later than 2050[4] to benefit all Americans.

The BIL will invest $20,000,000 over the next three years for research, development, demonstration, and commercialization projects to create innovative and practical approaches to increase the reuse and recycling of solar energy technologies. Previous BIL FOA issued in the fiscal year 2022 already resulted in selection of eight projects on recycling and reduced critical and/or expensive material use totaling $10,000,000 of Federal funding.

The activities to be funded under this FOA support BIL sections Sec. 41007 (c)(3) that provides funding for activities listed under section 3004(b)(4) of the Energy Act of 2020 (42 U.S.C. 16238(b)(4)), and the broader government-wide approach to invest in innovative research and development (R&D) in photovoltaics to reduce costs and supply chain vulnerabilities, achieve durable, recyclable solar technologies, and advance sustainable deployment of low-cost solar electricity generation. These activities also

[1] Infrastructure Investment and Jobs Act, Public Law 117-58 (November 15, 2021). https://www.congress.gov/bill/117th-congress/house-bill/3684. This FOA uses the more common name Bipartisan Infrastructure Law.

[2] Pursuant to E.O. 14008, "Tackling the Climate Crisis at Home and Abroad," January 27, 2021, and the Office of Management and Budget's Interim Justice40 Implementation Guidance M-21-28 and M-23-09 (whitehouse.gov), DOE recognizes disadvantaged communities as defined and identified by the White House Council on Environmental Quality's Climate and Economic Justice Screening Tool (CEJST), located at https://screeningtool.geoplatform.gov/. DOE's Justice40 Implementation Guidance is located at https://www.energy.gov/sites/default/files/2022-07/Final%20DOE%20Justice40%20General%20Guidance%20072522.pdf.

[3] U.S. Department of Energy. November 2021. "DOE Fact Sheet: The Bipartisan Infrastructure Deal Will Deliver for American Workers, Families and Usher in the Clean Energy Future." https://www.energy.gov/articles/doe-fact-sheet-bipartisan-infrastructure-deal-will-deliver-american-workers-families-and-0

[4] Executive Order (EO) 14008, "Tackling the Climate Crisis at Home and Abroad," January 27, 2021.

work to maximize the benefits of the clean energy transition as the nation works to curb the climate crisis, empower workers, and advance environmental justice. The section 3004(b)(4) of the Energy Act of 2020 (42 U.S.C. 16238(b)(4)) is focused on:

- research, development, demonstration, and commercialization projects to create innovative and practical approaches to increase the reuse and recycling of solar energy technologies.

i. Program Purpose

This FOA supports the administration goals laid out above by supporting multi-stakeholder collaborations to reduce material usage, improve installation quality and resilience of PV systems, and address handling of PV systems at the end of life. This FOA calls for diverse teams to assess impact of the developed technologies on all the life stages of PV systems in terms of energy use, cost, and environmental impact. The holistic technological solutions developed in the projects funded by this FOA will facilitate rapid growth of PV deployment in the U.S. in the next decade.

In this FOA, BIL funds will be used to establish the Solar Partnership to Advance Recycling and Circularity (Solar PARC) in accordance with the BIL sections described above. In addition to the Partnership funded by BIL, this FOA will also fund collaborations to develop technological solutions to address material use, installation quality, and resilience of PV systems.

As part of the whole-of-government approach to advance equity and encourage worker organizing and collective bargaining,[5,6,7] and in alignment with BIL sections Sec. 41007 (c)(3), this FOA and any related activities will seek to encourage meaningful engagement and participation of workforce organizations, including labor unions, as well as underserved communities and underrepresented groups, including consultation with Tribal nations.[8] Consistent with Executive Order 14008,[9] this FOA is designed to help meet the goal that 40% of the overall benefits of the Administration's investments in clean energy and climate solutions flow to disadvantaged communities, as defined by the Department pursuant to the Executive Order and to drive the creation of accessible good-paying jobs with the free and fair chance for workers to join a union.

[5] EO 13985, "Advancing Racial Equity and Support for Underserved Communities Through the Federal Government" (January 20, 2021).
[6] EO 14025, "Worker Organizing and Empowerment," April 26, 2021.
[7] EO 14052, "Implementation of the Infrastructure Investment and Jobs Act," November 18, 2021.
[8] EO 13175, November 6, 2000 "Consultation and Coordination With Indian Tribal Governments", charges all executive departments and agencies with engaging in regular, meaningful, and robust consultation with Tribal officials in the development of federal policies that have Tribal implications. Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships | The White House
[9] EO 14008, "Tackling the Climate Crisis at Home and Abroad," January 27, 2021.

ii. Technology Space and Strategic Goals

Solar energy technologies are essential to achieving the Biden administration's goals of carbon-pollution-free electricity by 2035 and net-zero emissions, economy-wide, by no later than 2050.[4] In September 2021, DOE released the Solar Futures Study,[10] which examined solar power's role in achieving the decarbonization of the grid by 2035 and 2050. According to the study, solar power would need to grow from supplying 5% of the U.S. electricity today[11] to 40% by 2035 and 45% by 2050. To enable such growth in U.S. solar electricity, photovoltaic systems will have to provide 1 terawatt (TW_{ac}) of solar capacity to the grid by 2035 and as much as 3 TW_{ac} of solar capacity by 2050, according to the preliminary modeling of decarbonizing the entire energy system. This means that the U.S. PV industry would need to grow to four or five times its current size in the next decade (Figure 1) quadrupling the current annual deployment rate on average (compared to 17 GW_{ac}[12] installed in the U.S. by the end of 2022).

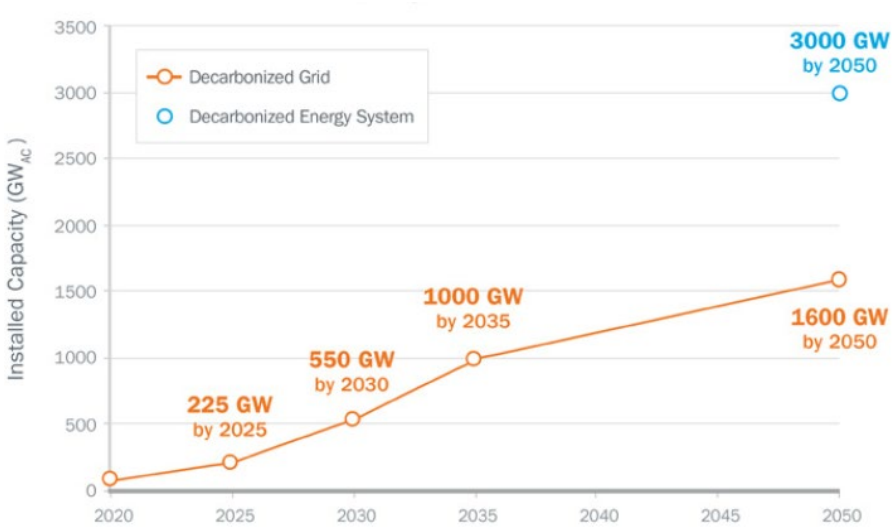

Figure 1. Solar deployment 2020-2050 for decarbonized grid scenario in the Solar Futures Study[10].

This FOA seeks to address challenges associated with this rapid deployment, particularly the increasing demands on PV materials, system operation and maintenance, and recycling. The focus of this FOA is to support technology improvements to reduce material use, optimize system design and operation, and minimize waste with a holistic view of all the stages of PV lifecycle—from the

[10] SETO. Solar Futures Study. https://www.energy.gov/eere/solar/solar-futures-study, Decarb+E scenario.
[11] Solar over 5% of US electricity generation in first 10 months of 2022 (pv-tech.org), based on the data from the US Energy Information Administration
[12] Solar Market Insight Report 2022 Year in Review | SEIA; Winter 2023 Solar Industry Update (nrel.gov)

material needs and installation to operation and end of life. This holistic view will enable effective optimization of the deployment process, where materials and installation meet the PV system operation, maintenance, and recycling goals in terms of performance, cost, and environmental impact. The optimized deployment and PV system management approaches developed in response to this FOA will facilitate the ramp up to a terawatt of PV deployment.

Holistic Approaches to Resilient Low-Cost PV Systems

To sustain and accelerate the projected deployment growth, the material supply chain[13] needs to keep up with the manufacturing and installation of new systems, and the energy payback time (EPBT) for new solar systems needs to be kept low.[14,15] At the same time, the supply chain should minimize greenhouse gas (GHG) emissions[16] and waste.[17] At the terawatt scale, rapid solar deployment can only be economically and environmentally sustainable if the PV systems deliver reliable energy over multiple decades at low cost with minimal energy consumption and minimal environmental impact over the entire PV system life.

This funding program aims to support innovations towards sustainable TW-scale solar power generation in a circular economy. Applicants are asked to consider PV system requirements throughout all the stages of the PV lifecycle from the material needs and installation to operation and the end of life, and account for the energy, economic, and environmental impacts of the proposed innovations.

The PV lifecycle can be divided into four life stages, shown in Figure 2:

- the material and component supply chain, which includes raw material acquisition, new or recycled material processing, and manufacturing of PV system components;
- a project development and installation stage, which includes EPC, followed by inspection and commissioning of a PV power plant;

[13] Ovaitt, S., Mirletz, H., Seetharaman, S., Barnes, T. (2022). PV in the circular economy, a dynamic framework analyzing technology evolution and reliability impacts. iScience, 21 (1): 103488.

[14] Dale, M., Benson, S. M. (2013) Energy Balance of the Global Photovoltaic (PV) Industry - Is the PV Industry a Net Electricity Producer? Environmental Science & Technology 47 (7), 3482-3489. https://pubs.acs.org/doi/10.1021/es3038824

[15] Jackson, A., Jackson, T. (2021) Modelling energy transition risk: The impact of declining energy return on investment (EROI). Ecological Economics 185, 107023. https://doi.org/10.1016/j.ecolecon.2021.107023
This reference shows that the growth rate of an energy production industry is limited by the EPBT to ensure net energy production. It is also important to keep in mind that EPBT is changing with the overall EROI of the energy production industry, which has been declining in recent decades.

[16] Goldschmidt, J. C., Wagner, L., Pietzcker, R., Friedrich, L. (2021) Energy Environ. Sci. 14, 5147-5160. https://doi.org/10.1039/D1EE02497C

[17] Solar Energy Technologies Office Photovoltaics End-of-Life Action Plan, March 2022.

- an energy generation stage that spans multiple decades of solar power delivery, during which routine operation and maintenance (O&M) is punctuated by the need for component failure detection and remediation either due to intrinsic wear out mechanisms or extreme weather or other environmental factors;
- an end-of-service stage, which consists of decommissioning the PV power plant and reclaiming or recycling its components.

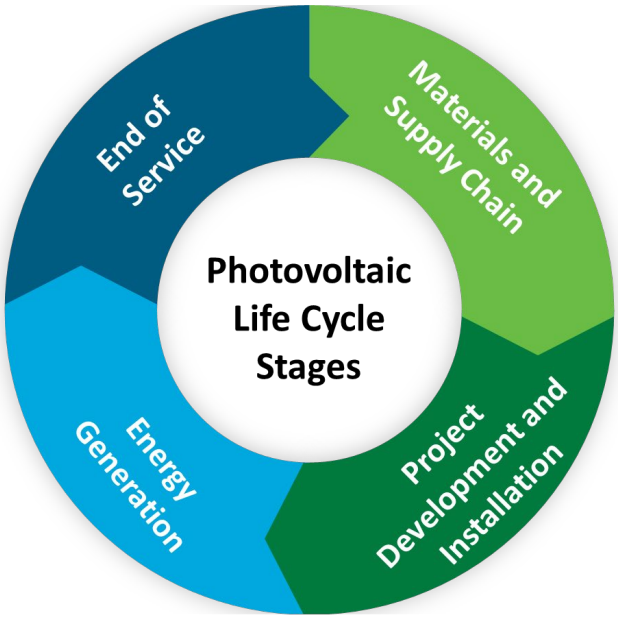

Figure 2. Lifecycle stages of a PV power plant. All of these stages need to be considered in projects supported by this FOA.

The four stages in the life of a PV power plant are connected. An occurrence at any life stage benefits from past decisions and influences future ones. Material and technology choices matter for design and installation choices, scalability of deployment, energy generation, O&M practices, and handling at EOL. With time, materials recycled at the end of life will start to enter the material stream and influence the supply chain. Furthermore, design and installation choices matter for reliable energy generation, O&M practices, handling at the end of life, and pose specific demands on the material and supply chain. Choosing to install a type of panel that has lower degradation rates and designing effective O&M processes will increase system lifetime and lower the amount of the lifecycle waste.[13] However, even with the most reliable technologies and processes, deficiencies in installation can lead to failure and degradation events later,[18] resulting in lower energy

[18] Tyrrell, S., Fernandez, R., Atkinson, W., Veilleux, N. "Study of Renewable Energy Installation Quality in the Renewable Energy Growth Program", The Cadmus Group, 2019. REG-Installation-Quality-Report.pdf (ri.gov)

production, higher cost of O&M, and decreased revenue. With growing PV deployment, there is also evidence that costly quality issues are increasing, with string, inverter, and combiner anomalies as the three main drivers of revenue loss.[19]

Project developers and system designers will also benefit from tailoring system design choices,[20] PV components,[21,22] and BOM[23] to prevailing and extreme climate conditions at the location of installation[24] to enable high energy production over the longest possible time. For example, some PV systems could include storm hardening solutions[25] and others could include swapable components that are optimized for low-cost, easy, standardized replacement, quick recovery to the baseline operation level, and recyclability. The design approaches might be different for different locations and even for different components of the PV system, and those choices will be guided by cost, energy, and environmental metrics.

To address these issues across the PV lifecycle, Topic Area 1 of this FOA seeks technological solutions that decrease material use, enable error-free installation, and support resilient PV operation to ensure reliable solar energy production.

Reducing Lifecycle and End-of-Life Impacts of PV

Decommissioning of the complete PV sites at their end of life creates the largest need for handling end-of-life waste from PV systems. In addition, PV systems experience numerous component replacements or repairs over their lifetime due to failure, damage (e.g., after an extreme weather event), repowering (the opportunity for increased production),[26] or operational issues such as changes in ownership. Decommissioning of complete PV systems, PV modules, or BOS components results in a material stream that includes useful metals, dielectrics, and semiconductors,

[19] Raptor Maps. Global Solar Report, 2023. https://3446343.fs1.hubspotusercontent-na1.net/hubfs/3446343/2023%20Global%20Report.pdf

[20] Interagency Sustainability Working Group (ISWG), "Solar PV in Severe Weather Locations: How Design, Construction, and O&M Can Improve Survivability," (2018). https://sftool.gov/Content/attachments/Iswg/iswg-case-studies/5%20-%20ISWG_Presentation_PV%20OM%2009_19_18.pdf

[21] Ahsan, S.M. and Khan, H.A. (2019), Performance comparison of CdTe thin film modules with c-Si modules under low irradiance. IET Renewable Power Generation, 13: 1920-1926. https://doi.org/10.1049/iet-rpg.2018.5479

[22] Energy yield comparison: TOPCon vs. HJT vs. IBC – pv magazine USA (pv-magazine-usa.com), 2022.

[23] International Technology Roadmap for Photovoltaics (ITRPV), March 2022. International Technology Roadmap for Photovoltaic (ITRPV) - vdma.org - VDMA

[24] Karin, T., Jones, C.B., and Jain, A. (2019) Photovoltaic Degradation Climate Zones. 2019 IEEE 46th Photovoltaic Specialists Conference (PVSC), pp. 0687-0694, doi: 10.1109/PVSC40753.2019.8980831. The accompanying Photovoltaic Climate Zones tool to calculate the effect of location-dependent environmental stressors is located at https://github.com/toddkarin/pvcz.

[25] National Renewable Energy Laboratory. Solar Photovoltaics in Severe Weather: Cost Considerations for Storm Hardening PV Systems for Resilience. Elsworth, J., Van Geet, O. Technical Report NREL/TP-7A40-75804, June 2020. https://www.nrel.gov/docs/fy20osti/75804.pdf

[26] Peters, I. M., Hauch, J., Brabec, C. J. (2022). The role of innovation for economy and sustainability of photovoltaic modules. iScience, 25. https://doi.org/10.1016/j.isci.2022.105208

which can be refurbished, recycled, or downcycled for PV and other uses (such as electronics or construction industries), or will need to be disposed of.[17] Improving and developing methods to effectively handle and recover materials from decommissioned PV system components would reduce environmental impact and benefit domestic supply chains. Topic Area 2 of this FOA addresses these needs by setting up a Solar Partnership to Advance Recycling and a Circular Economy dedicated to improving materials recovery efficiency and developing safe EOL practices for solar modules and other PV system components.

While recovery and recycling are often associated with the EOL phase of a product, the concepts should be implemented in each life stage from manufacturing to operation to decommissioning. Reducing materials usage in the supply chain could lower the environmental impact. Extending the system life during the energy generation life stage through methods such as refurbishment and repair can reduce the rate of materials and energy consumption. System level designs to enable backwards compatibility between components such as modules and racking could help with extending overall system life and reuse of modules.

Metrics for Holistic Evaluation of PV in the Circular Economy

SETO uses techno-economic analysis (TEA)[27] that determines the cost of energy produced by solar energy systems to help focus its research priorities. While the impact of innovations on the cost of solar energy is an essential criterion for successful adoption of the developed innovations in the marketplace, the techno-economic analyses do not measure the impact on energy consumption and environment, which inevitably influence long-term economic and societal outcomes for solar. To gain more complete understanding of impact of solar innovations, the lifecycle analysis (LCA) that assesses energy and environmental impacts needs to be done along the techno-economic analysis.

The main energy, economic, and environmental metrics that are used in cost and lifecycle analyses are listed in Table 1. The primary metrics are the total output solar energy and total input of energy, money, and GHG in a PV system over its lifetime. The compound metrics quantify the overall value of PV systems by relating the output energy and economic, energy, or GHG input. The compound metrics are useful to guide decisions in industry and policy. General methodology guidelines for calculating and reporting these metrics have been developed, in large part, by the International Energy Agency (IEA),[43,49] but different metrics and their components are frequently adapted for specific purposes.

[27] Jones-Albertus, R., Feldman, D., Fu, R., Horowitz, K., and Woodhouse, M. (2016) Technology advances needed for photovoltaics to achieve widespread grid price parity. Prog. Photovoltaics: Res. Appl., 24: 1272– 1283. https://doi.org/10.1002/pip.2755

Researchers are just starting to evaluate joint energy, cost, and environmental performance of PV.[28] This FOA seeks to encourage such evaluations for the PV system and component innovations developed by the research projects. Representative baseline metrics and values are provided in Table 2, and other sources[29] could be used to identify the applicable baseline for the target technology use. Applicants should use the most informative and relevant metrics to evaluate the energy, cost, and environmental lifecycle impact of the proposed projects with the appropriate baselines.

Recent studies show that metrics from different stages of the PV lifecycle (Figure 2) are connected. For example, the lifecycle impacts of the supply chain depend on PV module degradation, as well as installation in different climatic conditions.[30] Reducing the annual degradation rate (DR) has an especially positive impact on environmental metrics. LCA performed using ENVI-PV (Environmental Performance of PV tool)[31] shows that the lifecycle carbon footprint of a ground-mount PV system in a high solar-resource location can be reduced by 0.3-1.0 g CO_2-eq/kWh per 0.1 percentage point reduction in annual degradation rate.[32] Analysis done with PV ICE (Photovoltaics in the Circular Economy tool)[33] finds that increasing module lifetime through improved reliability has the biggest effect on lifecycle waste: a 10% improvement in module lifetime and reliability results in a 53% decrease in lifecycle waste.[13]

[28] Paiano, A., Lagioia, G., Ingrao, C. (2023) A combined assessment of the energy, economic and environmental performance of a photovoltaic system in the Italian context. Science of The Total Environment 866: 161329. https://doi.org/10.1016/j.scitotenv.2022.161329

[29] National Renewable Energy Laboratory. Annual Technology Baseline. 2022. https://atb.nrel.gov/electricity/2022/technologies

[30] Ahmad Ludin, N. et al. (2021) Environmental Impact and Levelised Cost of Energy Analysis of Solar Photovoltaic Systems in Selected Asia Pacific Region: A Cradle-to-Grave Approach. Sustainability 13: 396. https://doi.org/10.3390/su13010396

[31] ENVI-PV: Environmental performance tool for PV systems, available at Environmental Impact Assessment Service Scenario (webservice-energy.org). Described in Pérez-López, et al. (2017) ENVI-PV: an interactive Web Client for multi-criteria life cycle assessment of photovoltaic systems worldwide. Progress in Photovoltaics: Research and Applications, https://doi.org/10.1002/pip.2841

[32] Peters, I. M. and Sinha, P. Value of stability in photovoltaic life cycles. 2021 IEEE 48th Photovoltaic Specialists Conference (PVSC), pp. 0416-0419. https://doi.org/10.1109/PVSC43889.2021.9518480

[33] National Renewable Energy Laboratory. PV ICE: Photovoltaics in the Circular Economy Tool | Photovoltaic Research | NREL

Table 1. Energy, economic, and environmental metrics useful for joint cost and lifecycle analyses.

Type of metric	Primary metrics	Components of primary metric	Compound metrics relating input and output
Energy (output)	Solar energy output (kWh)[34,35]	Capacity factor[36], Efficiency[37,38], Performance ratio[39], Availability[40,41], Degradation rate[42], O&M response and resolution time[41]	
Energy (input)	Embodied Energy (MJ/m^2), or Cumulative Energy Demand (CED)[43]	Energy to produce panel and BOS materials for PV system Energy to manufacture PV system components Energy to transport materials and components Energy to install the system Energy for EOL management	Energy Payback Time[43,44,45] Energy Return on Investment (EROI)[45,46]
Economic (input)	Total Life Cycle Cost[47]	Material and component cost EPC cost O&M cost Recycling cost Cost priority number[48] of O&M	Levelized cost of energy (LCOE)[49,50] Value-adjusted levelized cost of energy (VALCOE)[49] Levelized cost of solar plus storage (LCOSS)[51]

[34] IEC 61724-1:2021

[35] A number of metrics can be used to describe the solar energy output as needed for the specific purpose, such as PV and energy storage performance indicators discussed in Best Practices for Operation and Maintenance of Photovoltaic and Energy Storage Systems; 3rd Edition (nrel.gov).

[36] IEC TS 61724-2:2016, IEC TS 61724-3:2016

[37] National Renewable Energy Laboratory. Best Research-Cell Efficiency Chart | Photovoltaic Research | NREL, Champion Photovoltaic Module Efficiency Chart | Photovoltaic Research | NREL

[38] Peters, I. M., et al. (2019) The Value of Efficiency in Photovoltaics. Joule 3(11), pp. 2732-2747. https://doi.org/10.1016/j.joule.2019.07.028

[39] PV Performance Modeling Collaborative | Performance Ratio (sandia.gov);

[40] IEC TS 63019:2019, IEC TR 63292:2020

[41] Solar Power Europe O&M Best Practice Guidelines Version 5.0, December 2021. https://api.solarpowereurope.org/uploads/O_and_M_Best_Practice_Guidelines_V_5_0_a07c44238b.pdf

[42] Bolinger, M., Gorman, W., Millstein, D., & Jordan, D. (2022). Plant-level performance and degradation of 31 GW-DC of utility-scale PV in the United States. https://escholarship.org/uc/item/5cr7817g

[43] Methodology Guidelines on Life Cycle Assessment of Photovoltaic 2020 - IEA-PVPS

[44] wp_-_recs_leading_energy_payback_time.pdf (recgroup.com)

[45] Bhandari, K. P., et al. (2015). Energy payback time (EPBT) and energy return on energy invested (EROI) of solar photovoltaic systems: A systematic review and meta-analysis. Renewable and Sustainable Energy Reviews 47, 133.

[46] Raugei, M., et al. (2017). Energy Return on Energy Invested (ERoEI) for photovoltaic solar systems in regions of moderate insolation: A comprehensive response. Energy Policy 102, 377-384. https://doi.org/10.1016/j.enpol.2016.12.042

[47] National Renewable Energy Laboratory. U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks, With Minimum Sustainable Price Analysis: Q1 2022 (nrel.gov). Ramasamy, V., et al. NREL/TP-7A40-83586, 2022.

[48] Hernandez, G.O, et al. (2019). Optimization of the Cost Priority Number (CPN) Methodology to the Needs of a Large O&M Operator. 36th EUPVSEC Proceedings, 1613-1617. DOI: 10.4229/EUPVSEC20192019-5CV.4.19

[49] Projected Costs of Generating Electricity 2020 – Analysis - IEA

[50] Levelised Cost of Electricity Calculator – Data Tools - IEA

[51] U.S. Solar Photovoltaic System and Energy Storage Cost Benchmarks: Q1 2021 (Technical Report) | OSTI.GOV, https://doi.org/10.2172/1829460

Environmental (input)	Embodied GHG (kg CO_2-eq)[43]	GHG due to producing materials for PV GHG due to manufacturing PV system GHG due to transporting materials GHG due to installing the system GHG due to O&M GHG due to end-of-life management	Environmental impact mitigation potential[52]

Table 2. Summary of the main relevant metrics with representative baselines.

Type of Metric	Metric	Representative Baseline	MORE PV FOA Goals
Energy (output)	Annual PV system degradation rate	0.7%[42] – 0.75%[53]	0.4%[58]
	PV plant availability	97%[54]	98% (best practices[41]) to 99% (est.)
	Performance ratio	0.83[55]	0.95[35]
Energy (input)	CED, or Embodied Energy	20 MJ/W_{dc}[14,16]	3-6 MJ/W_{dc}[16]
	EPBT	~1 year[55]	6months[56]
	EROI	20-34:1[57]	~70:1 (est.)
Economic (input)	LCOE	$0.041/kWh[47–Table 15]	$0.02/kWh[58]
	LCOSS	$0.077/kWh[51–Table 12]	$0.04/kWh (est.)
	O&M cost	$16/$kW_{dc}$/year[47]	$5/$kW_{dc}$/year[58]
Environmental (input)	Embedded GHG	30-50 g CO_2-eq/kWh[59]	~20 g CO_2-eq/kWh[60]
	Module recycling cost	$15-$45/module[17]	<$3/module (or <$150/ton)[17]

SETO seeks projects that develop impactful, trustworthy, and actionable solutions or tools that meaningfully impact economic, energy, and environmental metrics, while recognizing the effect on different PV system life stages. These projects will be informed by the field data and contain a strong industry-relevant implementation plan. The applicants are requested to shape the team, scope, metrics, and data aspects of the proposal with this overarching view in mind, as specified in the Topic Areas described in the sections that follow.

[52] Methodology Guidelines on Life Cycle Assessment of Photovoltaic 2020 - IEA-PVPS
[53] National Renewable Energy Laboratory. PV Fleet Performance Data Initiative.
[54] Guide to understanding solar production losses – pv magazine International (pv-magazine.com); National Renewable Energy Laboratory. PVWatts Calculator (nrel.gov)
[55] Fraunhofer ISE Photovoltaics Report, February 2023. Photovoltaics Report (fraunhofer.de)
[56] The target for EPBT is estimated using (PV system lifetime/EROI); to double the EROI to get to ~of 70:1, PV systems with 35-year lifetime will need EPBT of ~6 months.
[57] EROI range is calculated as lifetime of the system (years)/EPBT (years) for lifetimes of 25–35-years and EPBT from reference [55]. The upper end of the range is consistent with the range of 9-34 in earlier studies in [45,46].
[58] SETO. 2030 Solar Cost Targets | Department of Energy
[59] National Renewable Energy Laboratory. Life Cycle Greenhouse Gas Emissions from Solar Photovoltaics (Fact Sheet), NREL (National Renewable Energy Laboratory), NREL/FS-6A20-56487, 2012. Summarized results from the Life Cycle Assessment Harmonization | Energy Analysis | NREL.
[60] Tawalbeh, M., et al. (2021) Environmental impacts of solar photovoltaic systems: A critical review of recent progress and future outlook. Science of the Total Environment, 759, 143528. The target for GHG emissions is estimated using the conclusion from this reference that up to 50% lower GHG emissions can be achieved using new materials and/or recycled current materials.

iii. Teaming Partner List

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

The Teaming Partner List will be available on EERE eXCHANGE and will be regularly updated to reflect new teaming partners who provide their organization's information.

SUBMISSION INSTRUCTIONS: View the Teaming Partner List by visiting the EERE eXCHANGE homepage and clicking on "Teaming Partners" within the left-hand navigation pane. This page allows users to view published Teaming Partner Lists. To join the Teaming Partner List, submit a request within eXCHANGE. Select the appropriate Teaming Partner List from the drop-down menu, and fill in the following information: Investigator Name, Organization Name, Organization Type, Topic Area, Background and Capabilities, Website, Contact Address, Contact Email, and Contact Phone.

DISCLAIMER: By submitting a request to be included on the Teaming Partner List, the requesting organization consents to the publication of the above-referenced information. By facilitating the Teaming Partner List, DOE is not endorsing, sponsoring, or otherwise evaluating the qualifications of the individuals and organizations that are identifying themselves for placement on this Teaming Partner List. DOE will not pay for the provision of any information, nor will it compensate any applicants or requesting organizations for the development of such information.

B. Topic Areas

i. Topic Area 1. MORE Connection: Connecting PV Materials, Design, Installation, Performance, and End of Life

SETO seeks to fund up to six research projects at a maximum of $4 million per project to support collaborations of stakeholders who can bring expertise from all four stages of the PV system lifecycle to reduce cost and lifecycle impacts of a PV system and its components, including co-located storage. Projects funded in this topic area will develop technology and design solutions to optimize the interconnected energy, economic, and environmental impact metrics in pursuit of rapid and sustainable scale-up of PV technologies. Projects in this topic will be funded for three to four years. This topic area has a minimum cost-share requirement of 20% of the total project costs (see Sec. III.B. for details).

(Collaborations primarily focused on the end-of-life stage should apply to Topic Area 2. Applicants primarily focused on developing pilot-scale testing and demonstration of Si manufacturing technologies or supply chain innovations beyond Technology Readiness Level (TRL) of 6 should apply to the DE-FOA-0003057: Bipartisan Infrastructure Law: Silicon Solar Manufacturing, and Dual-use Photovoltaics Incubator Funding Opportunity Announcement.)

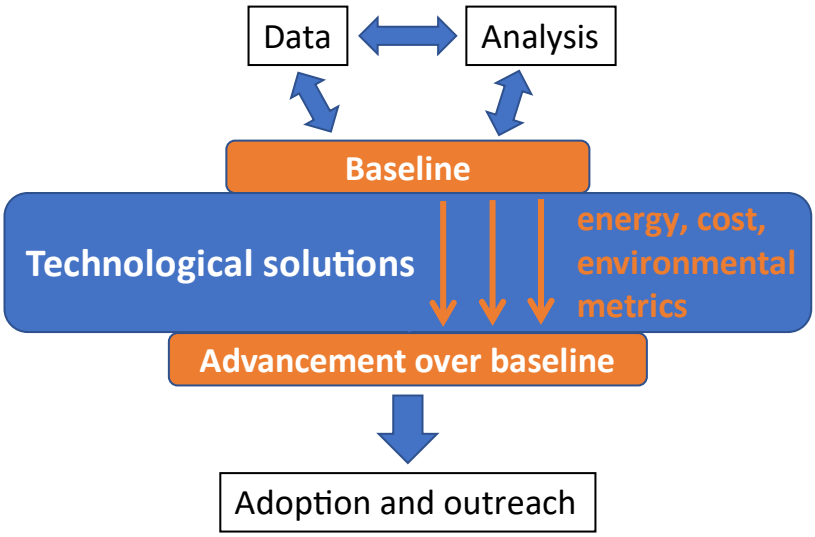

Figure 3. Potential structure of a responsive project.

Applications to this topic area must include the elements shown in Figure 3:

- **Technological solutions:** Projects must develop technological solutions in the Areas of Interest below. Applicants are encouraged to develop a multi-component or system solution rather than solely an improvement to a single component. Applicants should reduce the design or ideas to practice or application and connect energy generation or other relevant data from installed systems, technical modeling, financial modeling, and relevant field and lab measurements to enable a comprehensive evaluation of the applicability and impact of the developed solutions. The projects should select the most relevant energy, economic, or environmental metrics to assess the impact of the proposed technological solution in any of the life stages and include an evaluation or a path to evaluation of impact on the other three life stages.

- **Data**: Data partnerships to obtain, analyze, and/or share relevant high-quality data. The available data and sample size should be sufficiently large to allow the project to draw statistically significant conclusions.
- **Analysis**: Projects can use existing modeling tools or develop new modeling tools to analyze the data and assess its relationship to baseline and relevant metrics. The analysis should address the impact on all four stages of PV lifecycle.
- **Baselines**: Projects should contain industry-accepted baselines or verifiable baseline developments and be supported by an analysis or modeling activity to show an improvement over the relevant baseline.
- **Teaming:** The teams should be composed of multiple stakeholders contributing diverse expertise and experiences, as well as access to relevant tools, hardware, and data to evaluate the impact of the proposed innovations across the full lifecycle and to establish or support project baselines and metrics. Communication between stakeholders aware of PV system challenges and state-of-the-art at different stages of life is likely to lead to effective solutions, which would be sustainable throughout the PV system lifecycle.
  The proposed team must include at least two participants with expertise or experience with two different stages of PV system life. Furthermore, the proposed team should include at least one entity that plans to use the final product after the project end.
- **Adoption and Outreach:** The proposals must include a concrete plan for post-project implementation of the developed technological or process advancement in a scalable fashion to facilitate rapid PV deployment, either by one of the team members or through technology transfer to an entity outside the application team. The team is encouraged to engage the broader community, including disadvantaged communities, through publications, accessible information dissemination, seminars, workshops, and online tools.

Areas of Interest

The proposals to this Topic Area are requested to focus on the following areas:

- Design of PV systems and PV system components, including cells, modules, and other BOS components, that minimizes the use of materials, especially critical (e.g., In, Ga, Te), hazardous (e.g., Pb, Cd), expensive (e.g., Ag), or energy-intensive (e.g., Si, steel, Al, other metal for BOS components) materials, and accounts for recovery of materials from recycling. Aggregating and sharing BOM data is encouraged. Appropriate energy, economic, and environmental metrics should be used to quantify the effect of material

design change on PV system or component performance, as well as end-of-life handling.

- Development of characterization and non-destructive testing of BOM of PV system components throughout their life for material use analysis, product acceptance, O&M, and recycling approaches including quantifying toxic material content. This work can include methods and approaches to develop, implement, and promote adoption of traceability techniques and standards to improve global supply chain mapping and to quantify the role of BOM choices in the energy generation stage.

- Development and implementation of holistic design for EPC of PV systems that can simultaneously optimize energy, economic, and environmental metrics during the system's useful life under relevant operating conditions in a high deployment environment. The designs could focus on PV cells, modules, BOS components, PV systems, interaction with co-located storage, or any other aspects of PV system deployment. The design approach could be general or tailored to specific operating and extreme conditions for the relevant geographic locations.

  Utilizing and sharing data and statistics of installation defects and their effect on performance and end-of-life decisions is strongly encouraged. Impact of design innovations and practices on all three types of relevant lifecycle metrics (energy, economic, and environmental as listed in Table 1) should be quantified. Proposals should address the scalability of design approaches in the context of significant increases in the expected deployment rate.[10]

- Scalable hardware and software solutions for robust, error-free, low-maintenance tools, components, and methods for installation, quality management, and maintenance. The proposed solutions could address degradation mechanisms and mitigation approaches; collection, quality-checking, and actionable analysis of installation, operation, and O&M data; or implementation of feedback from the operation behavior to installation and maintenance processes.

  The solutions may address electrical, mechanical, and monitoring components failing or underperforming due to wear, operating in suboptimal conditions, or damage by wind, flood, snow load, hail, and fire, or other extreme events. For example, modular components with common interfaces adaptable to multiple locations and supply chains, both in the power transmission chain within the PV plant and mechanical structure for easy replacement, may be developed and assessed. Also of interest are methods

for rapid detection of degradation or failure and rapid recovery to the baseline operation level.

The installation setup, hardware, and materials could be tailored to the routine and extreme conditions that the PV systems will experience over the course of the system's lifetime. The projects should assess the impact of innovations on material needs, cost, manufacturability, and impact of installation and O&M decisions and errors on the energy generation stage and the end-of-life management.

For the lifecycle analysis, the projects should leverage existing material and supply chain availability, use, and flow analyses[13] and show improvement pathways over the relevant baselines for domestic PV manufacturing and deployment. For the cost analysis, the applicants could leverage existing analyses and models[61,62,63] or develop their own as needed to meet the project objective. The models can either be general or tailored to specific geographic and climate conditions.

The projects should quantify PV system operation during routine conditions and severe weather events, including defining relevant availability, power output, degradation rate, and cost baselines (see Table 2) to aid in assessing the impact of proposed solutions. Applicants are encouraged to consider several metrics simultaneously to understand trade-offs in capital cost, O&M cost, recycling cost and benefit, energy use, material availability, and energy output (see Table 1) to quantify the overall effect on the energy, cost, and environmental metrics.

Projects addressing installation quality would benefit from developing a useable, verifiable, and relevant metric for installation quality assessment, a baseline of current installation quality, and evaluation of the impact of installation defects on LCOE, as well as the actions at the end of service. This analysis could leverage existing tools[64,65,66] and either expand on them or develop new ones. The models in support of resilient system design will incorporate response to extreme weather

[61] National Renewable Energy Laboratory. System Advisor Model (SAM) General Description (Version 2017.9.5). Blair, N., et al., NREL/TP-6A20-70414, 2018. System Advisor Model - SAM. (nrel.gov); Levelized Cost of Electricity and Internal Rate of Return for Photovoltaic Projects (Text Version) | NREL

[62] National Renewable Energy Laboratory. NREL Comparative PV LCOE Calculator. Silverman, T.J., Deceglie, M.G., Horowitz, K.A., 2018. Comparative PV LCOE Calculator | Photovoltaic Research | NREL.

[63] Detailed Cost Analysis Model (DCAM) (openei.org), 2023.

[64] 4 Charts that Help You Reduce Rework in Solar Construction — Sustainabilist. 2019.

[65] Solar PV Inspections Checklist - IBTS

[66] Cost of Poor Quality (COPQ) (sixsigmastudyguide.com)

conditions and would benefit from defining a quantitative metric for PV resilience.[67,68]

ii. Topic Area 2. Solar Partnership to Advance Recycling and Circularity (Solar PARC)

This topic area uses funds designated by the BIL and seeks to fund one research partnership at a maximum of $8 million dedicated to improving materials recovery efficiency and developing safe EOL practices for PV system components, including modules, inverters, and other BOS components. The partnership selected under this topic area will be funded for four to five years. This topic area allows blended cost share: 0% cost share is required for outreach activities and a minimum 20% cost share is required for all research and development activities (see Sec. III.B. for details).

SETO seeks to fund the development of long-term planning tools and new technologies to handle PV materials at EOL. This planning and technology development requires input from multiple stakeholder groups from both within and outside of the PV community. Relevant stakeholders range from technology developers to end users to policymakers and regulators. Researchers, technicians, manufacturers, asset owners, recyclers, and government entities must come together to understand how their role in the solar lifecycle impacts PV sustainability and value. A successful applicant will have a credible plan to convene all these stakeholders.

SETO seeks applications that will establish the current and historical state of EOL volumes and handling. Much of the information on EOL currently comes from projections based on installed solar capacity rather than field data related to decommissioning and EOL handling. Field data is important for establishing current baseline EOL practices and materials. This includes quality data on component technologies, component materials, the volumes of material, the state of decommissioned components, decommissioning causes, and EOL handling methods.

Collaboration on EOL issues between stakeholders involved in different life stages of a PV system (see Figure 2) is critical to improving EOL practices. Manufacturers could design products that simplify recycling and help increase recovered material value. This, in turn, requires system owners, recyclers, and secondary users to give

[67] National Renewable Energy Laboratory. Valuing Resilience in Electricity Systems (nrel.gov). Anderson, K., Hotchkiss, E., Murphy, C., 2019.
[68] C. G. Rieger, "Resilient control systems practical metrics basis for defining mission impact," in 2014 7th International Symposium on Resilient Control Systems (ISRCS), Aug 2014, pp. 1–10.

feedback on the performance of new module designs to ensure that modules continue to be reliable and durable.

At EOL, high-throughput and low-cost processes should be developed for successful recycling and materials recovery from non-operational modules. Current recycling processes can recover up to 80% of the mass of a panel, which includes materials like aluminum, glass, and copper (Figure 4). However, the laminate structure of modules presents a challenge. Commercial modules employ a polymeric encapsulant to adhere the cells to the protective front glass and rear back sheet layers. The adhesive properties of the encapsulants are also an obstacle to materials separation. Another challenge is the separation of the cell metallization, which is often a silver-based composite, from the semiconductor cell, because they are engineered to have a strong interfacial bond.

Beyond the broad material categories such as glass, metal, and polymer, the materials in a module will have specific compositions and additives that can affect the recycling process and recovered material value. Cataloguing the specific materials and their composition in system components could provide valuable information for developing efficient recycling processes and safe EOL practices.

Decommissioning and transporting EOL components to recycling or disposal facilities can also be a costly step in EOL handling. There are opportunities to minimize these costs through improved designs and processes. Some examples are optimized recycling facility placement based on installation density, or tools to enable quick partial module disassembly onsite for gross materials separation, allowing different materials to be sent to separate facilities.

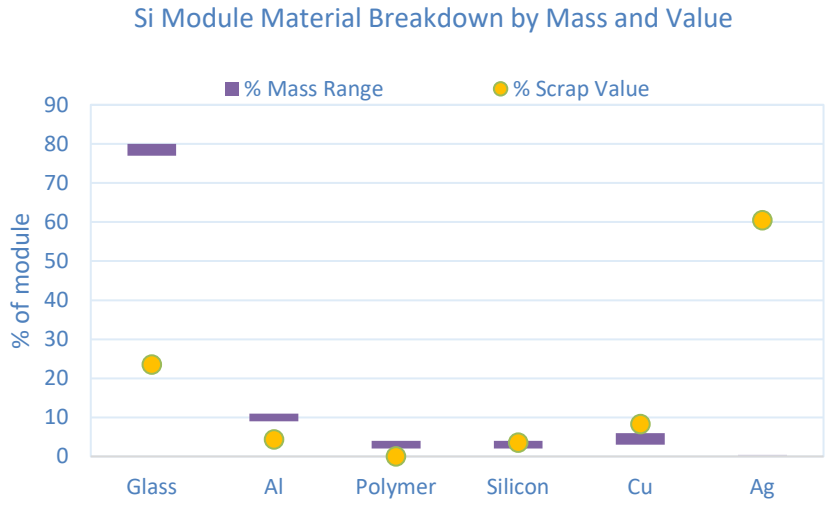

Figure 4. Percent mass contribution and scrap value of materials in silicon PV modules

As can be seen from the challenges listed above, field data is vital to understanding the current situation of solar EOL and developing practical improvements for EOL processes. A centralized and standardized repository for data on the current state of PV module materials, decommissioning, and EOL handling would allow researchers and industry to develop practical and economically feasible pathways to implement those actions.

To convene these diverse stakeholder groups and collectively improve solar recycling and recyclability, SETO seeks applicants to create a Solar Partnership to Advance Recycling and a Circular Economy that implements the structure outlined in Figure 3.

Successful applications will include:

- **Technology solutions (approximately 80% of effort):** Developing multiple pathways to technologies and methods to enable low-cost reuse, refurbishing, repair, and recycling of photovoltaic materials, and best practices for safe disposal of these materials, aided by collaborations with relevant industry and working groups listed below. Research in this area could include:
  - Projects that recover critical materials[69]
  - Designs to facilitate compatibility of components between product generations, decommissioning, disassembly, and EOL processing, including designs for recyclability.
  - Development of module recycling processes that cost less than $150/ton for recyclers.
  - Increasing recovered material value to be greater than recovery cost, as confirmed by second-use industry.
  - Optimizing locations of different stages of recycling.
  - Improving packing factor of decommissioned components for transport.

  Successful applications will include a well-defined scope of work for the technical solutions and technoeconomic analysis to ensure that designs and processes will not negatively impact module cost, module field performance, or EOL handling costs.

[69] Please refer to DOE Critical Material Assessment Request for Information for the definition and classification of critical materials: DOE Critical Materials Assessment RFI, May 2023.

- **Data:** Collecting field data on solar materials, decommissioning practices, embodied energy and GHG emissions from recycling processes, and industrially implemented EOL handling practices into a publicly accessible database. This will establish a baseline to enable informed decision-making about EOL management and research needs.
- **Analysis**: Perform studies to inform the diverse set of stakeholders on relevant and best practices for decommissioning and EOL handling, and paths to increase second use of components and materials.

- **Working groups:** Establish and regularly convene working groups to facilitate conversations within and between industry, policy makers, and researchers to guide Partnership research and analysis. A set of working groups could include:

    - Industry working group(s) that include industries relevant to PV EOL (such as manufacturers, asset owners, EPCs, O&M providers, recyclers, waste management) to identify barriers in efficient second use and EOL handling. This group will advise on challenges to scaling the recycling process, best practices around decommissioning, and directions for data collection, workforce needs, and research activities that would advance the EOL industry.
    - Regulatory and policy working group to bring together relevant federal and state-level regulators, including, but not limited to, regulators and officers from state and federal environmental quality and hazardous waste management offices. This working group would share challenges and best practices on regulations and policies for handling PV modules at EOL, such as PV decommissioning planning and toxicity testing.
    - Student working group composed of students that perform work in the Partnership to strengthen collaborations and information sharing between Partnership teams.

      The working groups should consist of at least 10 members, including a member from each of the key stakeholder entities. Working groups should facilitate workforce development opportunities in the PV EOL industry through research programs, training programs, and internships with the members of the partnership.

- **Adoption and Outreach:** Proposals must include a concrete plan for technology transfer of the results or products to entities outside the application team. The applicant should engage the broader community,

including disadvantaged communities, through accessible information dissemination, public seminars, and workshops.

All work for projects selected under this FOA must be performed in the United States. See Section V.K.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 IV.D. of the FOA):

- Applications that fall outside the technical parameters specified in Sections II.A. and II.B. of the FOA.
- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics).
- Standalone theoretical modeling and analysis efforts.
- Solutions with no clear financial or supply chain path to implementation.
- Applications that develop markets for redeployment of decommissioned PV system components (rather than recycling).
- Development of installation standards, which is the scope of separate efforts.
- Pilot-scale testing or demonstrations of Si PV manufacturing technologies or supply chain innovations beyond TRL of 6, which is the scope of DE-FOA-0003057: Bipartisan Infrastructure Law: Silicon Solar Manufacturing, and Dual-use Photovoltaics Incubator.

D. R&D Community Benefits Plan

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

To support the goal of building a clean and equitable energy economy, projects funded under this BIL FOA are expected to (1) advance diversity, equity, inclusion, and accessibility (DEIA); (2) contribute to energy equity; and (3) invest in America's workforce. To ensure these objectives are met, applications must include a Research and Development Community Benefits Plan (R&D Community Benefits Plan)[70] that

[70] Most DOE BIL FOAs focused on demonstration and deployment (D&D) also require a Community Benefits Plan; however, the plan content requirements for R&D-focused FOAs vary from the D&D Community Benefits Plan content requirements.

addresses the three objectives stated above. See Section V.E.xvii. and Appendix G for the more information on the R&D Community Benefits Plan content requirements.

E. Authorizing Statutes

The programmatic authorizing statute is Section 41007(c)(3) of BIL and Section 3004(b)(4) of the Energy Act of 2020 (codified at 42 U.S.C § 16238).

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.

F. Notice of Bipartisan Infrastructure Law–Specific Requirements

Be advised that special terms and conditions apply to projects funded by the BIL relating to:

- Reporting, tracking, and segregation of incurred costs;
- Reporting on job creation and preservation;
- Publication of information on the internet;
- Access to records by Inspectors General and the Government Accountability Office;
- Requirement that all of the iron, steel, manufactured goods, and construction materials used in the infrastructure activities of applicable projects be produced in the United States;
- Assurance that laborers and mechanics employed by contractors or subcontractors on BIL-funded projects be paid wages equivalent to prevailing wages on similar projects in the area;
- Protection for whistleblowers and requirement that evidence of a false claim be promptly referred an appropriate inspector general; and
- Certification and registration.

Recipients of funding appropriated by the BIL must comply with requirements of all applicable federal, state, and local laws, regulations, DOE policy and guidance, and instructions in this FOA. Recipients must flow down the requirements to subrecipients to ensure the recipient's compliance with the requirements.

Applications selected under Topic 2 will be funded with BIL funds and will need to comply with all relevant BIL requirements.

III. Award Information

A. Award Overview

i. Estimated Funding

DOE expects to make a total of approximately $20,000,000 of federal funding available for new awards under this FOA, subject to the availability of appropriated funds. DOE anticipates making approximately 4 to 7 awards under this FOA. DOE may issue one, multiple, or no awards. Individual awards may vary between $2,000,000 and $8,000,000.

DOE 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	MORE Connection: Connecting PV Materials, Design, Installation, Performance, and End of Life	3-6	$2,000,000	$4,000,000	$12,000,000	36-48
2 (BIL)[71]	Solar Partnership to Advance Recycling and Circularity (Solar PARC)	1	$8,000,000	$8,000,000	$8,000,000	48-60

DOE 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.

[71] Sec. 41007 RENEWABLE ENERGY PROJECTS (c)(3) - innovative and practical approaches to increase the reuse and recycling of solar energy technologies.

ii. Period of Performance

DOE anticipates making awards that will run from 36 months up to 60 months in length, comprised of one or more budget periods. Project continuation will be contingent upon several elements, including satisfactory performance and DOE's Go/No-Go decision. For a complete list and more information on the Go/No-Go review, see Section VII.B.xiv.

iii. New Applications Only

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

B. DOE Funding Agreements

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

i. Cooperative Agreements

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

Through cooperative agreements, DOE 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.

DOE has substantial involvement in all projects funded via cooperative agreement. See Section VII.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)[72]

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. See Section IV.E.i.

IV. 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 recipient and subrecipient(s) 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. Nonprofit entities; and
4. State and local governmental entities and Indian Tribes.

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

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

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

[72] FFRDCs are public-private partnerships that conduct research for the U.S. government. A listing of FFRDCs can be found at http://www.nsf.gov/statistics/ffrdclist/.

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

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.

Nonprofit organizations described in Section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995, are **not** eligible to apply for funding.

ii. Foreign Entities

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

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

B. Cost Sharing

Applicants are bound by the cost share proposed in their Full Applications if selected for award negotiations.

For Topic Area 1, the cost share must be at least 20% of the total project costs[73] for research and development projects.[74] Topic Area 2 allows blended cost share: 0% cost share is required for outreach activities and a minimum 20% cost share is required for all research and development activities. Please refer to Appendix B of the FOA for guidance on calculating the blended cost share.

Cost sharing is not required for institutions of higher education and nonprofit organizations. This waiver is granted per Section 10725 of the Research and Development, Competition, and Innovation Act, P.L. 117-167, which extends the cost share waiver pilot program enacted by Section 108 of the Department of Energy

[73] Total project costs are the sum of the government share, including FFRDC costs if applicable, and the recipient share of project costs.
[74] Energy Policy Act of 2005, Pub.L. 109-58, sec. 988. Also see 2 CFR 200.306 and 2 CFR 910.130 for additional cost sharing requirements.

Research and Innovation Act, Public Law 115–246 (Innovation Act) and provides an exemption for institutions of higher education and nonprofit organizations from the 20% cost share requirement for Research and Development activities. The exemption is available for the two-year period beginning on August 9, 2022. Codified at 42 U.S.C. 16352. The cost share must come from non-federal sources unless otherwise allowed by law.

To help applicants calculate proper cost share amounts, DOE 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 entire project 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 V.K.i. of the FOA. In addition, cost share must be verifiable upon submission of the Full Application. Cost share may be provided in the form of cash or cash equivalents, or in-kind contributions. Cost share must come from non-federal sources (unless otherwise allowed by law), such as project participants, state or local governments, or other third-party financing. DOE Loan Guarantee, cannot be leveraged by applicants to provide the required cost share or otherwise support the same scope that is proposed under a project.

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 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 federal government did not provide the funding to the state or local government.

The recipient may not use any of the following sources to meet cost share obligations:

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

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

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

Applicants are encouraged to refer to 2 CFR 200.306 and 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

DOE 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 DOE 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

All applicant submissions must:

- Comply with the applicable content and form requirements listed in Section V of the FOA;
- Include all required documents;

- Be uploaded and submitted to EERE eXCHANGE https://eere-eXCHANGE.energy.gov; and
- Be submitted by the deadline stated in the FOA.

DOE will not review or consider submissions submitted through means other than EERE eXCHANGE, submissions submitted after the applicable deadline, or incomplete submissions.

Applicants are strongly encouraged to submit their Letters of Intent, 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 before the submission deadline), applicants should allow at least one hour to submit a Letter of Intent, Concept Paper, Full Application, or Reply to Reviewer Comments. Once the Letter of Intent, 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 Letter of Intent, Concept Paper, Full Application, or Reply to Reviewer Comments before the applicable deadline. DOE will not extend the submission deadline for applicants that fail to submit required information by the applicable deadline due to server/connection congestion.

D. Responsiveness Criteria

All Applications Specifically Not of Interest, as described in Section II.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 FFRDCs 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:

a. 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.

b. 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.

c. Funding, Cost Share, and Subaward with FFRDCs

The value of and funding for the FFRDC portion of the work will not normally be included in the award. DOE/NNSA FFRDCs participating as a subrecipient on a project will be funded directly through the DOE field work proposal (WP) process. Non-DOE/NNSA FFRDCs participating as a subrecipient will be funded through an interagency agreement with the sponsoring agency.

Although the FFRDC portion of the work is excluded from the award, 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.

Unless instructed otherwise by the DOE Contracting Officer for the DOE award, all FFRDCs are required to enter into a Cooperative Research and Development Agreement[75] (CRADA) or, if the role of the DOE/NNSA FFRDC is limited to technical assistance and intellectual property is not anticipated to be generated from the DOE/NNSA FFRDC's work, a Technical Assistance Agreement (TAA), with at least the prime recipient before any project work begins. Any questions regarding the use of a CRADA or TAA should be directed to the cognizant DOE field intellectual property (IP) counsel.

The CRADA or TAA is used to ensure accountability for project work and provide the appropriate management of IP, e.g., data protection and background IP. The CRADA or TAA must be agreed upon by all parties and submitted to DOE or other sponsoring agency, when applicable, for approval, or submitted to DOE for notice under the Master Scope of Work process, when applicable, using any DOE or other sponsoring agency approved CRADA or TAA template without substantive changes by the time the award is made to the prime recipient.

d. Responsibility

[75] A cooperative research and development agreement is 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

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.

e. Limit on FFRDC Effort.

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

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

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

G. Questions Regarding Eligibility

DOE 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 apply in response to this FOA lies solely with the applicant.

V. Application and Submission Information

A. Application Process

The application process includes multiple submission phases: Letter of Intent, Concept Paper, and Full Application. **Only applicants who have submitted an eligible Concept Paper will be eligible to submit a Full Application**.

All submissions must conform to the form and content requirements described below, including maximum page lengths.

- 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” 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;

- A **control number** will be issued when an applicant begins the EERE eXCHANGE application process. The control number must be included with all application documents. Specifically, the control number must be prominently displayed on the upper right corner of the header of every page and included in the file name (i.e., *Control Number_Applicant Name_Full Application*);
- 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, DOE will review only the authorized number of pages and disregard any additional pages.

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.

Applicants who experience technical difficulties with submission PRIOR to the FOA deadline should contact the EERE eXCHANGE helpdesk for assistance (EERE-eXCHANGESupport@hq.doe.gov).

B. Application Forms

To access application forms and instructions available on EERE eXCHANGE, 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 50MB. Files larger than 50MB cannot be uploaded and hence cannot be submitted for review. If a file is larger than 50MB 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

DOE will not accept late submissions that resulted from technical difficulties due to uploading files that exceed 50MB.

C. Content and Form of the Letter of Intent

Applicants must submit a Letter of Intent by the specified due date and time to be eligible to submit a Concept Paper and Full Application. DOE will use Letters of Intent to plan for the merit review process. The letter should not contain any proprietary or business-sensitive information. The letter will not be used for down-selection purposes and does not commit an applicant to submit an application.

Each applicant must provide the following information as part of the Letter of Intent:

- Project Title;
- Lead Organization;
- Organization Type (business < 500 employees; business > 1,000 employees; business = 500-1,000 Employees; FFRDC; government-owned, government-operated; nonprofit; university);
- Whether the application has been previously submitted to DOE;
- % of effort contributed by the Lead Organization;
- The Project Team, including:
  - The Principal Investigator (PI) for the prime recipient;
  - Team members (i.e., subrecipients); and
  - Senior/Key Personnel (i.e., individuals who contribute in a substantive, measurable way to the execution of the proposed project);
- Technical Topic or Area; and
- Abstract no longer than 200 words providing a truncated explanation of the proposed project.

D. Content and Form of the Concept Paper

Each Concept Paper must be limited to a single concept or technology. The Concept Paper must conform to the requirements listed below, including the stated page limits.

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, the project location(s), and any statements regarding confidentiality.
Technology Description	4 pages maximum	Applicants are required to describe succinctly: • The proposed technology, including its basic operating principles and how it is unique and innovative; • The proposed technology's target level of performance (applicants should provide technical

		data or other support to show how the proposed target could be met); • The current state of the art in the relevant field and application, including key shortcomings, limitations, and challenges; • How the proposed technology will overcome the shortcomings, limitations, and challenges in the relevant field and application; • The potential impact that the proposed project would have on the relevant field and application; • How the proposed location of the proposed project will support technology development and long-term success; • The key technical risks/issues associated with the proposed technology development plan; and • The impact that DOE funding would have on the proposed project.
R&D Community Benefits Plan	1 page maximum	Applicants are required to succinctly describe their approach to the R&D Community Benefits Plan, addressing the three core elements: • Advance diversity, equity, inclusion, and accessibility (DEIA); • Contribute to energy equity; and • Invest in America's workforce.
Addendum	2 pages maximum	Applicants are required to succinctly describe the qualifications, experience, and capabilities of the proposed project team, including: • Whether the 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; • 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; and • Applicants may provide graphs, charts, or other data to supplement their Technology Description.
Summary Slide	1 page maximum	Applicants are required to provide a single PowerPoint slide summarizing the proposed project. The slide must be submitted in Microsoft PowerPoint format. This slide is used during the evaluation process and should be legible when viewed on a screen in a conference room. The content of this Summary Slide must not include any proprietary or sensitive business information as DOE may make it available to the

		public after selections are made. The Summary Slide requires the following information: • The project's key idea/takeaway • A description of the project's impact • Proposed project goals • Any key graphics (illustrations, charts, and/or tables) • Project title, Prime Recipient, Principal Investigator, and Subrecipients • Requested federal funds and proposed applicant cost share (if applicable)

DOE makes an independent assessment of each Concept Paper based on the criteria in Section VI.A.i. of the FOA. DOE will encourage a subset of applicants to submit Full Applications. Other applicants will be discouraged from submitting a Full Application. See Section VII.A.

E. Content and Form of the Full Application

Applicants must complete the following application forms found on the EERE eXCHANGE website at https://eere-eXCHANGE.energy.gov/.

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.

i. Full Application Content Requirements

Each Full Application must be limited to a single concept. Full Applications must conform to the following requirements and must not exceed the stated page limits.

Component	File Format	Page Limit	File Name
Technical Volume	PDF	Topic Area 1: 15 Topic Area 2: 20	ControlNumber_LeadOrganization_TechnicalVolume
Resumes	PDF	3 pages each	ControlNumber_LeadOrganization_Resumes
Letters of Commitment	PDF	1 page each	ControlNumber_LeadOrganization_LOCs
SF-424: Application for Federal Assistance	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 2)	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 (prime applicant and subrecipients)	PDF	n/a	ControlNumber_LeadOrganization_ SF-LLL
Foreign Entity Waiver Requests and Foreign Work Waiver Requests	PDF	n/a	ControlNumber_LeadOrganization_ Waiver
R&D Community Benefits Plan Budget Justification	MS Excel	n/a	ControlNumber_CBP_Budget_Justification
R&D Community Benefits Plan	PDF	5	ControlNumber_LeadOrganization_ CBP
Current and Pending Support	PDF	n/a	ControlNumber_LeadOrganization_ CPS
Location(s) of Work	Excel	n/a	ControlNumber_LeadOrganization_ LOW
Transparency of Foreign Connections	PDF	n/a	BusinessSensitive_ControlNumber_ LeadOrganization_TFC
Potentially Duplicative Funding Notice	PDF	n/a	ControlNumber_LeadOrganization_ PDFN

Note: The maximum file size that can be uploaded to the EERE eXCHANGE website is 50MB. See Section V.B.

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

ii. Technical Volume

The Technical Volume must conform to the following content and form requirements. This volume must address the technical review criteria as discussed in Section VI. 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, DOE and reviewers are under no obligation to review cited sources.

The Technical Volume to the Full Application may not be more than 15 pages for Topic Area 1 and 20 pages for Topic Area 2, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all information in the table below. The applicant should consider the weighting of each of the technical review criteria (see Section VI.A. of the FOA) when preparing the Technical Volume.

The Technical Volume should clearly describe and expand upon information provided in the Concept Paper.

Technical Volume Content Requirements	
SECTION/PAGE LIMIT	**DESCRIPTION**

Cover Page	• Project title
	• Specific FOA Topic Area applied to and project focus area keywords. This information will help determine the reviewer expertise areas for the application.
	• Project team and contact information, including:
	  ○ technical point of contact: the Principal Investigator for the prime recipient,
	  ○ business point of contact,
	  ○ names of all team member (i.e., subrecipient) organizations,
	  ○ names of project managers, Senior/Key Personnel (i.e., individuals who contribute in a substantive, measurable way to the execution of the proposed project), and their organizations
	  ○ the project location(s)
	• Total requested federal funds and cost share
	• Any statements regarding confidentiality
	
	No additional information, such as an application abstract, should be included on this page.

Project Overview (Approximately 10% of the Technical Volume)	The Project Overview should contain the following information: • Background: The applicant should discuss the background of its organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Full Application.

	• Project Goal: The applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal. • DOE Impact: The applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.
Technical Description, Innovation, and Impact (Approximately 30% of the Technical Volume)	The Technical Description should contain the following information: • Relevance and Outcomes: The applicant should provide a detailed description of the technology or focus area, including the scientific and other principles and objectives that will be pursued during the project. This section should describe how the proposed project will meet the objectives of the FOA, including the potential to meet specific DOE technical targets or other relevant performance targets. The applicant should clearly specify the expected outcomes of the project. • Feasibility: The applicant should demonstrate the technical feasibility of the proposed technology and capability of achieving the anticipated performance targets, including a description of previous work done and prior results. This section should also address the project's access to necessary infrastructure (e.g., transportation, water, electricity transmission), including any use of existing infrastructure, as well as to a skilled workforce. • Innovation and Impacts: The applicant should describe the current state-of-the-art in the applicable field, the specific innovation of the proposed technology or focus area, 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. This section should describe establishing the relevant baseline and identifying relevant metrics to evaluate the advantages and impact of the project, as well as a pathway to achieve stated impact after the end of the proposed project's period of performance.
Workplan (Approximately 40% of the Technical Volume)	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 will be requested separately at the negotiation stage. The Workplan should contain the following information: • Project Objectives: The applicant should provide a clear and concise statement of the goals and objectives of the project as well as the expected outcomes. • Technical Scope Summary: The applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). The overall work scope is to be divided by performance

	periods that are separated by discrete, approximately annual decision points (see below for more information on Go/No-Go decision points). The applicant should describe the specific expected end result of each performance period, including milestones in the R&D Community Benefits Plan. • WBS and Task Description Summary: The Workplan should describe the work to be accomplished and how the applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. The Workplan is to be structured with a hierarchy of performance period (approximately annual), task and subtasks, which is typical of a standard WBS for any project. The Workplan shall contain a concise description of the specific activities to be conducted over the life of the project. The description shall be a full explanation and disclosure of the project being proposed (i.e., a statement such as "we will then complete a proprietary process" is unacceptable). It is the applicant's responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this FOA. • 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 Specific, Measurable, Achievable, Relevant, and Timely (SMART) technical milestone. SMART milestones should be Specific, Measurable, Achievable, Relevant, and Timely, and must demonstrate a technical achievement rather than simply completing a task. Unless otherwise specified in the FOA, the minimum requirement is that each project must have at least one milestone per quarter for the duration of the project with at least one SMART technical milestone per year (depending on the project, more milestones may be necessary to comprehensively demonstrate progress). The applicant should also provide the means by which the milestone will be verified. • Go/No-Go Decision Points (See Section VII.B.xiv. for more information on the Go/No-Go Review): The applicant should provide a summary of project-wide Go/No-Go decision points at appropriate points in the Workplan. 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. The applicant should also provide the specific technical and community benefits plan criteria to be used to evaluate the project at the Go/No-Go decision point. 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.

	• Project Schedule (Gantt Chart or similar): The applicant should provide a schedule for the entire project, including task and subtask durations, milestones, and Go/No-Go decision points.
	• Buy America Requirements for Infrastructure Projects: Within the first two pages of the Workplan, include a short statement on whether the project will involve the construction, alteration, and/or repair of infrastructure in the United States. See Appendix D for applicable definitions and other information to inform this statement.
	• Project Management: The applicant should discuss the team's proposed management plan, including the following:
	  ○ 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, including a plan for securing a qualified workforce and mitigating risks to project performance including but not limited to community or labor disputes;
	  ○ 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 Impact Plan: The applicant should provide a market impact plan, including the following:
	  ○ Identification of industry adoption pathway and target market, including competitors, distribution channels for proposed technology, and known or perceived barriers to market penetration, along with a mitigation plan;
	  ○ Identification of the interest and extent of industry adoption of the developed technologies or processes;
	  ○ Discussion of main considerations on the path to commercialization, such as commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, data dissemination, and product distribution.

Example Workplan Structure

A. Project Objective
[Provide a high-level overview of the goals, impact and final result of this project. Explain the final objective, outcome, milestone and/or deliverable that are to be produced and the rationale for why the applicant has organized the tasks in the way they have.]

B. Technical Scope Summary
[Provide a summary description of the overall work scope and approach to achieve the objective(s). The applicant should describe the specific expected end result of each performance period.]

C. Milestone, Go/No-Go, and End of Project Goals Summary Table
[Optional example format, however, milestones, go/no-go decision points, and end of project goals should be included here or in the Project Schedule in the format most appropriate to the applicant's proposal. Go/no-go and End-of-Project decisions points should describe quantifiable metrics that will be achieved at the end of each budget period to demonstrate progress toward achieving overall project goals.]

D. Project Schedule
[The section should describe the anticipated activities to be conducted over the life of the project. This section provides a summary of the planned approach to this project and should clearly articulate what work must be accomplished to execute the project scope and thus meet the established project objectives. Each task should have a task summary that describes the objectives, what work is to be accomplished, and relationship to project deliverables or expected results. For example:

Task 1: Distinctive Title, Date range of the task in months (M1-M7), Estimated total task budget
Task Description: Task summaries shall explicitly identify:

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

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

- Explicitly identify the task objectives/outcomes being addressed and a concise statement of the objectives of that subtask.
- Describe the work and techniques that will be used and the expected result that will be generated from the effort.

(Optional) Subtask 1.2: Distinctive title, Date range (M2-M7)
(Continue until all Task 1 subtasks are listed)

Task 2: (Continue in the format above until all tasks and subtasks are listed)

	Subtask 2.1:] **E. Project Management** [Provide a description of the project management approach, roles of team members, how work will be coordinated among team members, and how project risks will be handled.] **F. Market Impact Plan** ○ [Provide a description of the current market, barriers to bringing this technology to market, industry engagements, and pathways to commercializing the technology.]
Technical Qualifications and Resources (Approximately 20% of the Technical Volume)	The Technical Qualifications and Resources should contain the following information: • A description of the project team's unique qualifications and expertise, including those of key subrecipients; • A description of the project team's existing equipment and facilities, including access to relevant data, 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; • Relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives; • The time commitment of the key team members to support the project; • A description of the technical services to be provided by DOE/NNSA FFRDCs, if applicable; • The skills, certifications, or other credentials of the construction and ongoing operations workforce; • For multi-organizational projects, describe succinctly: ○ The roles and the work to be performed by the project manager and Senior/Key Personnel at the prime and sub levels; ○ 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 technical direction; ○ Publication arrangements; ○ Intellectual property issues; and ○ Communication plans.

iii. Resumes

A resume provides information reviewers can use to evaluate an individual's skills, experience, and potential for leadership within the scientific community. Applicants must submit a resume (limited to three pages) for each Principal Investigator or Lead Project Manager and Senior/Key Personnel that includes the following:

1. Contact Information;
2. Education and training: Provide name of institution, major/area, degree, and year for undergraduate, graduate, and postdoctoral training;
3. Research and professional experience: Beginning with the current position, list professional/academic positions in chronological order with a brief description. List all current academic, professional, or institutional appointments, foreign or domestic, at the applicant institution or elsewhere, whether or not remuneration is received, and, whether full-time, part-time, or voluntary;
4. Awards and honors;
5. A list of up to 10 publications most closely related to the proposed project. For each publication, identify the names of all authors (in the same sequence in which they appear in the publication), the article title, book or journal title, volume number, page numbers, year of publication, and website address if available electronically. Patents, copyrights, and software systems developed may be provided in addition to or substituted for publications. An abbreviated style such as the Physical Review Letters (PRL) convention for citations (list only the first author) may be used for publications with more than 10 authors;
6. Synergistic activities: List up to five professional and scholarly activities related to the proposed effort; and
7. If there are lapses in time over the past 10 years or since age 18, an explanation should be provided.

As an alternative to a resume, it is acceptable to use the biographical sketch format approved by the National Science Foundation (NSF). The biographical sketch format may be generated by the Science Experts Network Curriculum Vita (SciENcv), a cooperative venture maintained at https://www.ncbi.nlm.nih.gov/sciencv/, also available at https://nsf.gov/bfa/dias/policy/nsfapprovedformats/biosketch.pdf. The use of a format required by another agency is intended to reduce the administrative burden to researchers by promoting the use of common formats.

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, the letter must state that the third party is committed to providing a specific minimum dollar amount or value of in-kind contributions allocated to cost sharing. The following information for each third party contributing to cost sharing should be identified: (1) the name of the organization; (2) the proposed dollar amount to be provided; and (3) the proposed cost sharing type (cash or in-kind contributions). Each letter must not exceed one page. Save the letters of commitment in a single PDF file using the following convention for the title: "ControlNumber_LeadOrganization_LOCs".

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

v. Community Partnership Documentation

In support of the R&D Community Benefits Plan, applicants may submit documentation to demonstrate existing or planned partnerships with community entities, such as organizations that work with local stakeholders most vulnerable to or affected by the project. Examples of such entities include organizations that carry out workforce development programs, labor unions, Tribal organizations, and community-based organizations that work with disadvantaged communities. The partnership documentation can be a letter on a partner's letterhead outlining the planned partnership and signed by an officer of the entity, a Memorandum of Understanding, or another similar agreement. Such letters must state the specific nature of the partnership and must not be general letters of support. If the applicant intends to enter into Workforce and Community Agreements as part of the R&D Community Benefits Plan, they should include letters from proposed partners. Each letter must not exceed one page. In total, the partnership documentation must not exceed 10 pages. Save the partnership documentation in a single PDF file using the following convention for the title: "ControlNumber_LeadOrganization_PartnerDoc".

vi. Statement of Project Objectives (SOPO)

If selected for award, a detailed SOPO will be requested separately at the negotiation stage. A SOPO template is available on EERE eXCHANGE at https://eere-eXCHANGE.energy.gov/.

vii. SF-424: Application for Federal Assistance

Applicants must complete the SF-424: Application for Federal Assistance, which is available on EERE eXCHANGE at https://eere-eXCHANGE.energy.gov/. 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".

viii. Budget Justification Workbook

Applicants must complete the Budget Justification Workbook, available on EERE eXCHANGE at https://eere-eXCHANGE.energy.gov/. Applicants must complete each tab of the Budget Justification Workbook for the project, including all work to be performed by the prime recipient and its subrecipients and contractors. Applicants should include costs associated with implementing the various BIL-specific requirements (e.g., Buy America requirements for infrastructure projects, Davis-Bacon, R&D Community Benefits Plan, reporting, oversight) and with required annual audits and incurred cost proposals in their proposed budget documents. Such costs may be reimbursed as a direct or indirect cost. The "Instructions and Summary" included with the Budget Justification Workbook will auto-populate as the applicant enters information into the Workbook. Applicants must carefully read the "Instructions and Summary" tab provided within the Budget Justification Workbook. Save the Budget Justification Workbook in a single Microsoft Excel file using the following convention for the title: "ControlNumber_LeadOrganization_Budget_Justification".

ix. Summary for Public Release

Applicants must submit a one-page summary of their project that is suitable for dissemination to the public. It should be a self-contained document that identifies the name of the applicant, the lead project manager/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), major participants (for collaborative projects), and the project's commitments and goals described in the R&D Community Benefits Plan. This document must not include any proprietary or business-sensitive information, as DOE may make it available to the public after selections are made. The summary must not exceed one page when printed, using standard 8.5" x 11" paper with 1" margins (top, bottom, left, and right) with font not smaller than 12-point. Save the Summary for Public Release in a single PDF file using the following naming convention: "ControlNumber_LeadOrganization_Summary".

x. Summary Slide

Applicants must provide a single slide summarizing the proposed project. The Summary Slide template is available on EERE eXCHANGE at https://eere-eXCHANGE.energy.gov/ and must include 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;
- Topline community benefits;
- Project title, prime recipient, Principal Investigator, and Senior/Key Personnel information; and
- Requested DOE 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".

xi. 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% 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".

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

If a DOE/NNSA FFRDC is to perform a portion of the work, the applicant must provide a DOE work proposal (WP) in accordance with the requirements in DOE Order 412.1A, Work Authorization System, Attachment 2, 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".

xiii. 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".

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

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.

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

xv. Waiver Requests (if applicable)

Foreign Entity Participation
For projects selected under this FOA, all recipients and subrecipients must qualify as domestic entities. See Section IV. To request a waiver of this requirement, the applicant must submit an explicit waiver request in the Full Application. Appendix C lists the information that must be included in a waiver request.

Foreign Work Waiver Request
As set forth in Section V.K.iii., all work for projects selected under this FOA must be performed in 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 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".

xvi. R&D Community Benefits Plan Budget Justification

Applicants must provide a separate budget justification identifying the R&D Community Benefit Plan costs included in the "Budget Justification Workbook." This R&D Community Benefits Plan Budget Justification must include the same justification information described in the "Budget Justification Workbook" section above but should only include R&D Community Benefits Plan costs. Save the R&D Community Benefits Plan Budget Justification in a Microsoft Excel file using the following convention for the title: "ControlNumber_CBP_Budget_Justification".

xvii. R&D Community Benefits Plan

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

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

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

The R&D Community Benefits Plan must not exceed five pages. It must be submitted in PDF format using the following convention name for the title: "ControlNumber_LeadOrganization_CBP." This Plan must address the technical

review criterion titled "R&D Community Benefits Plan." See Section VI. of the FOA.

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

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

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

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

See Appendix G for more guidance.

xviii. Current and Pending Support

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

research expenses. All connections with foreign government-sponsored talent recruitment programs must be identified in current and pending support.

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 through end date); and
- The person-months of effort per year dedicated to the award or activity.

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. Supporting documents of any identified source of support must be provided to DOE on request, including certified translations of any document.

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

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

The information may be provided in the format approved by the 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 also available at: https://www.nsf.gov/bfa/dias/policy/nsfapprovedformats/cps.pdf. The use of a format required by another agency is intended to reduce the administrative burden to researchers by promoting the use of common formats. If the NSF format is used, the individual must still include a signature, date, and a certification statement using the language included in the paragraph above.

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

Definitions:

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

Foreign Government-Sponsored Talent Recruitment Program – An effort directly or indirectly organized, managed, or funded by a foreign government, or a foreign government instrumentality or entity, to recruit science and technology professionals or students (regardless of citizenship or national origin, or whether having a full-time or part-time position). Some foreign government-sponsored talent recruitment programs operate with the intent to import or otherwise acquire from abroad, sometimes through illicit means, proprietary technology or software, unpublished data and methods, and intellectual property to further the military modernization goals and/or economic goals of a foreign government. Many, but not

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

Senior/key personnel – An individual who contributes in a substantive, meaningful way to the scientific development or execution of a research, development and demonstration (RD&D) project proposed to be carried out with a DOE award.[76]

xix. Intellectual Property Management Plan (if applicable)

If selected for award, applicants must submit an executed Intellectual Property Management Plan (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 DOE 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 IX.K.-IX.N. of this FOA for more details on applicable federal intellectual property laws and regulations). Guidance regarding the contents of IPMP is available from DOE upon request.

The following is a list of examples of items 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);

[76] Typically, these individuals have doctoral or other professional degrees, although individuals at the masters or baccalaureate level may be considered Senior/Key Personnel if their involvement meets this definition. Consultants, graduate students, and those with a postdoctoral role also may be considered Senior/Key Personnel if they meet this definition.

- 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.

Save the Intellectual Property Management Plan in a single PDF file using the following convention for the title: "ControlNumber_LeadOrganization_IPMP".

xx. Locations of Work

Applicants must complete the Locations of Work Documentation, available on EERE eXCHANGE at https://eere-eXCHANGE.energy.gov/. The applicant must complete the supplied template by listing the city, state, and zip code + 4 digits for each location where project work will be performed by the prime recipient or subrecipient(s). Save the completed template as a Microsoft Excel file using the following convention for the title: "Control Number_LeadOrganization_LOW."

xxi. Transparency of Foreign Connections

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

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

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

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

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

xxii. Potentially Duplicative Funding Notice

If the applicant or project team member has other active awards of federal funds, the applicant must determine whether the activities of those awards potentially overlap with the activities set forth in its application to this FOA. If there is a potential overlap, the applicant must notify DOE in writing of the potential overlap and state how it will ensure any project funds (i.e., recipient cost share and federal funds) will not be used for identical cost items under multiple awards. Likewise, for

projects that receive funding under this FOA, if a recipient or project team member receives any other award of federal funds for activities that potentially overlap with the activities funded under the DOE award, the recipient must promptly notify DOE in writing of the potential overlap and state whether project funds from any of those other federal awards have been, are being, or are to be used (in whole or in part) for one or more of the identical cost items under the DOE award. If there are identical cost items, the recipient must promptly notify the DOE Contracting Officer in writing of the potential duplication and eliminate any inappropriate duplication of funding.

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

F. Content and Form of Replies to Reviewers Comments

DOE will provide applicants with reviewer comments following the evaluation of all eligible Full Applications. Applicants have a brief opportunity to prepare a short Reply to Reviewer Comments (Reply). The Reply must not exceed three pages. If a Reply is more than three pages in length, DOE will review only the first three pages and disregard additional pages. Applicants may use the Reply to respond to one or more comments or to supplement their Full Application. The Reply may include text, graphs, charts, or data.

DOE 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 if 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 a Reply.

Applicants are not required to submit a Reply to Reviewer Comments. DOE will review and consider each eligible Full Application, even if no Reply is submitted or if the Reply is found to be ineligible.

G. Post Selection Information Requests

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

- Personnel proposed to work on the project and collaborating organizations (See Section VII.B.xix. Participants and Collaborating Organizations);

- Current and Pending Support (See Sections V.E.xviii. and VII.B.xx. Current and Pending Support);
- An Intellectual Property Management Plan (if applicable) describing how the project team/consortia members will handle intellectual property rights and issues between themselves while ensuring compliance with federal intellectual property laws, regulations, and policies in accordance with Section VII.B.x. Intellectual Property Management Plan;
- A Data Management Plan (if applicable) describing how all research data displayed in publications resulting from the proposed work will be digitally accessible at the time of publications, in accordance with Section VII.B.xxiii.;
- Indirect cost information;
- Other budget information;
- Letters of Commitment from third parties contributing to cost share, if applicable;
- Name and phone number of the Designated Responsible Employee for complying with national policies prohibiting discrimination (See 10 CFR 1040.5);
- Information for the DOE Office of Civil Rights to process assurance reviews under 10 CFR 1040;
- Representation of Limited Rights Data and Restricted Software, if applicable;
- Information related to Davis-Bacon Act requirements;
- Any proposed or required Project Labor Agreements;
- Environmental Questionnaire; and
- Statement of Project Objectives (SOPO).

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

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

NOTE: Due to the high demand of UEI requests and SAM registrations, entity legal business name and address validations are taking longer than expected to process.

Entities should start the UEI and SAM registration process as soon as possible. If entities have technical difficulties with the UEI validation or SAM registration process**,** they should use the HELP feature on SAM.gov. SAM.gov will work entity service tickets in the order in which they are received and asks that entities not create multiple service tickets for the same request or technical issue. Additional entity validation resources can be found here: GSAFSD Tier 0 Knowledge Base - Validating your Entity**.**

I. Submission Dates and Times

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

J. Intergovernmental Review

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

K. Funding Restrictions

i. Allowable Costs

All expenditures must be allowable, allocable, and reasonable in accordance with the applicable federal cost principles. Pursuant to 2 CFR 910.352, the cost principles in the Federal Acquisition Regulations (48 CFR 31.2) apply to for-profit entities. The cost principles contained in 2 CFR Part 200, Subpart E apply to all entities other than for-profits.

ii. Pre-Award Costs

Applicants selected for award negotiations (selectee) 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 DOE Contracting Officer.

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. DOE 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**
   DOE'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 DOE completing the NEPA review process.

   DOE 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 its 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 overrides the requirement 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 DOE 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 awards issued under this FOA must be performed in the United States. The prime recipient must flow down this requirement to its subrecipients.

2. **Failure to Comply**
   If the prime recipient fails to comply with the Performance of Work in the United States requirement, DOE may deny reimbursement for the work conducted outside the United States and such costs may not be recognized as allowable recipient cost share. The prime recipient is responsible should

any work under this award be performed outside the United States, absent a waiver, regardless of whether the work is performed by the prime recipient, subrecipients, contractors or other project partners.

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

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

DOE strongly encourages the use of project labor agreements (PLAs) in connection with construction projects. A PLA is a pre-hire agreement between a private entity (or entities) and a labor organization (or organizations) representing individuals who will be working on the construction project. Applicants that commit to using best-practice project labor agreements will generally be likely to produce a construction workforce plan that meets the criteria in this FOA. By contrast, applicants that do not commit to using a PLA will be required to submit workforce continuity plans and show that they have taken other measures to reduce the risk of delays in project delivery.

For large construction projects, DOE may require a PLA. Assessment of applicability will be conducted on a case-by-case basis.

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 U.S.C. § 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 United States 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

Property disposition may 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. Build America Buy America Requirements for Infrastructure Projects

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

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

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

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

Please note that, based on implementation guidance from the Office of Management and Budget issued on April 18, 2022, the Buy America requirements of the BIL do not apply to DOE projects in which the prime recipient is a for-profit entity; the requirements only apply to projects whose prime recipient is a "non-Federal entity," e.g., a State, local government, Indian tribe, Institution of Higher Education, or nonprofit organization. Subawards should conform to the terms of the prime award from which they flow; in other words, for-profit prime recipients are not required to flow down these Buy America requirements to subrecipients, even if those subrecipients are non-Federal entities as defined above. Conversely, prime recipients which are non-Federal entities must flow the Buy America requirements down to all subrecipients, even if those subrecipients are for-profit entities. Finally, for all applicants—both non-Federal entities and for-profit entities—DOE is including a Program Policy Factor that the Selection Official may consider in determining which Full Applications to select for award negotiations that considers whether the

applicant has made a commitment to procure U.S. iron, steel, manufactured products, and construction materials in its project.

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

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

viii. Davis-Bacon Act Requirements

Projects awarded under this FOA will be funded under Division D of BIL. Accordingly, per Section 41101 of that law, all laborers and mechanics employed by the recipient, subrecipients, contractors, or subcontractors in the performance of construction, alteration, or repair work funded in whole or in part under this FOA shall be paid wages at rates not less than those prevailing on similar projects in the locality, as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code commonly referred to as the Davis-Bacon Act (DBA).

Applicants shall provide written assurance acknowledging the DBA requirements above, confirming that the laborers and mechanics performing construction, alteration, or repair work on projects funded in whole or in part by awards made as a result of this FOA are paid or will be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by subchapter IV of Chapter 31 of Title 40, United States Code (Davis-Bacon Act).

Applicants acknowledge that they will comply with all the Davis-Bacon Act requirements, including but not limited to:

(1) Ensuring that the wage determination(s) and appropriate Davis-Bacon clauses and requirements are flowed down to and incorporated into any applicable subcontracts or subrecipient awards;

(2) Ensuring that if wage determination(s) and appropriate Davis-Bacon clauses and requirements are improperly omitted from contracts and

subrecipient awards, the applicable wage determination(s) and clauses are retroactively incorporated to the start of performance;

(3) Being responsible for compliance by any subcontractor or subrecipient with the Davis-Bacon labor standards;

(4) Receiving and reviewing certified weekly payrolls submitted by all subcontractors and subrecipients for accuracy and to identify potential compliance issues;

(5) Maintaining original certified weekly payrolls for three years after the completion of the project and making those payrolls available to DOE or the U.S. Department of Labor (DOL) upon request, as required by 29 CFR 5.6(a)(2);

(6) Conducting payroll and job-site reviews for construction work, including interviews with employees, with such frequency as may be necessary to assure compliance by its subcontractors and subrecipients and as requested or directed by DOE;

(7) Cooperating with any authorized representative of DOL in its inspection of records, interviews with employees, and other actions undertaken as part of a DOL investigation;

(8) Posting in a prominent and accessible place the wage determination(s) and DOL Publication: WH-1321, Notice to Employees Working on Federal or Federally Assisted Construction Projects;

(9) Notifying the Contracting Officer of all labor standards issues, including all complaints regarding incorrect payment of prevailing wages and/or fringe benefits, received from the recipient, subrecipient, contractor, or subcontractor employees; significant labor standards violations, as defined in 29 CFR 5.7; disputes concerning labor standards pursuant to 29 CFR Parts 4, 6, and 8 and as defined in FAR 52.222-14; disputed labor standards determinations; DOL investigations; or legal or judicial proceedings related to the labor standards under this contract, a subcontract, or subrecipient award; and

(10) Preparing and submitting to the Contracting Officer, the Office of Management and Budget Control Number 1910-5165, Davis Bacon Semi-Annual Labor Compliance Report, by April 21 and October 21 of each year. Form submittal will be administered through the iBenefits system (https://doeibenefits2.energy.gov), its successor system, or other manner of compliance as directed by the Contracting Officer.

Recipients of funding under this FOA will also be required to undergo Davis-Bacon Act compliance training and maintain competency in Davis-Bacon Act compliance. The Contracting Officer will notify the recipient of any DOE-sponsored Davis-Bacon Act compliance trainings. DOL offers free Prevailing Wage Seminars several times a year that meet this requirement, at https://www.dol.gov/agencies/whd/government-contracts/construction/seminars/events.

For additional guidance on how to comply with the Davis-Bacon provisions and clauses, see https://www.dol.gov/agencies/whd/government-contracts/construction and https://www.dol.gov/agencies/whd/government-contracts/protections-for-workers-in-construction.

DOE anticipates contracting with a third party for a Davis-Bacon Act electronic payroll compliance software application. Recipients of funding under this FOA must ensure the timely electronic submission of weekly certified payrolls through this software as part of its compliance with the Davis-Bacon Act unless a waiver is granted to a particular contractor or subcontractor because it is unable or limited in its ability to use or access. Applicants should indicate if they will seek a waiver.

ix. 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.

x. Risk Assessment

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

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

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

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

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

Further, as DOE invests in critical infrastructure and funds critical and emerging technology areas, DOE also considers possible threats to United States research, technology, and economic security from undue foreign government influence when evaluating risk. If high risks are identified and cannot be sufficiently mitigated, DOE may elect to not fund the applicant.

xi. 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;
- Proof of compliance with the Davis-Bacon Act and electronic submittals of certified payroll reports;
- 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.

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

a. Prohibition

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

b. Definitions

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

future compensation, or other types of remuneration or consideration, including in-kind compensation.

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

xiii. Affirmative Action and Pay Transparency Requirements

All applicants must comply with all applicable federal labor and employment laws, including but not limited to Title VII of the Civil Rights Act of 1964, the Fair Labor Standards Act, the Occupational Safety and Health Act, and the National Labor Relations Act, which protects employees' right to bargain collectively and engage in concerted activities for the purpose of workers' mutual aid or protection.

All federally assisted construction contracts exceeding $10,000 annually will be subject to the requirements of Executive Order 11246 Equal Employment Opportunity:

(1) Recipients, subrecipients, contractors, and subcontractors are prohibited from discriminating in employment decisions on the basis of race, color, religion, sex, sexual orientation, gender identity, or national origin.

(2) Recipients and contractors are required to take affirmative action to ensure that equal opportunity is provided in all aspects of their employment. This includes flowing down the appropriate language to all subrecipients, contractors, and subcontractors.

(3) Recipients, subrecipients, contractors, and subcontractors are prohibited from taking adverse employment actions against applicants and employees for asking about, discussing, or sharing information about their pay or, under certain circumstances, the pay of their co-workers.

DOL's Office of Federal Contractor Compliance Programs (OFCCP) uses a neutral process to schedule compliance evaluations. Consult OFCCP's Technical Assistance Guide[77] to gain an understanding of the requirements and possible actions the recipients, subrecipients, contractors, and subcontractors must take. Additional guidance may also be found in the National Policy Assurances, produced by DOE.

[77] See OFCCP's Technical Assistance Guide at: https://www.dol.gov/sites/dolgov/files/ofccp/Construction/files/ConstructionTAG.pdf?msclkid=9e397d68c4b111ec9d8e6fecb6c710ec Also see the National Policy Assurances http://www.nsf.gov/awards/managing/rtc.jsp

xiv. Foreign Collaboration Considerations

a. Consideration of new collaborations with foreign entities and governments. The recipient will be required to provide DOE with advanced written notification of any potential collaboration with foreign entities or governments in connection with its DOE-funded award scope. The recipient will then be required to await further guidance from DOE prior to contacting the proposed foreign entity or government regarding the potential collaboration or negotiating the terms of any potential agreement.

b. Existing collaborations with foreign entities and governments. The recipient will be required to provide DOE with a written list of all existing foreign collaborations in which has entered in connection with its DOE-funded award scope.

c. Description of collaborations that should be reported. In general, a collaboration will involve some provision of a thing of value to, or from, the recipient. A thing of value includes but may not be limited to all resources made available to, or from, the recipient in support of and/or related to the DOE award, regardless of whether or not they have monetary value. Things of value also may include in-kind contributions (such as office/laboratory space, data, equipment, supplies, employees, students). In-kind contributions not intended for direct use on the DOE award but resulting in provision of a thing of value from or to the DOE award must also be reported. Collaborations do not include routine workshops, conferences, use of the recipient's services and facilities by foreign investigators resulting from its standard published process for evaluating requests for access, or the routine use of foreign facilities by awardee staff in accordance with the recipient's standard policies and procedures.

VI. Application Review Information

A. Technical Review Criteria

i. Concept Papers

Concept Papers are evaluated based on consideration the following factors.

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, how the technology is unique and innovative, and how the technology will advance the current state-of-the-art;
- The applicant has identified risks and challenges of the technology, regulatory and financial aspects of the proposal 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 built a team with the qualifications, experience, capabilities, access to relevant data and other resources necessary to complete the proposed project and address the specific FOA Topic Area requirements; 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 technical review criteria shown below.

Criterion 1: Technical Merit, Innovation, and Impact (35%)
This criterion involves consideration of the following factors:

Technical Merit and Innovation

- Extent to which the proposed technology, process, or project is innovative or replicable;
- Degree to which the current state of the technology and the proposed advancement are clearly described;
- Extent to which the application specifically and convincingly demonstrates how the applicant will move the state of the art to the proposed advancement, including selecting the appropriate baseline(s) to use for assessment;
- 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 with analyses that support the viability of the proposed work;
- Extent to which project has buy-in from needed stakeholders to ensure success and path to adoption after the end of the funded project.

Impact of Technology Advancement

- Extent to which the project supports the topic area objectives and uses the appropriate energy, cost, and environmental metrics to evaluate the project impact;
- Potential impact of the project on advancing the state of the art, including the improvement on the baselines of relevant metrics;

- Scalability/replicability of the proposed solutions to accommodate rapid PV deployment growth;
- Extent to which the project facilitates stakeholder relationships across multiple stages of PV system life to gain technical buy-in and increase potential for future adoption or use of the developed technology and methods.

Criterion 2: Workplan Quality and Likelihood of Completion of Stated Goals (35%)
This criterion involves consideration of the following factors:

Research Approach and Workplan

- Degree to which the approach and critical path have been clearly described and thoughtfully considered;
- Degree to which the task descriptions are clear, detailed, timely, and reasonable, resulting in a high likelihood that the proposed Workplan will succeed in meeting the project goals;
- Degree to which the project has access to data of sufficient quality, quantity, and diversity to inform the proposed research efforts.

Identification of Technical Risks

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

Baseline, Metrics, and Deliverables

- Level of clarity in the definition of the baseline, metrics, and milestones;
- Relative to a clearly defined project baseline, the strength of the quantifiable metrics, milestones, and mid-point deliverables defined in the application, such that meaningful interim progress will be made;
- The stated goals of the project are SMART and likely to be accomplished within the scope of this project.

Market Impact Plan

- Identification of industry adoption pathway and target market, including competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including mitigation plan;
- Identification of the interest and extent of industry adoption of the developed technology or process;
- Comprehensiveness of market impact plan including but not limited to the plan to implement the final project result in a scalable fashion to facilitate rapid PV deployment, the engagement of potential offtakers,

commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, and product distribution.

Project Management

- Adequacy of proposed project management systems including the ability to track scope, cost, and schedule progress and changes;
- Adequacy, reasonableness, and soundness of the project schedule, as well as periodic Go/No-Go decisions prior to further funds disbursement, interim milestones, and metrics to track process.

Criterion 3: Team and Resources (15%)
This criterion involves consideration of the following factors:

- Capability of the project manager(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 team composition satisfying the requirements listed in the Topic Area description showing diversity of expertise and perspectives as well as the inclusion of industry partners that will amplify impact;
- Sufficiency of the facilities to support the work;
- Degree to which the proposed team demonstrates the ability to facilitate and expedite further demonstration, development and commercial deployment of the proposed technologies;
- Level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan; and
- Reasonableness of the budget and spend plan as detailed in the budget justification workbook for the proposed project and objectives.

Criterion 4: R&D Community Benefits Plan (15%)
This criterion involves consideration of the following factors:

Diversity, Equity, Inclusion, and Accessibility

- Clear articulation of the project's goals related to diversity, equity, inclusion, and accessibility;
- Quality of the project's DEIA goals, as measured by the goals' depth, breadth, likelihood of success, inclusion of appropriate and relevant SMART milestones, and overall project integration;
- Degree of commitment and ability to track progress toward meeting each of the DEIA goals; and

- Extent of engagement of organizations that represent disadvantaged communities as a core element of their mission, including Minority Serving Institutions (MSIs), Minority Business Entities, and nonprofit or community-based organizations.

Energy Equity

- Clear workplan tasks, staffing, research, and timeline for engaging energy equity stakeholders and/or evaluating the possible near- and long-term implications of the project for the benefit of the American public, including but not limited to public health and public prosperity benefits;
- Approach, methodology, and expertise articulated in the plan for addressing energy equity and justice issues associated with the technology innovation; and
- Likelihood that the plan will result in improved understanding of distributional public benefits and costs related to the innovation if successful.

Workforce Implications

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

iii. Criteria for Replies to Reviewer Comments

DOE 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 DOE funding to achieve programmatic objectives;
- The level of industry involvement and demonstrated ability to accelerate demonstration and commercialization and overcome key market barriers;
- The degree to which the proposed project is likely to lead to increased high-quality employment and manufacturing in the United States ;
- The degree to which the proposed project will accelerate transformational technological advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty;
- The degree to which the proposed project, or group of projects, represent a desired geographic distribution (considering past awards and current applications);
- The degree to which the proposed project incorporates applicant or team members from Minority Serving Institutions (e.g., Historically Black Colleges and Universities (HBCUs)/Other Minority Institutions); and partnerships with Minority Business Enterprises, minority-owned businesses, woman-owned businesses, veteran-owned businesses, or Indian tribes;
- The degree to which the proposed project, when compared to the existing DOE project portfolio and other projects to be selected from the subject FOA, contributes to the total portfolio meeting the goals reflected in the R&D Community Benefits Plan criteria;
- The degree to which the proposed project will employ procurement of U.S. iron, steel, manufactured products, and construction materials;
- The degree to which the proposed project enables recovery and/or reduced use of critical materials;
- The degree to which the project's solution or strategy will maximize deployment or replication.

D. Evaluation and Selection Process

i. Overview

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

ii. Pre-Selection Interviews

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

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

DOE will not reimburse applicants for travel and other expenses relating to the pre-selection interviews, nor will these costs be eligible for reimbursement as pre-award costs.

Participation in pre-selection interviews with DOE does not signify that applicants have been selected for award negotiations.

iii. Pre-Selection Clarification

DOE may determine that pre-selection clarifications are necessary from one or more applicants. Pre-selection clarifications are distinct from and less formal than pre-selection interviews. These pre-selection clarifications will solely be for the purposes of clarifying the application. The pre-selection clarifications may occur before, during or after the merit review evaluation process. Information provided by an applicant that is not necessary to address the pre-selection clarification question will not be

reviewed or considered. Typically, a pre-selection clarification will be carried out through either written responses to DOE's written clarification questions or video or conference calls with DOE representatives.

The information provided by applicants to DOE through pre-selection clarifications is incorporated in their applications and contributes to the merit review evaluation and DOE's selection decisions. If DOE 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.

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

iv. Recipient Responsibility and Qualifications

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 responsibility and qualification information about the applicant that is in the entity information domain in SAM.gov (see 41 U.S.C. § 2313).

The applicant, at its option, may review information in the entity information domain in SAM.gov and comment on any information about itself that a federal awarding agency previously entered and is currently in the entity information domain in SAM.gov.

DOE will consider any written comments by the applicant, in addition to the other information in the entity information domain in SAM.gov, in making a judgment about the applicant's integrity, business ethics, and record of performance under federal awards when completing the review of risk posed by applicants as described in 2 CFR 200.206.

v. Selection

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

E. Anticipated Notice of Selection and Award Negotiation Dates

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

VII. 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

DOE will notify applicants of its determination to encourage or discourage the submission of a Full Application. DOE will post these notifications to EERE eXCHANGE. DOE may include general comments provided from reviewers on an applicant's Concept Paper in the encourage/discourage notifications.

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, DOE 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.

iii. Full Application Notifications

DOE 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, DOE 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. Applicants Selected for Award Negotiations

Successful applicants will receive written notification that they have been selected for award negotiations. 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 DOE to issue an award nor is it a guarantee of federal government funding. Applicants do not receive an award unless and until award negotiations are

complete and the Contracting Officer executes the funding agreement, accessible by the prime recipient in FedConnect.

The award negotiation process takes approximately 60 days. Applicants must designate a primary and a backup point-of-contact in EERE eXCHANGE with whom DOE 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, DOE will cancel the award negotiations and rescind the selection. DOE reserves the right to terminate award negotiations at any time for any reason.

Please refer to Section V.K.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 DOE designated the application to be an alternate, which means DOE 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. DOE may ultimately determine to select or not select the Full Application for award negotiations.

vi. Unsuccessful Applicants

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

B. Administrative and National Policy Requirements

i. Registration Requirements

There are several required one-time actions applicants must take before applying to this FOA. Some of these actions may take several weeks, so it is vital applicants build in enough time to complete them. Failure to complete these actions could interfere with application or negotiation deadlines or the ability to receive an award if selected. These requirements are as follows:

1. **EERE Funding Opportunity Exchange (eXCHANGE)**

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

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

Each organization or business unit, whether acting as a team or a single entity, should use only one account as the contact point for each submission. Applicants must also designate backup points of contact. **This step is required to apply to this FOA.** The eXCHANGE registration does not have a delay; however, **the remaining registration requirements below could take several weeks to process and are necessary for a potential applicant to receive an award under this FOA.**

2. **System for Award Management**
   Register in SAM (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.

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

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

5. **Electronic Authorization of Applications and Award Documents**
   Submission of an application and supplemental information under this FOA through electronic systems used by the DOE, including EERE eXCHANGE and

FedConnect, constitutes the authorized representative's approval and electronic signature.

ii. Award Administrative Requirements

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

iii. Foreign National Participation

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

DOE may elect to deny a foreign national's participation in the award. Likewise, DOE may elect to deny a foreign national's access to a DOE site, information, technologies, equipment, programs, or personnel.

iv. Subaward and Executive Reporting

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

v. National Policy Requirements

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

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

DOE's decision whether and how to distribute federal funds under this FOA is subject to NEPA (42 U.S.C. § 4321, *et seq.*). NEPA requires federal agencies to

integrate environmental values into their decision-making processes by considering the potential environmental impacts of their proposed actions. For additional background on NEPA, please see DOE's NEPA website at https://www.energy.gov/nepa.

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

vii. Applicant Representations and Certifications

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 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, a corporation is any for-profit or nonprofit 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].

3. **Nondisclosure and Confidentiality Agreements Representations**
   In submitting an application to this FOA the applicant represents that:

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

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

''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.''

(1) 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.

(2) 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 U.S. government, may contain provisions appropriate to the 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 during such activity unless specifically authorized to do so by the U.S. 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 U.S. Department of Justice, that are essential to reporting a substantial violation of law.

viii. Statement of Federal Stewardship

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

ix. Statement of Substantial Involvement

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

1. DOE shares responsibility with the recipient for the management, control, direction, and performance of the project.

2. DOE 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. DOE may redirect or discontinue funding the project based on the outcome of DOE's evaluation of the project at the Go/No-Go decision point(s).

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

x. Intellectual Property Management Plan (IPMP)

As a quarter 1 milestone if selected for award, applicants must 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 DOE 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 IX.K.-IX.N. of this FOA for more details on

applicable federal intellectual property laws and regulations). Guidance regarding the contents of IPMP is available from DOE upon request.

The following is a list of examples of items 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.

xi. Subject Invention Utilization Reporting

To ensure that prime recipients and subrecipients holding title to subject inventions are taking the appropriate steps to commercialize subject inventions, DOE may require that each prime recipient holding title to a subject invention submit annual reports for 10 years from the date the subject invention was disclosed to DOE on the utilization of the subject invention and efforts made by prime recipient or its 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 DOE may specify.

xii. 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.

xiii. Reporting

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

Additional reporting requirements apply to BIL-funded projects. DOE may require specific data collection to track progress toward key departmental goals: ensuring justice and equity, investing in the American workforce, boosting domestic manufacturing, reducing greenhouse gas emissions, and advancing a pathway to private sector deployment. Examples of data that may be collected include:

- New manufacturing production or recycling capacity
- Jobs data, including:
    - Number and types of jobs provided, wages and benefits paid
    - Workforce demographics, including local hires
    - Efforts to minimize risks of labor disputes and disruptions
    - Contributions to training; employee certificates and training credentials; ratio of apprentice- to journey-level workers employed
    - Number of trainings completed, trainees placed in full-time employment, or number of trainings with workforce partnerships involving employers, community-based organizations, or labor unions
- Justice and Equity data, including:
    - Minority Business Enterprises, minority-owned businesses, woman-owned businesses, and veteran-owned businesses acting as vendors and subcontractors for bids on supplies, services, and equipment
    - Value, number, and type of partnerships with MSIs
    - Stakeholder engagement events, consent-based siting activities
    - Other relevant indicators from the R&D Community Benefits Plan
- Number and type of energy efficient and clean energy equipment installed
- Funding leveraged, follow-on-funding, intellectual property generation and utilization

xiv. 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. A Go/No-Go Review is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance, technical success is definitively achieved and potential for success in future phases or periods of performance is evaluated, prior to beginning the execution of future phases. At the Go/No-Go decision points, DOE 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. 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) DOE's Go/No-Go decision; (7) the recipient's submission of a continuation application;[78] 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, DOE may take appropriate action, including but not limited to, redirecting, suspending or terminating the award.

xv. 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 U.S. government of a conference held by any Executive branch department, agency, board, commission, or office for which the cost to the U.S. 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

[78] A continuation application is 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 its continuation application, which includes the following information:

i. A progress report on the project objectives, including 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 SOPO and/or Milestone Summary Table.

General (or senior ethics official for any entity without an Inspector General), of the date, location, and number of employees attending such conference.

xvi. 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 million 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.

xvii. Real Property and Equipment

Real property and equipment purchased with project funds (federal share and recipient cost share) are subject to the requirements at 2 CFR 200.310, 200.311, 200.313, and 200.316 (non-federal entities, except for-profit entities) and 2 CFR 910.360 (for-profit entities). For projects selected for awards under this FOA, the recipients may (1) take disposition action on the real property and equipment; or (2) continue to use the real property and equipment after the conclusion of the award period of performance with Contracting Officer approval. The recipient's written request for Continued Use must identify the property and include: a summary of how the property will be used (must align with the authorized project purposes); a proposed use period, (e.g., perpetuity, until fully depreciated, or a calendar date when the recipient expects to submit disposition instructions); acknowledgement that the recipient shall not sell or encumber the property or permit any encumbrance without prior written DOE approval; current fair market value of the property; and an estimated useful life or depreciation schedule for equipment.

When the property is no longer needed for authorized project purposes, the recipient must request disposition instructions from DOE. For-profit entity

disposition requirements are set forth in 2 CFR 910.360. Property disposition requirements for other non-federal entities are set forth in 2 CFR 200.310 – 200.316.

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

States, local governments, and other public entities may not condition subawards in a manner that would discriminate against or otherwise disadvantage subrecipients based on their religious character.

xix. Participants and Collaborating Organizations

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

xx. Current and Pending Support

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

xxi. U.S. Manufacturing Commitments

A primary objective of DOE's multi-billion-dollar research, development, and demonstration investments is to cultivate new research and development ecosystems, manufacturing capabilities, and supply chains for and by United States industry and labor. Therefore, in exchange for receiving taxpayer dollars to support an applicant's project, the applicant must agree to a U.S. Competitiveness provision requiring that any products embodying any subject invention or produced through the use of any subject invention will be manufactured substantially in the United States unless the recipient can show to the satisfaction of DOE that it is not commercially feasible. Award terms, including the specific U.S. Competitiveness Provision applicable to the various types of recipients and projects, are available at

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

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

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

More information and guidance on the waiver and modification request process can be found in the DOE Financial Assistance Letter on this topic, available at https://www.energy.gov/management/pf-2022-09-fal-2022-01-implementation-doe-determination-exceptional-circumstances-under. Additional information on DOE's Commitment to Domestic Manufacturing for DOE-funded R&D is available at https://www.energy.gov/gc/us-manufacturing.

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

xxii. Interim Conflict of Interest Policy for Financial Assistance

The DOE interim Conflict of Interest Policy for Financial Assistance (COI Policy)[79] is applicable to all non-Federal entities applying for, or that receive, DOE funding by means of a financial assistance award (e.g., a grant, cooperative agreement, or technology investment agreement) and, through the implementation of this policy by the entity, to each Investigator who is planning to participate in, or is participating in, the project funded wholly or in part under the DOE financial assistance award. The term "Investigator" means the PI and any other person, regardless of title or position, who is responsible for the purpose, design, conduct, or reporting of a project funded by DOE or proposed for funding by DOE. Recipients must flow down the requirements of the interim COI Policy to any subrecipient non-federal entities. Further, for DOE funded projects, the recipient must include all financial conflicts of interest (FCOI) (i.e., managed and unmanaged/unmanageable) in its initial and ongoing FCOI reports.

It is understood that non-federal entities and individuals receiving DOE financial assistance awards will need sufficient time to come into full compliance with DOE's interim COI Policy. To provide some flexibility, DOE allows for a staggered implementation. Specifically, prior to award, applicants selected for award negotiations must: ensure all Investigators complete their significant financial disclosures; review the disclosures; determine whether a FCOI exists; develop and implement a management plan for FCOIs; and provide DOE with an initial FCOI report that includes all FCOIs (i.e., managed and unmanaged/unmanageable). Recipients will have 180 days from the date of the award to come into full compliance with the other requirements set forth in DOE's interim COI Policy. Prior to award, the applicant must certify that it is, or will be within 180 days of the award, compliant with all requirements in the COI Policy.

xxiii. Data Management Plan

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

[79] DOE's interim COI Policy can be found at PF 2022-17 FAL 2022-02 Department of Energy Interim Conflict of Interest Policy Requirements for Financial Assistance.

xxiv. Fraud, Waste, and Abuse

The mission of the DOE Office of Inspector General (OIG) is to strengthen the integrity, economy, and efficiency of the Department's programs and operations, including deterring and detecting fraud, waste, abuse, and mismanagement. The OIG accomplishes this mission primarily through investigations, audits, and inspections of DOE activities to include grants, cooperative agreements, loans, and contracts.

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

Additionally, recipients of DOE awards must be cognizant of the requirements of 2 CFR 200.113 Mandatory disclosures, which states:

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

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

xxv. Human Subjects Research

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

xxvi. Cybersecurity Plan

In accordance with BIL section 40126, applicants selected for award negotiations must submit a cybersecurity plan to DOE prior to receiving funding.[80] These plans are intended to foster a cybersecurity-by-design approach for BIL efforts. The Department will use these plans to ensure effective integration and coordination across its research, development, and demonstration programs. A cybersecurity plan is **not** required as part of the application submission for this FOA, but all projects selected under this FOA will be required to submit a cybersecurity plan during the award negotiation phase.

DOE recommends using open guidance and standards, such as the National Institute of Standards and Technology's (NIST) Cybersecurity Framework (CSF) and the DOE Cybersecurity Capability Maturity Model (C2M2).[81] The cybersecurity plan created pursuant to BIL section 40126 should document any deviation from open standards, as well as the utilization of proprietary standards where the awardee determines that such deviation is necessary.

- Cybersecurity plans should be commensurate to the threats and vulnerabilities associated with the proposed efforts and demonstrate the cybersecurity maturity of the project.
- Cybersecurity plans may cover a range of topics relevant to the proposed project—e.g., software development lifecycle, third-party risks, and incident reporting.
- At a minimum, cybersecurity plans should address questions noted in BIL section 40126 (b), Contents of Cybersecurity Plan.[82]

Supplementary guidance on the cybersecurity plan requirement is available at https://www.energy.gov/ceser/bipartisan-infrastructure-law-implementation.

[80] 42 U.S.C. § 18725

[81] NERC critical infrastructure protection (CIP) standards for entities responsible for the availability and reliability of the bulk electric system. NIST IR 7628: 2 Smart grid cyber security strategy and requirements. NIST SP800-53, Recommended Security Controls for Federal Information Systems and Organizations: Catalog of security controls in 18 categories, along with profiles for low-, moderate-, and high-impact systems. NIST SP800-82, Guide to Industrial Control Systems (ICS) Security. NIST SP800-39, Integrated Enterprise-Wide Risk Management: Organization, mission, and information system view. AMI System Security Requirements: Security requirements for advanced metering infrastructure. ISO (International Organization for Standardization) 27001, Information Security Management Systems: Guidance on establishing governance and control over security activities (this document must be purchased). IEEE (Institute of Electrical and Electronics Engineers) 1686-2007, Standard for Substation Intelligent Electronic Devices (IEDs) Cyber Security Capabilities (this document must be purchased). DOE Cybersecurity Capability Maturity Model (C2M2).

[82] 42 U.S.C. § 18725

VIII. Questions/Agency Contacts

Upon the issuance of a FOA, DOE personnel are prohibited from communicating (in writing or otherwise) with applicants regarding the FOA except through the established question and answer process described below. Questions regarding this FOA must be submitted to PVRD@ee.doe.gov no later than three (3) business days prior to the application due date and time. Please note, feedback on individual concepts will not be provided through Q&A.

All questions and answers related to this FOA will be posted on EERE eXCHANGE at https://eere-eXCHANGE.energy.gov. **You must first select the FOA Number to view the questions and answers specific to this FOA**. EERE will attempt to respond to a question within three (3) business days unless a similar question and answer has already been posted on the website.

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

IX. Other Information

A. FOA Modifications

Amendments to this FOA will be posted on EERE eXCHANGE 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

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

C. Commitment of Public Funds

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 business-sensitive, proprietary, or otherwise confidential information in their application unless such information is necessary to convey an understanding of the proposed project or to comply with a requirement in the FOA. Applicants are advised to not include any critically sensitive proprietary detail.

If an application includes trade secrets or business-sensitive, proprietary, or otherwise confidential information, it is furnished to the federal 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, DOE 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 federal government's right to use the information if it is obtained from another source.

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

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

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

In addition, (1) the header and footer of every page that contains trade secrets or business-sensitive, proprietary, or otherwise confidential information must be marked as follows: "Contains Business Sensitive Information, Trade Secrets, or Proprietary or Otherwise Confidential Information Exempt from Public Disclosure," and (2) every line or paragraph containing such information must be clearly marked with double brackets or highlighting. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

E. Evaluation and Administration by Non-Federal Personnel

In conducting the merit review evaluation, the Go/No-Go Reviews and Peer Reviews, the government may seek the advice of qualified non-federal personnel as reviewers. The government may also use non-federal personnel to conduct routine, nondiscretionary administrative activities, including DOE 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 that 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

DOE 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 cancellation of award negotiations;
- The modification, suspension, and/or cancellation of a funding agreement;
- The initiation of debarment proceedings, debarment, and/or a declaration of ineligibility for receipt of federal contracts, subcontracts, and financial assistance and benefits; and
- Civil and/or criminal penalties.

I. Retention of Submissions

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

J. Title to Subject Inventions

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

- Domestic Small Businesses, Educational Institutions, and Nonprofits: Under the Bayh-Dole Act (35 U.S.C. § 200 et seq.), domestic small businesses, educational institutions, and nonprofits may elect to retain title to their subject inventions;
- All other parties: The Federal Non-Nuclear Energy Act of 1974, 42. U.S.C. § 5908, provides that the government obtains title to new inventions unless a waiver is granted (see below);
- Class Patent Waiver:

  DOE has issued a class waiver that applies to this FOA. Under this class waiver, domestic large businesses may elect title to their subject inventions similar to the right provided to the domestic small businesses, educational institutions, and nonprofits by law. To avail itself of the class waiver, a domestic large business must agree that any products embodying or produced through the use of a subject invention first created or reduced to practice under this program will be substantially manufactured in the United States.

K. Government Rights in Subject Inventions

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

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.

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 United States 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 DOE 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 award's 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.

For this FOA, selectees and recipients may request an extended period of protection (more than 5 years and not to exceed 30 years) if reasonably required for commercialization for specific categories of data for Topic Areas 1 and 2 first produced under the resulting awards in accordance with 15 U.S.C. § 3710a(c)(7)(B)(ii) and the Energy Policy Acts of 1992 and 2005, or 42 U.S.C. § 7256(g)(5) for OTAs, if applicable. Further direction will be provided during the negotiation process upon request.

M. Copyright

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

N. Export Control

The United States government regulates the transfer of information, commodities, technology, and software considered to be strategically important to the United States to protect national security, foreign policy, and economic interests without imposing undue regulatory burdens on legitimate international trade. There is a network of federal agencies and regulations that govern exports that are collectively referred to as "Export Controls." All recipients and subrecipients are responsible for ensuring compliance with all applicable United States Export Control laws and regulations relating to any work performed under a resulting award.

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

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

As set forth in 2 CFR 200.216, recipients and subrecipients are prohibited from obligating or expending project funds (federal funds and recipient cost share) to procure or obtain; extend or renew a contract to procure or obtain; or enter into a contract (or extend or renew a contract) to procure or obtain equipment, services, or systems that use *covered telecommunications equipment or services* as a substantial or essential

component of any system, or as critical technology as part of any system. As described in Section 889 of Public Law 115-232, covered telecommunications equipment is telecommunications equipment produced by Huawei Technologies Company or ZTE Corporation (or any subsidiary or affiliate of such entities).

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

P. Personally Identifiable Information (PII)

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

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

Q. Annual Independent Audits

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

If an educational institution, nonprofit organization, or state/local government is a prime recipient or subrecipient and has expended $750,000 or more of federal awards during the non-federal entity's fiscal year, 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. DOE will share in the cost of the audit at its applicable cost share ratio.

R. Informational Webinar

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

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

APPENDIX A – COST SHARE INFORMATION

Cost Sharing or Cost Matching

The terms "cost sharing" and "cost matching" are often used synonymously. Even the DOE Financial Assistance Regulations, 2 CFR 200.306, use both terms in the titles specific to regulations applicable to cost sharing. DOE almost always uses "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 million 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 two 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 a DOE grant or cooperative agreement, it is allowable as cost share. Conversely, if the cost is not allowable under the cost principles and not eligible for reimbursement, 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 they are generally the same for all types of entities. The specific rules applicable to:

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

In addition to the above regulations, other factors may come into play, such as timing of donations and length of the project period. For example, the value of 10 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, DOE 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, DOE generally does not allow pre-award costs prior to the signing of the Selection Statement by the DOE 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, or equipment for their company with organizational resources. If the cost of the item or service is reimbursed, 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, and 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. Consult your DOE contact if you have questions 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 incur only those costs that are allowable and allocable to the project (including cost share) as determined in accordance with the applicable cost principles prescribed in FAR Part 31 for For-Profit entities and 2 CFR Part 200 Subpart E - Cost Principles for all other non-federal entities.

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

2 CFR 200.306

(a) Under Federal research proposals, voluntary committed cost sharing is not expected. It cannot be used as a factor during the merit review of applications or proposals, but may be considered if it is both in accordance with Federal awarding agency regulations and specified in a notice of funding opportunity. Criteria for considering voluntary committed cost sharing and any other program policy factors that may be used to determine who may receive a Federal award must be explicitly described in the notice of funding opportunity. See also §§ 200.414 and 200.204 and appendix I to this part.

(b) For all Federal awards, any shared costs or matching funds and all contributions, including cash and third-party in-kind contributions, must be accepted as part of the non-Federal entity's cost sharing or matching when such contributions meet all of the following criteria:

(1) Are verifiable from the non-Federal entity's records;

(2) Are not included as contributions for any other Federal award;

(3) Are necessary and reasonable for accomplishment of project or program objectives;

(4) Are allowable under subpart E of this part;

(5) Are not paid by the Federal Government under another Federal award, except where the Federal statute authorizing a program specifically provides that Federal funds made available for such program can be applied to matching or cost sharing requirements of other Federal programs;

(6) Are provided for in the approved budget when required by the Federal awarding agency; and

(7) Conform to other provisions of this part, as applicable.

(c) Unrecovered indirect costs, including indirect costs on cost sharing or matching may be included as part of cost sharing or matching only with the prior approval of the Federal awarding agency. Unrecovered indirect cost means the difference between the amount charged to the Federal award and the amount which could have been charged to the Federal award under the non-Federal entity's approved negotiated indirect cost rate.

(d) Values for non-Federal entity contributions of services and property must be established in accordance with the cost principles in subpart E of this part. If a Federal awarding agency authorizes the non-Federal entity to donate buildings or land for construction/facilities

acquisition projects or long-term use, the value of the donated property for cost sharing or matching must be the lesser of paragraph (d)(1) or (2) of this section.

(1) The value of the remaining life of the property recorded in the non-Federal entity's accounting records at the time of donation.

(2) The current fair market value. However, when there is sufficient justification, the Federal awarding agency may approve the use of the current fair market value of the donated property, even if it exceeds the value described in paragraph (d)(1) of this section at the time of donation.

(e) Volunteer services furnished by third-party 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 third-party volunteer services must be consistent with those paid for similar work by the non-Federal entity. In those instances in which the required skills are not found in the non-Federal entity, rates must be consistent with those paid for similar work in the labor market in which the non-Federal entity competes for the kind of services involved. In either case, paid fringe benefits that are reasonable, necessary, allocable, and otherwise allowable may be included in the valuation.

(f) When a third-party organization furnishes the services of an employee, these services must be valued at the employee's regular rate of pay plus an amount of fringe benefits that is reasonable, necessary, allocable, and otherwise allowable, and indirect costs at either the third-party organization's approved federally-negotiated indirect cost rate or, a rate in accordance with § 200.414(d) provided these services employ the same skill(s) for which the employee is normally paid. Where donated services are treated as indirect costs, indirect cost rates will separate the value of the donated services so that reimbursement for the donated services will not be made.

(g) Donated property from third parties may include such items as equipment, office supplies, laboratory supplies, or workshop and classroom supplies. Value assessed to donated property included in the cost sharing or matching share must not exceed the fair market value of the property at the time of the donation.

(h) The method used for determining cost sharing or matching for third-party-donated equipment, buildings and land for which title passes to the non-Federal entity may differ according to the purpose of the Federal award, if paragraph (h)(1) or (2) of this section applies.

(1) If the purpose of the Federal award is to assist the non-Federal entity in the acquisition of equipment, buildings or land, the aggregate value of the donated property may be claimed as cost sharing or matching.

(2) If the purpose of the Federal award is to support activities that require the use of equipment, buildings or land, normally only depreciation charges for equipment and buildings may be made. However, the fair market value of equipment or other capital assets and fair rental charges for land may be allowed, provided that the Federal awarding agency has approved the charges. See also § 200.420.

(i) The value of donated property must be determined in accordance with the usual accounting policies of the non-Federal entity, with the following qualifications:

(1) The value of donated land and buildings must not exceed its fair market value at the time of donation to the non-Federal entity as established by an independent appraiser (*e.g.,* certified real property appraiser or General Services Administration representative) and certified by a responsible official of the non-Federal entity as required by the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970, as amended, (42 U.S.C. 4601-4655) (Uniform Act) except as provided in the implementing regulations at 49 CFR part 24, "Uniform Relocation Assistance And Real Property Acquisition For Federal And Federally-Assisted Programs".

(2) The value of donated equipment must not exceed the fair market value of equipment of the same age and condition at the time of donation.

(3) 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.

(4) The value of loaned equipment must not exceed its fair rental value.

(j) For third-party in-kind contributions, the fair market value of goods and services must be documented and to the extent feasible supported by the same methods used internally by the non-Federal entity.

(k) For IHEs, see also OMB memorandum M-01-06, dated January 5, 2001, Clarification of OMB A-21 Treatment of Voluntary Uncommitted Cost Sharing and Tuition Remission Costs.

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 million in federal funds, with four tasks requiring different non-federal cost share percentages:

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

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

Each task must be calculated individually as follows:

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

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

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

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

The calculation may then be completed as follows:

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

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

APPENDIX C – WAIVER REQUESTS FOR: 1. FOREIGN ENTITY PARTICIPATION; AND 2. FOREIGN WORK

1. Waiver for Foreign Entity Participation

Many of the technology areas DOE funds fall in the category of critical and emerging technologies (CETs). CETs are a subset of advanced technologies that are potentially significant to United States national and economic security.[83] For projects selected under this FOA, all recipients and subrecipients must be organized, chartered or incorporated (or otherwise formed) under the laws of a state or territory of the United States; have majority domestic ownership and control; and have a physical location for business operations in the United States. To request a waiver of this requirement, an applicant must submit an explicit waiver request in the Full Application.

Waiver Criteria

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

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

Content for Waiver Request

A Foreign Entity waiver request must include the following:

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

[83] See Critical and Emerging Technologies List Update (whitehouse.gov).

ownership/control by foreign entities, foreign shareholders, foreign state, or foreign individuals;

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

DOE may also require:

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

DOE may require additional information before considering the waiver request.

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

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

As set forth in Section V.K.iii., all work funded under this FOA must be performed in the United States. To seek a waiver of the Performance of Work in the United States requirement, the applicant must submit an explicit waiver request in the Full Application. A separate waiver request must be submitted for each entity proposing performance of work outside of the United States.

Overall, a waiver request must demonstrate to the satisfaction of DOE 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 for a foreign work waiver must include the following:

1. The rationale for performing the work outside the United States ("foreign work");
2. A description of the work proposed to be performed outside the United States;
3. An explanation as to how the foreign work is essential to the project;
4. A description of the anticipated benefits to be realized by the proposed foreign work and the anticipated contributions to the U.S. economy;
5. The associated benefits to be realized and the contribution to the project from the foreign work;
6. How the foreign work will benefit the United States, including manufacturing, contributions to employment in the United States and growth in new markets and jobs in the United States;
7. How the foreign work will promote manufacturing of products and/or services in the United States;
8. A description of the likelihood of IP being created from the foreign work and the treatment of any such IP;
9. The total estimated cost (DOE and recipient cost share) of the proposed foreign work;
10. The countries in which the foreign work is proposed to be performed; and
11. The name of the entity that would perform the foreign work.

DOE may require additional information before considering the waiver request.

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

APPENDIX D – REQUIRED USE OF AMERICAN IRON, STEEL, MANUFACTURED PRODUCTS, AND CONSTRUCTION MATERIALS BUY AMERICA REQUIREMENTS FOR INFRASTRUCTURE PROJECTS

A. Definitions

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

Construction materials includes an article, material, or supply—other than an item of primarily iron or steel; a manufactured product; cement and cementitious materials; aggregates such as stone, sand, or gravel; or aggregate binding agents or additives[84]—that is or consists primarily of:

- Non-ferrous metals;
- Plastic and polymer-based products (including polyvinylchloride, composite building materials, and polymers used in fiber optic cables);
- Glass (including optic glass);
- Lumber; or
- Drywall.

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

Moreover, according to the OMB guidance document:

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

[84] BIL, § 70917(c)(1).

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

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

B. Buy America Requirements for Infrastructure Projects ("Buy America" requirements)
In accordance with Section 70914 of the BIL, none of the project funds (includes federal share and recipient cost share) may be used for a project for infrastructure unless:

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

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

(3) all construction materials[85] are produced in the United States—this means that all manufacturing processes for the construction material occurred in the United States.

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

These requirements must flow down to all sub-awards, all contracts, subcontracts, and purchase orders for work performed under the proposed project, except where the prime recipient is a for-profit entity. Based on guidance from the Office of Management and Budget (OMB), the Buy America requirements of the BIL do not apply to DOE projects in which the

[85] Excludes cement and cementitious materials, aggregates such as stone, sand, or gravel, or aggregate binding agents or additives.

prime recipient is a for-profit entity; the requirements only apply to projects whose prime recipient is a State, local government, Indian tribe, Institution of Higher Education, or nonprofit organization.

For additional information related to the application and implementation of these Buy America requirements, please see OMB Memorandum M-22-11, issued April 18, 2022: https://www.whitehouse.gov/wp-content/uploads/2022/04/M-22-11.pdf

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

C. Waivers

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

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

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

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

- A detailed justification for the use of "non-domestic" iron, steel, manufactured products, or construction materials to include an explanation as to how the non-domestic item(s) is essential to the project

- A certification that the applicant or recipient made a good faith effort to solicit bids for domestic products supported by terms included in requests for proposals, contracts, and nonproprietary communications with potential suppliers
- Applicant/Recipient name and Unique Entity Identifier (UEI)
- Total estimated project cost, DOE and cost-share amounts
- Project description and location (to the extent known)
- List and description of iron or steel item(s), manufactured goods, and construction material(s) the applicant or recipient seeks to waive from Domestic Content Procurement Preference requirement, including name, cost, country(ies) of origin (if known), and relevant PSC and NAICS code for each
- Waiver justification including due diligence performed (e.g., market research, industry outreach) by the applicant or recipient
- Anticipated impact if no waiver is issued

DOE may require additional information before considering the waiver request.

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

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

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

BIL	Bipartisan Infrastructure Law
BOM	Bill of Materials
BOS	Balance of Systems
CED	Cumulative Energy Demand
CETs	Critical and Emerging Technologies
CEJST	Climate and Economic Justice Screening Tool
COI	Conflict of Interest
CPN	Cost Priority Number
CRADA	Cooperative Research and Development Agreement
DEC	Determination of Exceptional Circumstances
DEIA	Diversity, Equity, Inclusion, and Accessibility
DMP	Data Management Plan
DOE	Department of Energy
DOI	Digital Object Identifier
DOL	Department of Labor
DR	Degradation Rate
EIMP	Environmental impact mitigation potential
EERE	Energy Efficiency and Renewable Energy
EOL	End of Life
EPBT	Energy Payback Time
EPC	Engineering, Procurement, and Construction
EROI	Energy Return on Investment
FAR	Federal Acquisition Regulation
FCOI	Financial Conflicts of Interest
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
GW	Gigawatt
HBCUs	Historically Black Colleges and Universities
HJT	Heterojunction
IBC	Interdigitated Back Contact
IEA	International Energy Agency
IPMP	Intellectual Property Management Plan
IRB	Institutional Review Board
ITRPV	International Technology Roadmap for Photovoltaics
LCA	Lifecycle Analysis
LCOE	Levelized Cost of Energy
LCOSS	Levelized Cost of Solar Plus Storage
M&O	Management and Operating

MFA	Multi-Factor Authentication
MJ	Megajoule
MPIN	Marketing Partner ID Number
MSI	Minority-Serving institution
MYPP	Multi-Year Program Plan
NDA	Non-Disclosure Acknowledgement
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
NSF	National Science Foundation
O&M	Operation and Maintenance
OFCCP	Office of Federal Contractor Compliance Programs
OIG	Office of Inspector General
OMB	Office of Management and Budget
OSS	Open-Source Software
OSTI	Office of Scientific and Technical Information
OTA	Other Transactions Authority
PII	Personal Identifiable Information
PR	Performance Ratio
PV	Photovoltaic
R&D	Research and Development
RD&D	Research, Development, and Demonstration
RFI	Request for Information
RFP	Request for Proposal
SAM	System for Award Management
SETO	Solar Energy Technologies Office
SciENcv	Science Experts Network Curriculum Vita
SMART	Specific, Measurable, Achievable, Relevant, and Timely
SOPO	Statement of Project Objectives
SPOC	Single Point of Contact
STEM	Science, Technology, Engineering, and Mathematics
TAA	Technical Assistance Agreement
TIA	Technology Investment Agreement
TLCC	Total Lifecycle Cost
TRL	Technology Readiness Level
TW	Terawatt
UCC	Uniform Commercial Code
UEI	Unique Entity Identifier
VALCOE	Value-adjusted levelized cost of energy
WBS	Work Breakdown Structure
WP	Work Proposal

APPENDIX G– R&D COMMUNITY BENEFITS PLAN GUIDANCE

DOE is committed to pushing the frontiers of science and engineering; catalyzing high-quality domestic clean energy jobs through research, development, demonstration, and deployment; and ensuring energy equity and energy justice[86] for disadvantaged communities. Therefore, and in accordance with the Administration's priority to empower workers and harness opportunities to create good union jobs as stated in EO 14008 (Executive Order on Tackling the Climate Crisis at Home and Abroad),[87] it is important to consider the impacts of the successful commercial deployment of any innovations resulting from this FOA on the current and future workforce.

The goal of the R&D Community Benefits Plan is to allow the application to illustrate engagement in critical thought about implications of how the proposed work will benefit the American people and lead to broadly shared prosperity, including for workers and disadvantaged communities.[88] The three sections of the R&D Community Benefits Plans are considered together because there may be significant overlap among audiences considered in workforce and disadvantaged communities.

Example DEIA, Energy Equity, and Workforce Plan Elements

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

DEIA

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

Equity extends beyond diversity to equitable treatment. Equitable access to opportunity for members of the project team is paramount. This includes

[86] DOE defines energy justice as "the goal of achieving equity in both the social and economic participation in the energy system, while also remediating social, economic, and health burdens on those disproportionately harmed by the energy system" (Initiative for Energy Justice, 2019). This document refers to "energy equity" to encompass energy justice and DOE's efforts related to Justice40. https://www.energy.gov/diversity/articles/how-energy-justice-presidential-initiatives-and-executive-orders-shape-equity

[87] https://www.federalregister.gov/documents/2021/02/01/2021-02177/tackling-the-climate-crisis-at-home-and- abroad

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

ensuring all members of the team, including students, are paid a living wage, provided appropriate working conditions, and provided appropriate benefits. In the execution of their project plan, applicants are asked to describe efforts in diversity, equity, inclusion, and accessibility. In this context, efforts toward DEIA are defined as:[89]

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

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

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

When crafting the DEIA section of the Plan, applicants should describe how they will act to promote each of the four DEIA efforts above into their

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

investigation. It is important to note that diversity, equity, inclusion, and accessibility are four different but related concepts that should not be conflated. For instance, you can achieve diversity without equity; all four must be addressed. Applicants could discuss how the proposed investigation could contribute to training and developing a diverse scientific workforce. Applicants could describe the efforts they plan to take, or will continue to take, to create an inclusive workplace, free from retaliation, harassment, and discrimination. Applicants could outline any barriers to creating an equitable and inclusive workplace and address the ways in which the team will work to overcome these barriers within the bounds of the specific research project. The plan could detail specific efforts to inform project team members in any capacity of their labor rights and rights under Equal Employment Opportunity laws and their free and fair chance to join a union. Note that this inclusion of informing project team members is also incorporated into awards through the National Policy Assurances.[90]

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

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

Specific examples include:

[90] https://www.energy.gov/management/articles/national-policy-assurances-be-incorporated-award-terms

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

Energy Equity

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

Applicants should describe the influencing factors and the most likely energy

equity implications of the proposed research. Applicants should describe any long-term constraints the proposed technology may pose to communities' access to natural resources and Tribal cultural resources. There may be existing equity research available to use and cite in this description, or the applicant could describe milestone-based efforts toward developing that understanding through this innovation. These near- and long-term outcomes may include but are not limited to: a decrease in the percent of income a household spends on energy costs (energy burden);[91] an increase in access to low-cost capital; a decrease in environmental exposure and burdens; increases in clean energy enterprise creation and contracting (e.g., women- or minority-owned business enterprises); increased parity in clean energy technology access and adoption; increases in energy democracy, including community ownership; and an increase in energy resilience.

Specific examples include:

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

Workforce

The Workforce section of the R&D Community Benefits Plan should articulate the future workforce implications of the innovation or a milestone-driven plan for understanding those implications. This includes documenting the skills, knowledge, and abilities that would be required of workers installing, maintaining, and operating the technology that may be derivative of the applicant's research, as well as the training pathways and its accessibility for workers to acquire the necessary skills. There may be field-specific or relevant existing research that could be cited in this section. In addition, applicants could detail the process they will use to evaluate long-

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

term impacts on jobs, including job growth or job loss, a change in job quality, disruptions to existing industry and resulting changes to relationships between employers and employees and improvements or reductions in the ability of workers to organize for collective representation, and anything else that could result in changes to regional or national labor markets.

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

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

Specific examples include:

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

Inclusion of SMART milestones

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

- What needs to be accomplished?

- What measures and deliverables will be used to track progress toward accomplishment?
- What evidence suggests that the accomplishment is achievable?
- Why choose this milestone?
- When will the milestone be reached?