FINANCIAL ASSISTANCE
FUNDING OPPORTUNITY ANNOUNCEMENT

Department of Energy (DOE)
Office of Fossil Energy and Carbon Management (FECM)

Bipartisan Infrastructure Law (BIL) - Advanced Processing of Critical Minerals and Materials for Industrial and Manufacturing Applications

Funding Opportunity Announcement (FOA) Number: DE-FOA-0002619
FOA Type: Initial
Assistance Listing Number: 81.089

FOA Issue Date:	08/21/2023
Submission Deadline for Full Applications:	10/20/2023 11:59pm ET
Expected Date for DOE Selection Notifications:	January 2024
Expected Timeframe for Award Negotiations:	April – May 2024

- To apply to this FOA, applicants must register with and submit application materials through Grants.gov at https://www.grants.gov/.

- Applicants must designate primary and backup points-of-contact with whom DOE 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.

Registration Requirements

There are several one-time actions that must be completed before submitting an application in response to this Funding Opportunity Announcement (FOA) (e.g., register with the System for Award Management (SAM), obtain a Unique Entity Identifier (UEI) number, register with Grants.gov, and register with FedConnect.net to submit questions). It is vital that applicants address these items as soon as possible. Some may take several weeks, and failure to complete them could interfere with an applicant's ability to apply to this FOA.

- **SAM** – Applicants must register with SAM at https://www.sam.gov/ prior to submitting an application in response to this FOA. Designating an Electronic Business Point of Contact (EBiz POC) and obtaining a special password called an MPIN are important steps in SAM registration. Failure to register with SAM will prevent your organization from applying through Grants.gov. The applicant must maintain an active SAM registration with current information at all times during which it has an active Federal award or application under consideration. More information about SAM registration for applicants is found at: https://www.fsd.gov/gsafsd_sp?id=gsafsd_kb_articles&sys_id=650d493e1bab7c105465eaccac4bcbcb.

  NOTE: If clicking the SAM links does not work, please copy and paste the link into your browser.

  Due to the high demand of SAM registrations and UEI requests, entity legal business name and address validations are taking longer than expected to process. Entities should start the SAM and UEI registration process as soon as possible. If entities have technical difficulties with the SAM registration or UEI validation process they should utilize 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.

- **UEI** – Applicants must obtain an UEI from the SAM to uniquely identify the entity. The UEI is available in the SAM entity registration record.

  NOTE: Subawardees/subrecipients at all tiers must also obtain an UEI from the SAM and provide the UEI to the Prime Recipient before the subaward can be issued. Full registration in SAM is not required to obtain an UEI for subaward reporting.

- **Grants.gov** – Applicants must register with Grants.gov and set up your WorkSpace. You cannot submit an application through Grants.gov unless you are registered. Please read the registration requirements carefully and start the process immediately.

1) The Authorized Organizational Representative (AOR) must register at: https://apply07.grants.gov/apply/OrcRegister.

2) An email is sent to the E-Business (E-Biz) POC listed in SAM. The E-Biz POC must approve the AOR registration using their MPIN from their SAM registration.

   More information about the registration steps for Grants.gov is provided at: https://www.grants.gov/web/grants/applicants/registration.html.

   In addition:

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

   - *EBiz POC Authorized Profile Roles*: After you register with Grants.gov and create an Organization Applicant Profile, the organization applicant's request for Grants.gov roles and access is sent to the EBiz POC. The EBiz POC will then log in to Grants.gov and authorize the appropriate roles, which may include the AOR role, thereby giving you permission to complete and submit applications on behalf of the organization. You will be able to submit your application online any time after you have been assigned the AOR role.

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

     For more detailed instructions about creating a profile on Grants.gov, refer to: https://www.grants.gov/web/grants/applicants/registration/authorize-roles.html.

     To track your role request, refer to: https://www.grants.gov/web/grants/applicants/registration/track-role-status.html.

Questions relating to the **registration process, system requirements, or how an application form works** must be directed to Grants.gov at 1-800-518-4726 or support@grants.gov.

- **FedConnect.net** – Applicants must register with FedConnect to submit questions. FedConnect website: https://www.fedconnect.net/

  See Section IV for Application and Submission Information (including how to create a WorkSpace).

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I. Funding Opportunity Description

A. Background and Context

The Department of Energy (DOE) Office of Fossil Energy and Carbon Management (FECM) is issuing this Funding Opportunity Announcement (FOA). Awards made under this FOA will be funded, in whole or in part, with funds appropriated by the Infrastructure Investment and Jobs Act (IIJA),[1] more commonly known as the Bipartisan Infrastructure Law (BIL).

The BIL is a once-in-a-generation investment in modernizing and upgrading American infrastructure to enhance United States competitiveness, drive the creation of good-paying union jobs, tackle the climate crisis, and ensure stronger access to economic, environmental, and other benefits for disadvantaged communities.[2] The BIL appropriates more than $62 billion to the 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 sector 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.

BIL will invest appropriations of $30 million to conduct proof-of-concept testing in laboratory- or bench-scale facilities, addressing the potential viability of advanced innovative processes to produce individually separated, high purity

[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 Executive Order (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] E.O. 14057, "Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability," December 8, 2021.

(ISHP) rare earth oxides/rare earth salts (REO/RES), and high purity single or binary rare earth metals (REM), at costs that are lower (e.g., ~20%) than costs for producing these materials using currently available conventional separations and conversion technologies.

Mixed rare earth oxides or mixed rare earth salts (MREO/MRES) for use in advanced separation and purification process, as well as critical minerals and materials (CMM),[5] will be produced in existing small pilot-scale facilities that extract, separate and recover MREO/MRES and CMM from coal-based resources. Rare earths and CMM of interest include dysprosium (Dy), europium (Eu), neodymium (Nd), terbium (Tb), yttrium (Y), lutetium (Lu), praseodymium (Pr), samarium (Sm), gadolinium (Gd), cobalt (Co), manganese (Mn), gallium (Ga), chromium (Cr), germanium (Ge), lithium (Li), niobium (Nb), strontium (Sr), titanium (Ti), vanadium (V), indium (In), iridium (Ir), platinum (Pt), nickel (Ni), graphite, and tin (Sn).

This FOA has the following two Topic Areas:

1. Advanced Process Development for Production of Rare Earth Metals and Co-Production of Critical Minerals and Materials from Coal-Based Resources; and
2. Production of Critical Minerals and Materials Excluding Materials Containing Rare Earth Elements from Coal-Based Resources.

The activities to be funded under this FOA support BIL section 41003(b) (which authorized appropriations for activities under section 7001(a) of the Energy Act of 2020) and the broader government-wide approach to upgrading and modernizing infrastructure, including strengthening critical domestic manufacturing and supply chains to maximize the benefits of the clean energy transition as the nation works to curb the climate crisis, empower workers, and advance environmental justice. This BIL section authorizes appropriations to:

- develop and assess advanced separation technologies for the extraction and recovery of rare earth elements and other critical materials from coal and coal by-products; and
- determine if there are, and mitigate, any potential environmental or public health impacts that could arise from the recovery of rare earth elements from coal-based resources.

[5] The term "Critical Material" includes critical minerals designated by the Secretary of the Interior. Section 7002(a)(2) of the Energy Act of 2020 defines critical material to mean: (A) any non-fuel mineral, element, substance, or material that the Secretary of Energy determines—(i) has a high risk of a supply chain disruption; and (ii) serves an essential function in one or more energy technologies, including technologies that produce, transmit, store, and conserve energy; or (B) a critical mineral. (30 U.S.C. § 1606(a)). The term "critical minerals and materials" or "CMM" used throughout this document means "Critical Material" as defined in section 7002(a) of the Energy Act of 2020.

i. Program Purpose

The United States imports more than 80% of its rare earth elements (REE) demand from offshore suppliers. Similarly, in 2022, for at least 43 of the 50 critical minerals that were identified by the United States Geological Survey, the United States imported more than half its consumption, with no domestic production of 14 critical minerals.[6] As evidenced by several Executive Orders,[7,8] the BIL that was enacted on November 15, 2021,[9] and DOE's first-ever strategy on securing America's energy supply chains,[10] transitioning the production of these materials and their associated supply chains back to the United States is a strategic priority.

One goal of this and related DOE activities (such as the Critical Materials Institute[11]) and those elsewhere in the government (such as the Department of Defense and Title III of the Defense Production Act[12]) is to help build out domestic supply chains for REE from a diversity of sources.[13] Other near-term planned private sector investments will help establish the first domestic midstream processing capabilities for REE in the United States in several decades. Together, these public and private sector investments form a nationwide effort that can help provide a firm foundation for resilient, sustainable, and responsible REE supply chains.

This effort focuses on rebuilding the U.S. leadership role in the economically viable, environmentally benign extraction, separation, and refining technologies arena. This supports the generation of sustainable U.S. domestic supply chains for onshore production of REE and CMM for clean energy, commercial commodities, and national defense industries, and is in support of the Administration's goals of decarbonizing the electricity sector by 2035 and reaching net-zero emissions economy-wide by 2050. Facilities will be designed to be environmentally benign and use feedstocks derived from coal and coal by-

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[6] U.S. Geological Survey, Department of the Interior, Mineral Commodity Summaries 2022, (January 31, 2022). https://pubs.usgs.gov/periodicals/mcs2022/mcs2022.pdf

[7] E.O. 13817, A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals, December 20, 2017. *See also* U.S. Department of the Interior, U.S. Geological Survey, 2022 Final List of Critical Minerals, 87 Fed. Reg 10381 (Feb 24, 2022).

[8] E.O. 14017, "Securing America's Supply Chains," February 24, 2021.

[9] BIL, *supra* note 1.

[10] Securing America's Clean Energy Supply Chain | Department of Energy

[11] https://www.ameslab.gov/cmi

[12] https://www.defense.gov/News/Releases/Release/Article/2488672/dod-announces-rare-earth-element-award-to-strengthen-domestic-industrial-base/

[13] Tegler, E. (2021, February 26). The U.S. Is Trying To Secure Rare Earth Elements For National Security. That Goes Beyond Simple Investment. *Forbes*. Retrieved from https://www.forbes.com/sites/erictegler/2021/02/26/the-us-is-trying-to-secure-rare-earth-elements-for-national-security-that-goes-beyond-simple-investment/?sh=3050944a5c53

products. The FOA will require projects to track and report on project results related to environmental impacts, environmental justice, community engagement, consent-based siting, equity, and workforce development.

To address the challenge of leading our Nation to secure national independence from REE offshore reliance, DOE in 2014 performed an initial assessment under its *Feasibility of Recovering Rare Earth Elements* program, to assess the potential recovery of REE from coal and coal by-products which included run-of-mine (ore from source prior to processing) coal, coal refuse (mineral matter that is removed from coal prior to shipment), clay/sandstone over/under-burden materials, ash (coal combustion residuals), and aqueous effluents such as acid mine drainage (AMD), and associated solids and precipitates resulting from AMD treatment. After reporting its findings in the 2017 Report to Congress,[14] DOE initiated a multi-year research, development and demonstration (RD&D) effort to demonstrate both the technical and economic feasibility of extracting, separating and recovering REE from these domestic coal-based resource materials. Basic and applied science research projects were conducted at National Laboratories, small business organizations and at numerous universities which led in 2016 to the design, construction and operation of bench- and small pilot-scale facilities, and in 2018 to the production of small quantities (e.g., ~100 grams/day) of 90% (900,000 ppm) high purity, MREO using conventional physical beneficiation and chemical separation processes. State-of-the-art, conventional separation, process system concepts were recently assessed for near-future production of 1-3 metric tons (t)[15,16] of high purity MREO per day from coal-based resources in demonstration-scale facilities.

In order to comply with Executive Order 13817,[17] DOE's program expanded its technology development effort in 2019 to include the recovery of CMM from coal-based resources. As a result, DOE's program in 2020, renamed as the *Critical Minerals Sustainability* program, required existing domestic small pilot-scale facilities to co-produce CMM in addition to producing REE. In 2021, DOE's program initiated basinal coalition efforts to address realization of the full economic potential value of U.S. natural resources for producing REE, CMM, and high-value, nonfuel, carbon-based products (Figure 1), and to holistically assess not only upstream mining of resources and physical separation (e.g., beneficiation), but also midstream processing, separation, recovery and

[14] U.S. Department of Energy Report to Congress. Report on Rare Earth Elements from Coal and Coal Byproducts, (2017). (https://www.energy.gov/sites/prod/files/2018/01/f47/EXEC-2014-000442%20-%20for%20Conrad%20Regis%202.2.17.pdf)

[15] t = tonnes = metric tons.

[16] 1-3 t/day or ~360-1000 t/yr is ~10% of the 2019 U.S. demand, which is the production basis used in DOE FECM-NETL's RFP Solicitation 89243320RFE000032, Issued April 22, 2020; Awards made September 15, 2020.

[17] Executive Order 13817, A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals, December 20, 2017. List of Critical Minerals posted in Federal Register/Vol. 83, No. 97/Friday, May 18, 2018/Notices.

purification of critical and high-value materials, and ultimately onshore downstream manufacturing that incorporates these materials into commodity or national defense products.

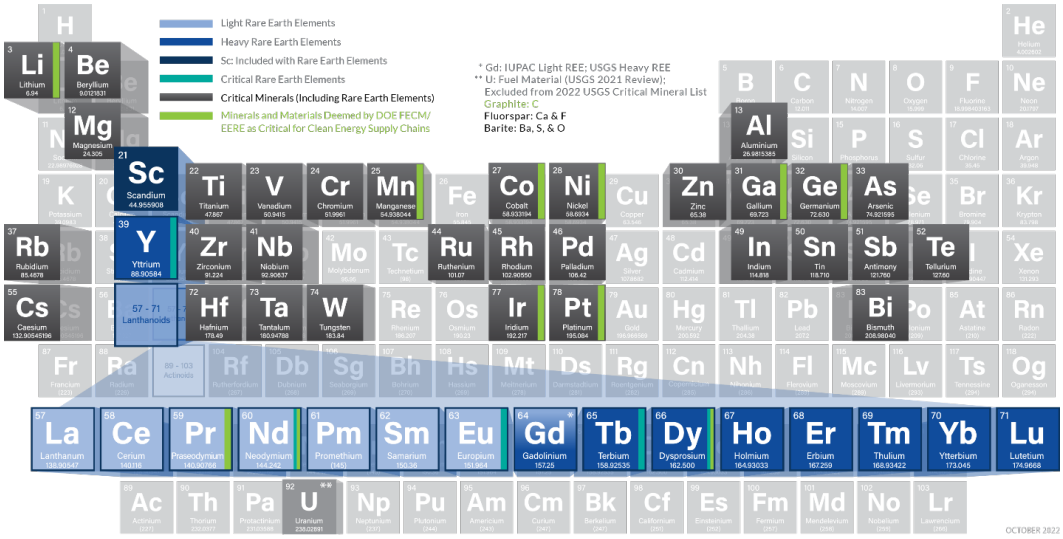

Figure 1 – Critical Minerals Including Rare Earth Elements[18]

REE and CMM Supply Chains

Recent U.S. demand for REE is approximately ~13,000 t per year (annual consumption varies).[19] The estimated distribution in 2019 of rare earths (as oxides) based on end use was 75% catalysts, 5% metallurgical applications and alloys, 5% ceramic and glass, 5% polishing, and 10% other.[20] In 2010 and 2012, the Department of Defense indicated that military consumption accounted for less than 5% of domestic REE consumption (approximately 800 t per year) that was associated with national security needs.[21,22]

When viewed in its entirety, the REE supply or value chain consists of mining, separation, refining, alloying, and ultimately manufacturing devices and

[18] Rare Earth Elements (REE): Lanthanide Series of elements as shown on the periodic table plus scandium and yttrium
Mixed Rare Earth Oxides/Mixed Rare Earth Salts (MREO/MRES): Oxides/salts of any rare earth elements, present as a mixture of oxides/salts
Rare Earth Oxide/Rare Earth Salt (REO/RES): An individual oxide/salt of a rare earth element
Rare Earth Metal (REM): An individual or binary set of metals of a rare earth element(s)

[19] https://pubs.usgs.gov/periodicals/mcs2020/mcs2020-rare-earths.pdf

[20] Department of the Interior, US Geological Survey, Minerals Commodity Summaries 2020, January 31, 2020, ISBN 978-1-4113-4362-7.

[21] https://www.bloomberg.com/news/articles/2010-11-01/pentagon-is-myopic-over-china-s-rare-earths-monopoly-u-s-lawmaker-says

[22] https://www.bloomberg.com/news/articles/2012-04-09/rare-earths-shortage-would-spur-pentagon-to-action

component parts (Figure 2). A major issue with respect to REE development in the U.S. is the lack of refining, alloying, and fabricating capacity that could process domestically produced REE.[23] In order to achieve domestic self-reliance, ensuring a stable, sustainable REE and CMM dual-use supply chain – from mine to manufactured product (Table 1) – is critically essential for clean energy and high-value defense platforms.

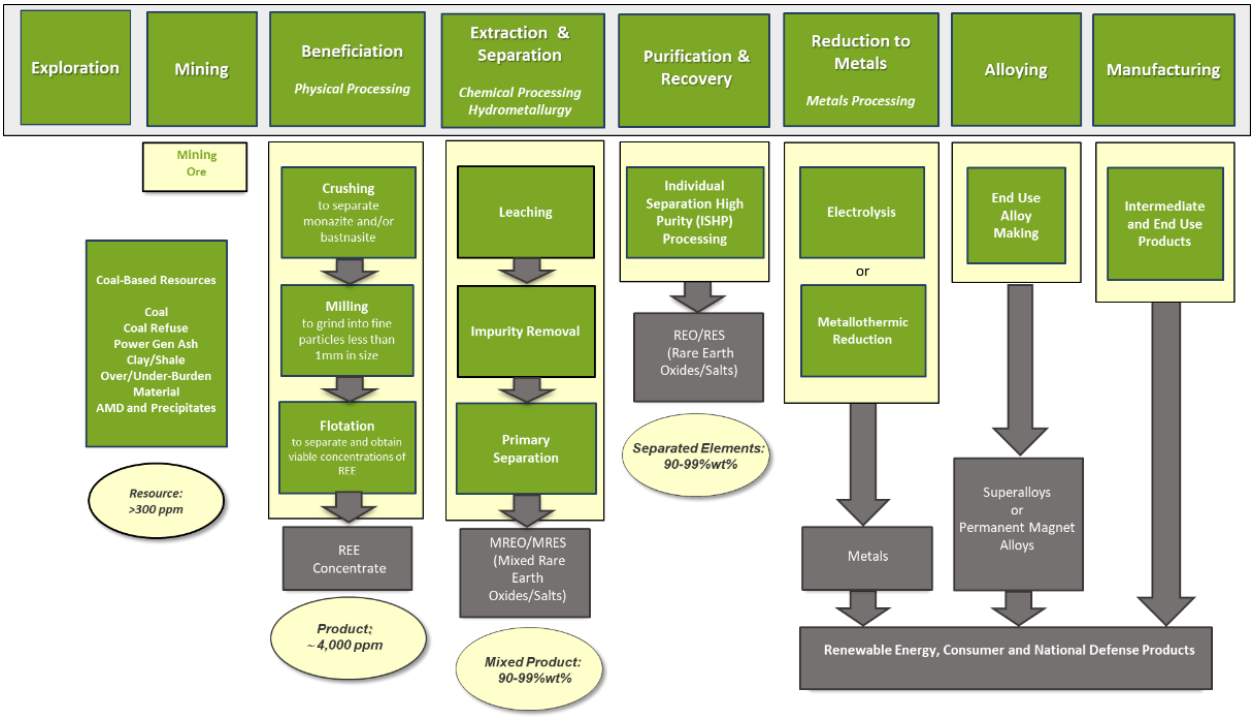

Figure 2 – Rare Earth Element and Critical Minerals Supply Chain

[23] Mark Humphries, Critical Minerals and the U.S. Public Policy, Congressional Research Services (CRS) Report Prepared for Members and Committees of Congress, June 28, 2019, R-45810.

Table 1 – Critical Minerals: Major End Uses[23] Error! Bookmark not defined.			
Aluminum (Bauxite)	transportation, packaging, building, electrical	**Manganese**	production of steel and other metals
Antimony	ceramics, glass, and rubber products, fire retardant	**Niobium**	steel and super alloys
Arsenic	lead storage batteries, herbicides, insecticides, military applications	**Platinum Group Metals**	auto catalysts, fuel cells, jewelry
Barite	filler, extender, and weighing agent in paint, plastics and rubber	**Potash**	fertilizer, chemical industry applications
Beryllium	auto and consumer electronics, defense applications	**Rare Earth Elements**	permanent magnets, petroleum refining, glass, lasers, steel alloys, fluorescent lighting
Bismuth	additives for lead-free pipe fittings	**Rhenium**	super alloys in high temperature turbine engine components and petroleum-reforming catalysts
Cesium	photoelectric cells, and energy conversion devices	**Rubidium**	biomedical research, electronics, specialty glass
Chromium	transportation, packaging, building, electrical	**Scandium**	Ceramics, electronics, lasers, radioactive isotopes, lighting
Cobalt	super alloys, aircraft engines, batteries, permanent magnets	**Strontium**	additive in drilling fluids for oil and gas wells
Fluorspar	used in processing aluminum, and uranium	**Tantalum**	capacitors for electronic devices
Gallium	integrated circuits (in high-tech equipment), light emitting diodes (LEDs), solar cells	**Tellurium**	photovoltaic panels, solar cells, thermoelectric devices
Germanium	fiber optics, infrared optics, solar cells, other solar energy applications	**Tin**	Chemicals, tinplate, solder and alloys
Graphite (Natural)	steelmaking, refractory applications, foundry operations, brake linings	**Titanium Concentrate**	aerospace applications
Hafnium	super alloys	**Tungsten**	cutting tools, wear-resistant materials used in construction and metal making
Helium	lifting gas, lab applications, MRI, welding	**Uranium**	fuel for nuclear reactors
Indium	electrical conduction, liquid crystal displays (LCDs), solar cells and photovoltaics	**Vanadium**	steelmaking, aerospace applications
Lithium	rechargeable batteries, ceramics, glass, chemical compounds	**Zirconium**	Used in ceramics, foundry sand, refractories, and abrasives

Notably, approximately 40% of mined rare earth production is reduced to metals and alloys, including most of neodymium, samarium, and dysprosium, for applications such as neodymium metal for Nd-Fe-B permanent magnets, samarium metal for Sm-Co permanent magnets, lanthanum, cerium, praseodymium, and neodymium for rechargeable battery electrodes.[24]

By creating a sustainable domestic REE and CMM supply chain, the U.S. would reduce its risk of supply disruption for essential domestic and military industries, would have the potential to produce intermediate products and manufacture end use products onshore which are currently valued above $1.2-trillion, and would prevent the U.S. from being left behind in the emerging clean energy technology market.

Current Commercial Technology

Within the rare earth industry, solvent extraction (SX) is generally accepted as the primary commercial technology for separating MREO/MRES into high purity REO/RES. Rare earth SX processes are generally classified as *primary separations*, which focus on separating rare earth elements from other elements, and *secondary separations*, which produce single or mixed (typically two or three) rare earth products from mixed rare earth streams that are produced by *primary separations*. Commercially, extractants such as D2EHPA, HEHEHP, Versatic 10, TBP, and Aliquat 336 have been widely used in rare earth SX processes. Up to hundreds of stages of mixers and settlers may need to be assembled in order to achieve the necessary extent of separation and product purity.[25,26]

Current reduction to metal(s) technology utilizes metallothermic high temperature reduction with very strong reductants such as lanthanum and calcium, or high temperature fused salt electrowinning whereby rare earths are dissolved in molten halide salt solutions and reduced by an external direct current power source. A discussion of the history and the many techniques for the reduction of rare earths compounds to metal(s) have been described by Gupta and Krishnamurthy.[27]

[24] J. Lucas, P. Lucas, T. Le Mercier, A. Rollat and W. G. Davenport, Rare Earths: Science, Technology, Production and Use, Elsevier, 2014.
[25] Fang Xie, Ting An Zhang, David Dreisinger, Fiona Doyle, A Critical Review on Solvent Extraction of Rare Earths from Aqueous Solutions, Minerals Engineering, Vol. 56, February 2014, p.10-28.
[26] Dorato Kolodynska, Dominika Fila, Bernadeta Gajda, Jerzy Gega, Zbigniew Hubicki, Rare Earth Elements—Separation Methods Yesterday and Today, Applications of Ion Exchange Materials in the Environment, pp 161-185, February 2019.
[27] C. Gupta and N. Krishnamurthy, Extractive Metallurgy of Rare Earths, CRC, Boca Raton, FL: 28-56, 2005.

Prior Efforts and Future Direction

Projects selected from DE-FOA-0002404 developed detailed Technical Research Plans focused on (1) the development of advanced processes/circuits for separation and purification, and ultimate reduction to REM from MREO/MRES, or (2) the production of CMM. The major focus of DE-FOA-0002404 required that the advanced processes/circuits provide an overall cost reduction (e.g., ~20%) to the overall process/system economics that utilized unconventional feedstock materials when compared to comparable operating processes/systems that utilized conventional separations technologies.

Applicants to and projects selected for award under DE-FOA-0002619 will be required to provide a similar or updated Technical Research Plan as described in Section I.B.iv. and will conduct research aligned with proof-of-concept (POC) testing in laboratory- or bench-scale facilities, addressing the potential viability of their advanced innovative processes/circuits for producing ISHP REO/RES, and high purity single or binary REM, at costs that are lower (e.g., ~20%) than costs for producing these materials using currently available conventional separations and conversion technologies.

MREO/MRES for use in DE-FOA-0002619's advanced separation and purification process/circuits, will be produced in existing small pilot-scale (or larger-scale) facilities that extract, separate and recover MREO/MRES and CMM from coal-based resources.

Advanced Processing of Critical Minerals and Materials for Industrial and Manufacturing Applications

DE-FOA-0002619, *Bipartisan Infrastructure Law (BIL) – Advanced Processing of Critical Minerals and Materials for Industrial and Manufacturing Applications*, will build upon the work carried out under DE-FOA-0002404, *Advanced Processing of Rare Earth Elements and Critical Minerals for Industrial and Manufacturing Applications,* to improve the process economics of REE and CMM facilities that use conventional separations and recovery technologies and unconventional feedstock resources. DE-FOA-0002619 specifically addresses:

- integration of technology advancements that results in a reduction in cost (targeting ~20% reduction) compared to the current state-of-the-art (SOTA) (Figure 3);
- production of high purity MREO/MRES and CMM from coal-based resources in currently existing small pilot-scale (or larger-scale) separation facilities (Circuit 1);
- design and development of advanced separation processes to produce ISHP

REO/RES and CMM from small pilot-scale (or larger-scale) MREO/MRES and CMM (Circuit 2);

- design and development of advanced processes to reduce high purity, separated REO/RES into high purity REM (Circuit 3); and
- utilization of conventional processes to convert CMM, other than REE, into CMM-oxides/salts/metals for use in either non-metals industry (i.e., catalysts, phosphors, etc.) or metals industry (i.e., permanent magnets, aerospace, etc.) (Circuit 4).

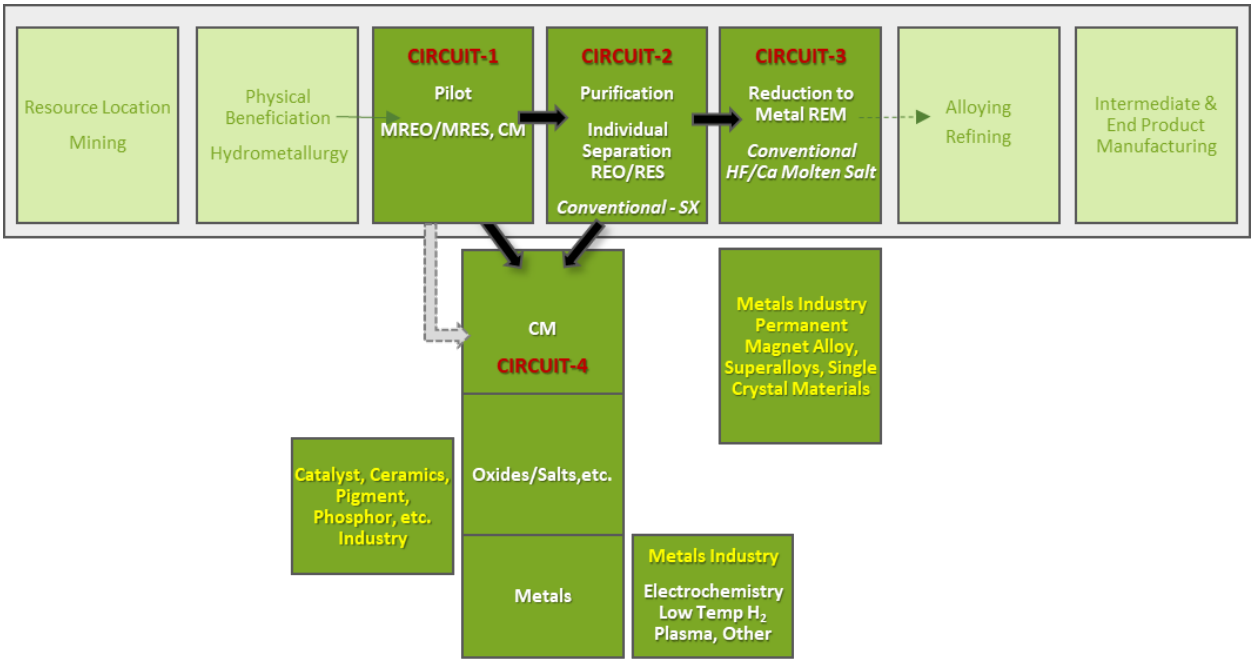

Figure 3 – Process Schematic for Advanced Processing of Critical Minerals and Materials for Industrial and Manufacturing Applications

Topic Areas

Topic Area 1 *Includes All Circuits for Production of REM and CMM*
REM: Circuits-1,2, and 3; Example Nd, Pr, Dy, Sm
CMM: Circuits-1 and 4 or CMM: Circuits-1,2, and 4, depending on CMM of interest; Example Co, Mn

Topic Area 2 *Primarily Includes Circuit-1 and Circuit-4 (Excluding REE) for Production of CMM*

As part of the whole-of-government approach to advance equity and encourage worker organizing and collective bargaining,[28,29,30] and in alignment with BIL

[28] E.O. 13985, "Advancing Racial Equity and Support for Underserved Communities Through the Federal Government." January 20, 2021. E.O. 14091, "Further Advancing Racial Equity and Support for Underserved Communities Through the Federal Government." February 16, 2023.
[29] E.O. 14025, "Worker Organizing and Empowerment," April 26, 2021.
[30] E.O. 14052, "Implementation of the Infrastructure Investment and Jobs Act," November 18, 2021.

section 41003(b), 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 Indian Tribes.[31] Consistent with Executive Order 14008,[32] 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 and identified by CEJST pursuant to the Executive Order, and to drive creation of accessible, good-paying jobs with the free and fair chance for workers to join a union.

ii. Technology Space and Strategic Goals

This FOA seeks applications to address priorities in the BIL regarding the establishment of rare earth minerals security as per section 41003(b). Detailed technical descriptions of the specific Topic Areas are provided in the sections that follow.

Recipients will provide and execute a Technical Research Plan wherein proof-of-concept (POC) testing will be conducted in laboratory- or bench-scale facilities, addressing the potential viability of advanced innovative processes/circuits to produce ISHP REO/RES, and high purity single or binary REM, at costs that are lower (e.g., ~20%) than costs for producing these materials using currently available conventional separations and conversion technologies.

B. Topic Areas

i. Overall Objectives

The overarching vision of DE-FOA-0002619 is environmentally benign, domestic production of REO, RES and/or REM and CMM from unconventional resources, such as coal and coal by-products, at lower cost (e.g.,~20%) than conventional technologies for use in the manufacture of intermediate and/or end-use consumer products, or critical clean energy and/or defense products.[33]

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[31] E.O. 13175, "Consultation and Coordination With Indian Tribal Governments." November 6, 2020, 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.

[32] E.O. 14008, "Tackling the Climate Crisis at Home and Abroad," January 27, 2021.

[33] Section 41003(b) of the BIL authorizes appropriations for Rare Earth Mineral Security activities in Section 7001(a) of the Energy Act of 2020 (42 U.S.C. 13344(a)) to develop advanced separation technologies for the extraction and recovery of REE/CMM from coal and coal by-products, as well as mitigate any potential environmental and public health impacts of such activities.

DE-FOA-0002619 seeks to competitively solicit and award research and development (R&D) projects that will focus on innovative midstream processing technologies for the purification, recovery, individual separation and reduction to metal(s) of high purity REE and other CMM from coal or coal by-products feedstock materials. Additionally, the innovative midstream separation, purification and reduction to metal(s) processes are required to be environmentally benign and sustainable and have reduced capital costs and/or operating expenses in comparison to commercially available processes. Rare earth metal powder(s) that are produced may be used for the production of permanent magnets, or alloys, superalloys and single crystal materials, etc., in the metals industry, while REO/RES and CMM may additionally have the potential to support product development in the catalyst, ceramic and pigment, phosphor, battery and other industries.

The primary focus of DE-FOA-0002619 is the extraction, separation, and refining of the following REE and CMM: Dy, Eu, Nd, Tb, Y, Lu, Pr, Sm, Gd, Co, Mn, Ga, Cr, Ge, Li, Nb, Sr, Ti, V, In, Ir, Pt, Ni, graphite, and Sn.

Solicited projects are to produce MREO, MRES and/or CMM in currently existing, domestic, small pilot-scale (or larger-scale) facilities using coal-based feedstock, with subsequently improved economic and innovative refining, producing materials for use in industrial and manufacturing applications. Notably, supply of MREO and/or MRES and CMM from coal-based resources is critical to the success of each awarded project.

This FOA includes the following two Topic Areas:

Topic Area 1: Advanced Process Development for Production of Rare Earth Metals and Co-Production of Critical Minerals and Materials from Coal-Based Resources

Topic Area 2: Production of Critical Minerals and Materials Excluding Materials Containing Rare Earth Elements from Coal-Based Resources

ii. Topic Area 1: Advanced Process Development for Production of Rare Earth Metals and Co-Production of Critical Minerals and Materials from Coal-Based Resources

Projects in Topic Area 1 will specifically be focused on technology development through proofs of concept that advance rare earth separation into ISHP materials and reduction to metal(s), as well as co-production of CMM. As part of the proposal, applicants must submit a Technical Research Plan that is focused on the development of advanced processes/circuits for separation and purification,

and ultimate reduction to metal(s). Selected projects will execute their Technical Research Plan wherein POC testing will be conducted in laboratory- or bench-scale facilities, addressing the potential viability of advanced innovative processes/circuits to produce ISHP REO/RES, and high purity single or binary REM, at costs that are lower (e.g., ~20%) than costs for producing these materials using currently available conventional separations and conversion technologies.

In Topic Area 1, **coal-based materials** will be used to produce MREO/MRES and CMM at ~90-99+% purity in currently existing small pilot-scale (or larger-scale) facilities, and:

- a minimum of five (5) ISHP REO/RES at ~90-99.99% purity;
- a minimum of five (5) individual or binary REM at a purity of ~99.5-99.8%; and
- a minimum of five (5) additional ~90-99% pure individual CMM as oxide(s), salt(s) or metal(s).

Topic Area 1 applications should describe all proposed process circuits including (1) production of MREO/MRES and CMM in existing small pilot-scale (or larger-scale) facilities (Circuit 1); (2) development of advanced ISHP REO/RES (and CMM if appliable) circuit (Circuit 2); (3) development of advanced REM circuit (Circuit 3); and (4) processes for the production of CMM of interest (Circuit 4).

iii. Topic Area 2: Production of Critical Minerals and Materials Excluding Materials Containing Rare Earth Elements from Coal-Based Resources

Projects in Topic Area 2 will solely be focused on CMM separation, purification and conversion into industrial materials of interest using conventional technology. Development and validation of advanced technologies for the separation of rare earths into ISHP materials and reduction to metal(s) is not desired for Topic Area 2. As part of the proposal, applicants must submit a Technical Research Plan that is focused on development and validation for production of CMM from coal-based resources. Selected projects will execute their Technical Research Plan wherein POC testing will be conducted in laboratory- or bench-scale facilities, addressing the potential viability of advanced innovative processes/circuits to produce ~90-99% pure individual CMM (non-REE) as oxide(s), salt(s) or metal(s), at costs that are lower (e.g., ~20%) than costs for producing these materials using currently available conventional separations and conversion technologies.

In Topic Area 2, **coal-based materials** will be used to produce, pending feedstock source:

- a minimum of one (1), preferred two (2) (or more), if possible, ~90-99% pure individual (non-REE) CMM as oxide(s), salt(s) or metal(s).

Topic Area 2 applications should describe (1) production of mixed CMM in existing small pilot-scale (or larger-scale) facilities (Circuit 1); and (2) processes for the production of CMM of interest (possibly Circuit 2 and Circuit 4 or solely Circuit 4).

iv. General Requirements and Information for both Topic Areas

Projects are required to source their MREO/MRES and/or mixed CMM feedstocks derived from actual feedstocks (i.e., from currently or previously existing small pilot-scale (or larger-scale) facilities). Synthetic, model/ideal feedstocks replicating actual feedstocks are not of interest. Feedstock materials shall consist of an adequate quantity of coal and coal by-products from which a majority (greater than 50% by weight) of the MREO/MRES and/or CMM product must be extracted. These may include newly mined coal (limited to mines that were in operation prior to September 19, 2022), coal ash, coal mine wastes (refuse tailings), coal-based raw AMD fluids and precipitates, or any other coal-related by-products. Recycled materials such as hard drives or fluorescent lightbulbs are not of interest.

The separation, purification, and conversion processes/circuits used for economic production of REM and/or CMM are:

- to be operated in an environmentally benign and sustainable manner;
- to address potential future integration into DOE's 1-3 t MREO/MRES per day BIL REE Demonstration Facility;[34,35] and
- to address integration with downstream supply chain processing of these materials for manufacturing and production of consumer, clean energy and/or national defense products.

To additionally improve process economics, applicants are encouraged to consider the production of value-added products (e.g., graphite from carbon, other carbon-based products, cements products, fertilizer, chloride to chlorine). Project scope can include development of these products, but their development should not be the focus of the project. Value-added products may come from anywhere in the processing stream but must positively impact economics of the overall process and this benefit must be shown in the application. A current commercial market application for the value-added product must exist.

[34] DOE NETL Funding Opportunity Announcement, BIL - Rare Earth Element Demonstration Facility, DE-FOA-0002618. http://www.fedconnect.net/fedconnect/?doc=DE-FOA-0002618&agency=DOE

[35] This is a potential value-added aspect of a proposed project, but integration into the BIL REE Demonstration Facility will not positively nor negatively impact the scoring of the application.

Applicants must provide photo(s) of the largest facility in use or previously used to generate products that will provide the feedstock materials/concentrates for the various process circuit(s). Photo(s) should also be included of each processing stage/circuit that may be modified for use as a newly developed, advanced circuit (e.g., solvent extraction, thermal processing, etc.). Photo(s) should include some reference gauge of dimension (e.g., a quarter, a person, etc.), and should also include captions describing the circuit(s) depicted.

As a project deliverable, Recipients will be required to provide NETL with single split samples of the (1) feedstock material(s) to Circuit 1, (2) resulting MREO/MRES and/or CMM from Circuit 1, (3) resulting REO/RES and/or CMM from Circuit 2, (4) resulting REM from Circuit 3; and (5) resulting oxide(s), salt(s), and metal(s) from Circuit 4.

In addition, regarding analytical characterization data, Recipients will be required to provide the following information:

- state-specific, county-specific, and site-specific information, as well as analytic characterization information (i.e., elemental concentrations, proximate/ultimate analyses, ash content, phase identification/concentrations, morphology information) for feedstock materials that are used in small pilot-scale (or larger-scale) facilities (Circuit 1) to produce MREO/MRES and/or CMM;
- analytic characterization data (i.e., elemental REE and/or CMM concentrations, REE and/or CMM percent purity, proximate /ultimate analyses, ash content, phase identification/concentrations, morphology (scanning electron micrographs (SEM) information), as well as REE and/or CMM percent recovery information, for MREO/MRES and/or CMM that are produced in small pilot-scale (or larger-scale) extraction, separation and recovery facilities (Circuit 1);
- analytical characterization data (i.e., elemental concentrations, REE and/or CMM percent purity, phase identification, morphology (SEM information) for initial MREO and/or mixed CMM that are used to develop/validate the performance of laboratory/bench-scale advanced separation processes that produce ISHP REO/RES and/or CMM, as well as REE and/or CMM percent conversion and percent recovery for ISHP-produced REO/RES and/or CMM (Circuit 2);
- analytical characterization data (i.e., elemental REE and/or CMM concentrations, REO/RES/CMM percent purity, phase identification, morphology (SEM information) for REO/RES/CMM that are used to develop/validate advanced reduction to metal processes, as well as percent conversion and percent recovery for REM and/or CMM generated in the advanced reduction to metal process (Circuit 3); and

- analytical characterization data (i.e., elemental CMM concentrations, CMM percent purity, phase identification, morphology (SEM information) for CMM that are used to develop/validate CMM conversion processes, as well as percent conversion and percent recovery of CMM during the production of oxides, salts, or metals (Circuit 4).

NETL will provide award Recipients access to an Excel spreadsheet template for entry of all analytical characterization data and information generated. NETL intends to make this information publicly available through inclusion of the Recipient's spreadsheet in NETL's Energy Data eXchange (EDX) database platform which can be found by accessing the following URL link: https://edx.netl.doe.gov/ree-cmm.

Technical Research Plan Contents

The Technical Research Plan, which is to be submitted with the application and executed during performance of the project, must include all information described below. For Topic Area 2 only, applicants should note that because the scope of Topic Area 2 excludes REE, the Technical Research Plan should not include information for Circuit 3 and might not include information for Circuit 2.

Project Teams, Process Development Criteria, Markets and Industrial Applications

Project Teams will be identified and consist of subject matter experts and stakeholders from across the entire REE and/or CMM supply chain (Figure 2). This will include, but not be limited to, rare earth and critical minerals experts from the areas of resource assessment and characterization; mining and minerals processing; small pilot-scale (or larger-scale) MREO/MRES and/or CMM facility developers and operators; advanced separation and purification and reduction to metal(s) process/circuit developers; and a minimum of one industrial partner whose expertise is in manufacturing and/or production of intermediate and/or end-use products containing REE and/or CMM.

In order to initiate effort on the production of REM and/or CMM from unconventional resources, applicants will be required to:

Identify the feedstock resource(s) that is/are planned to be used during conduct of the project, and the nominal concentrations and phases of REE and/or CMM contained in the feedstock material(s). Define the potential REE and/or CMM extractability and recovery. Estimate the quantity of the resource that would be needed and available for sustainable operation (e.g., two to five years of continuous operation of a 1-3 t MREO/MRES per day BIL REE Demonstration Facility) and its associated domestic feedstock location.

Identify the targeted industrial application(s) and supply chain product(s) that serve as the basis for conducting research efforts under this FOA. The industrial application(s) will identify which REE and/or CMM will be the primary technical focus of the research project team. This in turn will determine the manner in which advanced REE and/or CMM separation and purification, and if applicable, conversion to metal(s) processes/circuits will be developed. Identify annual international production quantities, U.S. demand, and intermediate/end-use products for which the REE and/or CMM target. Identify the critical materials and the quantity of critical minerals used in these markets/applications.

Industrial and manufacturing partners are essential to participate as project team members, in order to provide guidance as to critical material specifications, market/supply needs, and/or to assist in potential market entry of the produced REE and/or CMM, or newly developed advanced separation, recovery, and/or refining processes/circuits.

Pilot-Scale Production of MREO/MRES and Mixed CMM – Circuit 1 (Figure 3)

All applicants will be required to utilize MREO/MRES and/or mixed CMM produced in currently existing domestic small pilot-scale (or larger-scale) extraction/separation facilities[36] that use coal-based resources as their feedstock source. Unlike model REO, RES, and/or CMM compounds that when purchased are inherently pure, small pilot-scale (or larger-scale) produced MREO/MRES and/or CMM are expected to contain trace and/or minor quantities of contaminant species that may (1) if present, competitively interact with down-stream separation and purifications reactions, leading to reduced process efficiency (e.g., commercial SX processes), or (2) if present, impact the performance of the resulting REE/CMM-containing manufactured intermediate/end-use product(s) (e.g., reduced magnetic properties of permanent magnets).

Addressing the inclusion and subsequently mitigating the potential impact of trace and/or minor contaminant species, in parallel with development of advanced separation, purification, and reduction to metal(s) processes/circuits, assists to de-risk, as well as expedite the time to optimize the overall efficiency and sequential performance of the advanced process circuits.

[36] Small pilot-scale facility is defined as (1) a currently existing R&D test facility that has demonstrated the capability of producing REE and CMM from an REE-CMM-containing feedstock source such as coal, coal-based resources (e.g., coal refuse, lignite, over/under-burden shales/clays, combustion by-products (e.g., ash), acid mine drainage fluids/precipitates), placer sand deposits, mineral mine drainage, ash legacy impoundments, etc.; (2) having the capability of producing a minimum of ~75kg MREO/MRES/yr; and (3) producing MREO and/or CMM at purities of greater than 90%.

Applicants will describe the extraction, separation, and recovery processes for producing MREO/MRES and/or mixed CMM from coal-based resources in currently existing small pilot-scale (or larger-scale) facilities.

Applicants will identify the quantity and purity of small pilot-scale (or larger-scale) produced MREO/MRES and/or CMM (Circuit 1) that will be needed for use in the development and validation of advanced separation and purification systems/processes/circuits (Circuit 2) that produce ISHP REO/RES and/or CMM, or for direct conversion to oxide(s), salt(s), and/or metal(s) (Circuit 4).

Minimal modifications and/or efficiency improvements to currently existing coal-based small pilot-scale facilities are allowable. Modifications and/or efficiency improvements to currently existing, non-coal-based, small pilot-scale (or larger-scale) facilities are not supported by this FOA.

Production of ISHP REO/RES and/or CMM – Circuit 2 (Figure 3)

Applicants will provide a summary review of (1) the literature with respect to the SOTA techniques and (2) market industrial utilization of these techniques principally for the separation of MREO/MRES and/or CMM into ISHP (i.e., ~90-99.99%) materials. Separation techniques/processes will include, but not be limited to, SX, ion chromatography, electrowinning, sublimation/condensation, etc. Applicants will address the possible use of these separation techniques, as well as others, for further purification, as needed.

Development for advanced concepts/methodologies/processes/circuits[37] will address production of ~90-99.99% ISHP REO/RES and/or CMM at a cost that is lower (e.g., ~20%) than the cost of producing these materials when currently available, conventional, commercial separations technologies are used.

A description of the advanced, reduced cost, ISHP separation and purification process/circuit) will include (1) operational tolerance specifications with respect to trace and/or minor contaminant level concentrations, (2) the required quantity and purity of MREO/MRES and/or CMM feed material produced by small pilot-scale (or larger-scale) facilities in Circuit 1, for validating the ISHP process/circuit performance capability in Circuit 2, and (3) the projected recovery, as well as the quantity and purity of ISHP materials produced in Circuit 2.

[37] Processes/circuits that are being developed may include *new concepts* that (1) have undergone limited but promising proof-of-concept testing by the applicant or (2) concepts that may have received Phase 1 SBIR/STTR government funding. Enhancements of prior art concepts/processes that has not been reduced to commercial practice may also be proposed.

If the project proposes advancements to further extend technology development on already existing non-commercial ISHP processes, then a description of the current process/circuit performance capabilities, equipment utilized, and detailed description for continued process/circuit development, must be provided.

Production of High Purity REM – Circuit 3 (Figure 3)

Applicants will provide a summary review of (1) the literature with respect to the SOTA techniques and (2) market utilization of these techniques for production of REM. Reduction to metal(s) techniques/processes will include, but not be limited to, metallothermic high temperature reduction with very strong reductants such as lanthanum and calcium, or high temperature fused salt electrowinning, etc.

Development for advanced concepts/methodologies/processes will address production of high purity individual or binary REM systems (e.g., Nd, Pr, NdPr) at a cost that is lower (e.g., ~20%) than the cost of producing these materials when currently available, conventional, commercial reduction/conversion to metal(s) technologies are used.

A detailed description of advanced, reduced cost, conversion process/circuit will include (1) operational tolerance specifications with respect to trace and/or minor contaminant level concentrations, (2) the required quantity and purity of REO or RES feed material produced by the ISHP concept in Circuit 2, for validating the reduction to metal(s) process in Circuit 3, and (3) the conversion process performance capability (e.g., projected conversion efficiency), as well as the quantity and purity of REM produced in Circuit 3.

Advanced reduction to metal(s) processes used in Circuit 3 will reflect production of materials primarily for the rare earth markets and the metals industries (e.g., permanent magnets; alloys, superalloys, single crystals, etc.).

If the project proposes advancements to further extend technology development on already existing non-commercial reduction to metal(s) processes, then a description of the current process performance capabilities, equipment utilized, and detailed description for continued concept development, must be provided.

Production of High Purity Critical Minerals for Alternate Industrial Applications – Circuit 4 (Figure 3)

Applicants will provide a summary review of (1) the literature with respect to the SOTA techniques and (2) market/industrial utilization of these

techniques/processes for production of CMM for use in the catalyst, ceramic and pigment, phosphor, battery, etc., industry.

A detailed description of the methodologies/processes/circuit to extract and separate CMM from coal-based resources in Circuit 4 will be provided, as well as the required phase (i.e., oxide, salt, etc.) and purity specifications for each CMM based on its use in industrial applications.

Process Integration for Production of REM and CMM – Circuits 1-4 (Figure 3)

Applicants will provide process flow diagrams (PFDs) that illustrate the integration of the advanced separation and conversion processes/circuits to produce REM and/or CMM from coal-based resources.

The PFD showing the production route(s) should include a mass and energy balance, and include the entire production process/circuits from MREO/MRES to refined metal, and/or production of CMM.

Applicants must estimate the purity obtainable for materials produced from each process/circuit. This should be backed by scientific discussion. In addition, the production rate and quantity of materials produced in the laboratory- or bench-scale facility should be estimated.

Applicants will address the potential application of these process circuits to support DOE's planned 1-3 t MREO/MRES per day BIL REE Demonstration Facility,**Error! Bookmark not defined.** as well as integration with downstream supply chain processing for manufacturing and production of consumer products, or critical clean energy and/or defense products.

Techno-Economic Analyses – Circuits 1-4 (Figure 3)

Techno-economic analysis (TEA) of each circuit will be performed, and as a series of integrated modular processes/circuits. Environmental life cycle analyses (LCA) will be addressed. The analyses should use conventional technologies as a baseline for comparison. Specifically, a projected cost comparison for the advanced systems/processes/circuits must be provided relative to a similarly sized system(s) that utilizes conventional technologies.

Anticipated Technology Readiness Level (TRL)

Topic Area 1:
Beginning of project: 2
End of project: 3-4

Topic Area 2:
Beginning of project: 2
End of project: 3-4

End of Project Success Metrics

- Projects will (1) invest in America's workforce; (2) advance diversity, equity, inclusion, and accessibility; and (3) contribute to the President's goal that 40% of the overall benefits of certain federal investments flow to disadvantaged communities (the Justice40 Initiative) in order to support the goal of building a clean and equitable energy economy.
- Projects will submit generated characterization or analytical data, if any, to the NETL EDX database.
- Topic Area 1: Projects will have demonstrated viability of advanced innovative processes/circuits to produce a minimum of five (5) ISHP REO/RES at 90-99.99% purity, a minimum of five (5) individual or binary REM at a purity of 99.5-99.8%, and, a minimum of five (5) additional 90-99% pure individual CMM as oxide(s), salt(s) or metal(s) from coal-based feedstock(s) in currently existing small pilot-scale (or larger-scale) separation facilities, at costs that are lower (e.g., ~20%) than costs for producing these materials using currently available conventional separations and conversion technologies.
- Topic Area 2: Projects will have demonstrated viability of conventional processes to produce a minimum of one (1), preferred two (2) (or more), if possible, ~90-99% pure individual CMM (non-REE) as oxide(s), salt(s) or metal(s) from coal-based feedstock(s) in currently existing small pilot-scale (or larger-scale) separation facilities, at costs that are lower (e.g., ~20%) than costs for producing these materials using currently available conventional separations and conversion technologies.

Technical Elements that Must be Included in Applications

Applicants are required to submit the technical elements listed below as attachments to the application. These elements will be evaluated as part of Technical Review Criterion 1. See Sections IV.C. and V. for more details. The required technical elements are:

1. a complete and detailed Technical Research Plan;
2. Teaming Plan with letters of commitment from a coal-based resource supplier, small pilot-scale (or larger-scale) MREO/MRES and/or CMM facility operator, advanced separation and purification and reduction to metal(s)

process developers, and an industrial partner(s) who is/are able to utilize the material(s) produced; and

3. photo(s) of the largest facility in use or previously used to generate products that will provide the feedstock materials/concentrates for the various process circuit(s). Photo(s) should also be included of each processing stage/circuit that may be modified for use as a newly developed, advanced circuit (e.g., solvent extraction, thermal processing, etc.). Photo(s) should include some reference gauge of dimension (e.g., a quarter, a person, etc.), and should also include captions describing the circuit(s) depicted.

All work for projects selected under this FOA must be performed in the United States. See Section IV.H.iii. and Appendix C.

Critical Materials Collaborative (CMC)

All awardees will be required to participate as a member of the Critical Materials Collaborative, which is a coalition of DOE offices, federal agencies and federally funded R&D programs to:

- Align the DOE research portfolio to achieve climate goals and crosscutting Science and Technology objectives;
- Advance crosscutting applied RD&D related to critical minerals and materials;
- Accelerate the adoption and deployment of innovation;
- Nurture and expand the innovation ecosystem; and
- Facilitate scientific and technical exchange and discussion.

Principle investigators or a member of their research team are expected to participate in coordination efforts including, but not limited to, an in-person annual symposium, virtual coordination meetings, and periodically give a presentation on research progress.

There are no fees associated with this participation in the CMC.

v. Teaming Partner List

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

Updates to the Teaming Partner List will be available in the FedConnect (https://www.fedconnect.net/) website. The Teaming Partner List will be regularly updated to reflect new teaming partners who provide their organization's information.

SUBMISSION INSTRUCTIONS: Any organization that would like to be included on this list should submit the following information: Organization Name, Contact Name, Contact Address, Contact Email, Contact Phone, Organization Type, Area of Technical Expertise, Brief Description of Capabilities, and Topic Area. Interested parties should email the information to FOA2619@netl.doe.gov with the subject line "Teaming Partner Information."

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 self-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.

C. Applications Specifically Not of Interest

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

- applications that fall outside the technical parameters specified in Sections I.A. and I.B. of the FOA;
- applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics);
- applications that use feedstock(s) that result in less than 50% by weight MREO/MRES or CMM produced from coal, coal by-products, and/or coal wastes from currently or former operating mines, which may include coal ash, coal prep plant tailings/refuse, coal-based AMD, etc. Feedstock(s) cannot include recycled materials such as hard drives or fluorescent lightbulbs;
- applications using feedstocks from new mines that commenced operation on or after September 19, 2022;
- applications that use monazite or bastnaesite as feedstock materials;
- applications that use resources from geothermal brines;
- applications that use commercially purchased, model compounds to facilitate development of advanced separation, purification, and conversion processes/circuits;
- applications that do not result in products that are readily useable by an industrial partner;
- applications that do not include at a minimum of one industrial partner. More than one partner should be included unless the sole partner encompasses all parts of the value chain for which the FOA is focused;

- applications that do not identify an intermediate and/or end product or industrial/manufacturing application for each REE and/or CMM produced;
- applications that seek modifications and/or efficiency improvements to currently existing, non-coal-based, small pilot-scale (or larger-scale) facilities;
- applications that are not environmentally benign;
- Topic Area 1: applications that do not include Circuits 1-3 to produce REM, and additionally Circuit 4 to produce CMM for industrial and manufacturing applications;
- Topic Area 1: applications that consist of only currently available conventional technologies such as (1) commercial solvent extraction and (2) commercial metallothermic high temperature reduction for REM production;
- Topic Area 1: projects that produce less than five high purity REO with subsequent conversion to REM, and less than five additional high purity CMM from coal-based feedstock materials;
- Topic Area 2: applications that do not include Circuit 1 and Circuit 4 for the production of CMM for industrial and manufacturing applications;
- Topic Area 2: projects that do not address production of a minimum of one (1), preferred two (2) (or more) ~90-99% pure individual CMM as oxide(s), salt(s) or metal(s) from coal-based resources; and
- Topic Area 2: Projects that focus on the development and validation of advanced technologies for the separation of rare earths into ISHP materials and reduction to metal(s).

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)[38] that addresses the three objectives stated above. See Section IV.C.xvi. and Appendix K for the more information on the R&D Community Benefits Plan content requirements.

E. Authorizing Statutes

This FOA is issued pursuant to the statutory authority provided by:

- Public Law (P.L.) 95-91, DOE Organization Act, as amended;
- P.L. 116-260, Div. Z, Energy Act of 2020, Title VII, Sec. 7001, as amended, codified at 42 U.S.C. 13344; and
- P.L. 117-58, Infrastructure Investment and Jobs Act (IIJA), Sec. 41003(b), which authorized appropriations for 42 U.S.C. 13344(a).

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

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;
- Requiring all of the iron, steel, manufactured goods, and construction materials used in the infrastructure activities of applicable projects are produced in the United States;
- Ensuring laborers and mechanics employed by contractors or subcontractors on BIL-funded projects are paid wages equivalent to prevailing wages on similar projects in the area;
- Protecting whistleblowers and requiring prompt referral of evidence of a false claim to 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

[38] 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.

guidance, and instructions in this FOA. Recipients must flow down the requirements to subrecipients to ensure the recipient's compliance with the requirements.

II. Award Information

A. Award Overview

i. Estimated Funding

DOE expects to make a total of approximately $30M of federal funding available for new awards under this FOA, subject to the availability of appropriated funds. DOE anticipates making approximately six (6) to seven (7) awards under this FOA. DOE may issue one, multiple, or no awards.

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 (Maximum Award Size for Any One Individual Award (Fed Share)	Approximate Total Federal Funding Available for All Awards	Anticipated Period of Performance (months)
1	Advanced Process Development for Production of Rare Earth Metals and Co-Production of Critical Minerals and Materials from Coal-Based Resources	5-6	$5M	$25M - $30M	36
2	Production of Critical Minerals and Materials Excluding Materials Containing Rare Earth Elements from Coal-Based Resources	1-2	$2.5M	$2.5M - $5M	36

APPLICATIONS THAT EXCEED THE "Maximum DOE Share for Any One Individual Award (Federal Share)" SPECIFIED ABOVE WILL BE CONSIDERED NONCOMPLIANT. DOE WILL NOT REVIEW OR CONSIDER NONCOMPLIANT APPLICATIONS.

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.

ii. Period of Performance

DOE anticipates making awards that will run for 36 months, comprised of one budget period.

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 United States 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 VI.B.x. of the FOA for more information on what substantial involvement may involve.

III. Eligibility Information

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

A. Eligible Applicants

i. Individuals

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

ii. 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. Non-profit 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. **NETL is not eligible for award under this announcement and may not be proposed as a subrecipient on another entity's application. An application that includes NETL as a prime recipient or subrecipient will be considered non-responsive.**

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

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 United States 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.

iii. 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.

The cost share must be at least 20% of the total project costs[39] for research and development projects.[40] The cost share must come from non-federal sources unless otherwise allowed by law.

DOE understands that projects selected under this FOA may require the use of existing data. For purposes of this FOA, DOE will consider data that is commercially available at an established market price to be an allowable cost under the project (either as DOE share or non-federal cost share) but DOE will not consider in-kind data (e.g., data, owned by an entity, that is not routinely sold commercially but is instead donated to the project and assigned a value) to be an allowable cost under the project, including as Recipient cost share. Estimation methods used by the Recipient to assign a value to in-kind data cannot be objectively verified by DOE and therefore will not be accepted by DOE as an allowable cost under any project selected from this FOA. Consequently, DOE will not recognize in-kind data costs in any resulting approved DOE budget.

[39] Total project costs is the sum of the government share, including FFRDC costs if applicable, and the recipient share of project costs.

[40] 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.

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 project as a whole is met.

iii. Cost Share Types and Allowability

Every cost share contribution must be allowable under the applicable federal cost principles, as described in Section IV.H.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 Guarantees 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 volunteer time or the donation of space or use of equipment.

Project teams may use funding or property received from state or local governments to meet the cost share requirement, so long as the federal government did not provide the funding to the state or local government (unless otherwise authorized by law).

The recipient may not use the following sources to meet its 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) (unless otherwise authorized by law); 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.

C. Compliance Criteria

All applicant submissions must:

- comply with the applicable content and form requirements listed in Section IV. of the FOA;
- include all required documents;
- be successfully uploaded in Grants.gov at https://www.grants.gov/, including clicking the "Submit" button; and
- be submitted by the deadline stated in the FOA.

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

Applicants are strongly encouraged to submit their Full Applications at least 48 hours in advance of the submission deadline. Under normal conditions (i.e., at least 48 hours in advance of the submission deadline), applicants should allow at least 1 hour to submit a Full Application. Once the Full Application, is submitted by means specified in the FOA, applicants may revise or update that submission until the expiration of the applicable deadline. If any changes are made, the applicant must resubmit the Full Application 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 I.C. of the FOA, are deemed nonresponsive and are not reviewed or considered.

E. Other Eligibility Requirements

i. Requirements for DOE/NNSA and non-DOE/NNSA 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:

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

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

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

iii. *Funding, Cost Share, and Subaward with FFRDCs*
DOE will NOT fund DOE/NNSA FFRDCs participating as a subrecipient through the DOE field work authorization process. DOE will NOT fund non-DOE/NNSA FFRDCs through an interagency agreement with the sponsoring agency. Therefore, the prime recipient and FFRDC are responsible for entering into an appropriate subaward that will govern, among other things, the funding of the FFRDC portion of the work from the prime recipient under its DOE award. Such an agreement must be entered into before any project work begins.

The applicant should prepare the budgets using rates appropriate for funding the FFRDCs through subawards. 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.

iv. *Responsibility*
The prime recipient will be the responsible authority regarding the settlement and satisfaction of all contractual and administrative issues,

including, but not limited to disputes and claims arising out of any agreement between the prime recipient and the FFRDC.

v. *Limit on FFRDC Effort*
The scope of work to be performed by the FFRDC may not be more significant than the scope of work to be performed by the applicant.

F. Limitation on Number of Full Applications Eligible for Review

An entity may submit more than one Full Application to this FOA, provided that each application describes a unique, scientifically distinct project.

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 submit an application in response to this FOA lies solely with the applicant.

IV. Application and Submission Information

A. Application Process

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-inch by 11-inch paper with margins not less than one inch on every side. Use Calibri typeface, a black font color, and a font size of 12 point or larger (except in figures or tables, which may be 10 point font). A symbol font may be used to insert Greek letters or special characters, but the font size requirement still applies. References must be included as footnotes or endnotes in a font size of 10 or larger. Footnotes and endnotes are counted toward the maximum page requirement;
- 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.

B. Application Forms

The application forms and instructions are available on Grants.gov at https://www.grants.gov/.

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

TechnicalVolume_Part_1
TechnicalVolume_Part_2

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

C. Content and Form of the Full Application

Applicants must complete the following application forms found on the Grants.gov website at https://www.grants.gov/.

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
SF-424	Form	N/A	N/A
Project/Performance Site Location(s)	Form	N/A	N/A
Technical Volume	PDF	30	TechnicalVolume.pdf
Resumes	PDF	3 pages each	Resumes.pdf
Letters of Commitment	PDF	1 page each	LOC.pdf (or "LOC-FILL IN TEAM MEMBER.pdf" if more than one letter is submitted)
Statement of Project Objectives	MS Word	15	SOPO.doc or docx
Budget Justification Workbook	MS Excel	N/A	Budget_Justification.xls or xlsx
Summary for Public Release	PDF	1	Summary.pdf
Summary Slide	MS PowerPoint	1	Slide.ppt or pptx
Subrecipient Budget Justification	MS Excel	N/A	Subrecipient_Budget_Justification.xls or xlsx
Authorization from cognizant Contracting Officer for FFRDC (if applicable)	PDF	N/A	FFRDCAuth.pdf
SF-LLL Disclosure of Lobbying Activities	Form	N/A	N/A
Foreign Entity Waiver Requests and Foreign Work Waiver Requests	PDF	N/A	FN_Waiver.pdf
Data Management Plan	PDF	N/A	DMP.pdf
R&D Community Benefits Plan	PDF	5	RDCBenefits.pdf
Current and Pending Support	PDF	N/A	CPS.pdf
Locations of Work	MS Excel	N/A	LOW.xls or xlsx
Transparency of Foreign Connections	PDF	n/a	BusinessSensitive.pdf
Potentially Duplicative Funding Notice (if applicable)	PDF	N/A	PDFN.pdf
Environmental Questionnaire	PDF	N/A	Env.pdf
Technology Maturation Plan	PDF	15	TMP.pdf
Project Management Plan	PDF	15	PMP.pdf

Technical Research Plan	PDF	N/A	TRP.pdf
Teaming Plan	PDF	N/A	TP.pdf
Photograph(s) of the largest facility in use or previously used to generate products that will provide the feedstock materials/concentrates	PDF	N/A	Photos.pdf

Note: The maximum file size that can be uploaded to the Grants.gov website is 10MB.

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

ii. SF-424: Application for Federal Assistance

Complete the SF 424 form first to populate data in other forms. Complete all required fields in accordance with the instructions on the form. The list of certifications and assurances in Field 21 can be found at https://www.energy.gov/management/financial-assistance-forms-and-information-applicants-and-recipients, under Certifications and Assurances. Note: The dates and dollar amounts on the SF-424 are for the complete project period of performance and not just the first project year, first phase or other subset of the project period of performance.

iii. Project/Performance Site Location(s)

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

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

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

iv. 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 V. of the FOA. Save the Technical Volume in a single PDF file using the following convention for the title “TechnicalVolume.pdf” and click on "Add Mandatory Other Attachment" to attach.

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 30 pages, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all of the information in the table below. The applicant should consider the weighting of each of the technical review criterion (see Section V. of the FOA) when preparing the Technical Volume.

Technical Volume Content Requirements	
SECTION/PAGE LIMIT	**DESCRIPTION**
Cover Page	The cover page should include the project title, the specific FOA Topic Area being addressed, both the technical and business points of contact, names of all team member organizations, names of project managers, senior/key personnel and their organizations, the project location(s), and any statements regarding confidentiality.
Project Overview (Approximately 10% of the Technical Volume)	The Project Overview should contain the following information: • Background: The applicant should discuss the background of their organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Full Application. • Project Goal: The applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal. • DOE Impact: The applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.
Scientific and Technological Merit (Approximately 30% of the Technical Volume)	The Scientific and Technological Merit 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 the relevance of the proposed project to the goals and objectives of the FOA, including the potential to meet specific DOE technical targets or other relevant performance targets. The applicant should clearly specify the expected outcomes of the project. • Feasibility: The applicant should demonstrate the technical feasibility of the proposed technology and capability of achieving the anticipated

	performance targets, including a description of previous work done and prior results. 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. • Technical Review Criterion 1: In addition to the above, the applicant should address each technical review sub-criterion individually. Provide sufficient information so that reviewers will be able to evaluate the application in accordance with technical review criteria.
Technical Approach and Understanding (Approximately 40% of the Technical Volume)	The Technical Approach should include a summary of the Project Objectives, Technical Scope, Work Breakdown Structure (WBS), Milestones, and Project Schedule. A detailed SOPO and PMP are separately requested. The Technical Approach should contain the following information: • Project Objectives: The applicant should provide a clear and concise (high-level) statement of the goals and objectives of the project as well as the expected outcomes. • Technical Scope Summary: The applicant should provide a summary description of the overall work scope and approach to achieve the objective(s). The applicant should describe the specific expected end result, including milestones in the R&D Community Benefits Plan. • WBS and Task Description Summary: The Technical Approach 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 Technical Approach 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 Technical Approach shall contain a concise description of the specific activities to be conducted over the life of the project. The description shall be a full explanation and disclosure of the project being proposed (i.e., a statement such as "we will then complete a proprietary process" is unacceptable). It is the applicant's responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this FOA. The summary provided should be consistent with the SOPO. The SOPO will contain a more detailed description of the WBS and tasks. • Buy America Requirements for Infrastructure Projects: Within the first 2 pages of the Technical Approach, 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.

	• Technical Review Criterion 2: In addition to the above, the applicant should address each technical review sub-criterion individually. Provide sufficient information so that reviewers will be able to evaluate the application in accordance with technical review criteria.
Technical and Management Capabilities (Approximately 20% of the Technical Volume)	The Technical and Management Capabilities should contain the following information: • Describe the project team's unique qualifications and expertise, including those of key subrecipients. • Describe the project team's existing equipment and facilities, or equipment or facilities already in place on the proposed project site, that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project. • This section should also include relevant, previous work efforts of similar size, scope, and complexity, demonstrated innovations, and how these enable the applicant to achieve the project objectives. • Describe the time commitment of the key team members to support the project. • Describe the technical services to be provided by DOE/NNSA FFRDCs, if applicable. • Describe the skills, certifications, or other credentials of the construction and ongoing operations workforce. • For multi-organizational projects, describe succinctly: o The roles and the work to be performed by each project manager and senior/key personnel at the prime and sub levels; o Business agreements between the applicant and sub; o How the various efforts will be integrated and managed; o Process for making decisions on technical direction; o Publication arrangements; o Intellectual Property issues; and o Communication plans. • Technical Review Criterion 3: In addition to the above, the applicant should address each technical review sub-criterion individually. Provide sufficient information so that reviewers will be able to evaluate the application in accordance with technical review criteria.

v. Resumes

A resume provides information that can be used by reviewers to evaluate the 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 and Senior/Key Personnel that include the following:

1. Contact Information;
2. Education and training: Provide 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. There should be no lapses in time over the past ten years or since age 18, which ever time period is shorter.

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/, and is 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 naming convention for the title “Resumes.pdf” and click on “Add Optional Other Attachment” to attach.

vi. 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 1 page. Save the letters of commitment in a single PDF file using the following naming convention for the title “LOC.pdf” and click on “Add Optional Other Attachment” to attach.

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

vii. Statement of Project Objectives (SOPO)

Applicants are required to complete a SOPO. A SOPO template is available in Appendix G of the FOA. The SOPO must not exceed 15 pages. Save the SOPO in a single Microsoft Word file using the following naming convention for the title “SOPO.doc or docx” and click on “Add Optional Other Attachment” to attach.

viii. Budget Justification Workbook

Applicants must complete the Budget Justification Workbook. This workbook is included as an attachment to this announcement for use and to describe the level of detail required in the budget justification. Although the data requested is mandatory, the use of the budget justification workbook is not. Applicants must complete each tab of the Budget Justification Workbook for the project as a whole, including all work to be performed by the prime recipient and its subrecipients and contractors. Applicants should include costs associated with 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 naming convention for the title “Recipient_Budget_Justification.xls or xlsx” and click on “Add Optional Other Attachment” to attach.

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/project director/principal investigator(s), the project title, the objectives of the project, a description of the project, including methods to be employed, the potential impact of the project (e.g., benefits, outcomes), 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 sensitive business information as DOE may make it available to

the public after selections are made. The summary must not exceed 1 page when printed using standard 8.5-inch by 11-inch paper with 1-inch 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 for the title "Summary.pdf" and click on "Add Optional Other Attachment" to attach.

x. Summary Slide

Applicants must provide a single slide summarizing the proposed project.

The Summary Slide template 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 naming convention for the title "Slide.ppt or pptx" and click on "Add Optional Other Attachment" to attach.

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 percent of the total work effort (whichever is less). The budget justification must include the same justification information described in the "Budget Justification Workbook" section above. Save each subrecipient budget justification in a Microsoft Excel file using the following naming convention for the title "Subrecipient_Budget_Justification.xls or xlsx" and click on "Add Optional Other Attachment" to attach.

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

The federal agency sponsoring the FFRDC must authorize in writing the use of the FFRDC on the proposed project and this authorization must be submitted with the application. The use of a FFRDC must be consistent with the contractor's authority under its award. Save the Authorization in a single PDF file using the following naming convention for the title "FFRDCAuth.pdf" and click on "Add Optional Other Attachment" to attach.

xiii. 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" 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.

xiv. Waiver Requests (if applicable)

i. Foreign Entity Participation

For projects selected under this FOA, as set forth in Section III., all recipients and subrecipients must qualify as domestic entities. See Section III. 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.

ii. Foreign Work Waiver Request

As set forth in Section IV.H.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 naming convention for the title "FN_Waiver.pdf" and click on "Add Optional Other Attachment" to attach.

xv. Data Management Plan

Applicants are required to submit a Data Management Plan as part of their Full Application. The Data Management Plan is a document that outlines the proposed plan for data sharing or preservation. Submission of this plan is required with the full application, and failure to submit the plan may result in rejection of the application without further consideration. Applicants shall prepare the DMP in the format provided in Appendix H of this FOA. Save the Data Management Plan in a single PDF file using the following naming

convention for the title "DMP.pdf" and click on "Add Optional Other Attachment" to attach."

xvi. 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) DEIA; (2) 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, DOE 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. DOE will evaluate the recipient's progress throughout the life of the award.

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 K, 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. Save the R&D Community Benefits Plan in a PDF file using the following naming convention for the title "RDCBenefits.pdf" and click on "Add Optional Other Attachment" to attach."

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 K for more guidance

xvii. 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 being 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.

Principal Investigators 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 project 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 National Science Foundation (NSF), which may be generated by the Science Experts Network Curriculum Vita (SciENcv), a cooperative venture maintained at https://www.ncbi.nlm.nih.gov/sciencv/, and is also available at https://www.nsf.gov/bfa/dias/policy/nsfapprovedformats/cps.pdf. The use of a format required by another agency is intended to reduce the administrative burden to researchers by promoting the use of common formats. 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 naming convention for the title "CPS.pdf" and click on "Add Optional Other Attachment" to attach.

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 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 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 DOE award.[41]

xviii. Locations of Work

The applicant must complete the supplied template by listing the city, state, and zip code + 4 for each location where project work will be performed by the prime recipient or subrecipient(s). Save the Location of Work in a single Microsoft Excel file using the following naming convention for the title "LOW.xls or xlsx" and click on "Add Optional Other Attachment" to attach.

xix. 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;

[41] 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.

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

Save the Transparency of Foreign Connections in a single PDF file using the following naming convention for the title "BusinessSensitive.pdf" and click on "Add Optional Other Attachment" to attach.

xx. Potentially Duplicate Funding Notice (if applicable)

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 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 naming convention for the title "PDFN.pdf" and click on "Add Optional Other Attachment" to attach.

xxi. Environmental Questionnaire

The Applicant must submit an environmental questionnaire providing for the work of the entire project. The Applicant is also responsible for submitting a separate environmental questionnaire for each proposed subrecipient performing at a different location. The environmental questionnaire is available at https://netl.doe.gov/sites/default/files/2018-02/451_1-1-3.pdf.

Save the questionnaire in a single file named "Env.pdf" (or "Env-FILL IN TEAM MEMBER.pdf" if more than questionnaire is submitted) and click on "Add Optional Other Attachment" to attach.

NOTE: If selected for award and if a subrecipient's location is not known at the time of application, a subsequent environmental questionnaire will be needed prior to beginning work at an alternate location

The Selection Official may consider the results of this evaluation when making selections.

xxii. Technology Maturation Plan

The Technology Maturation Plan (TMP) must not exceed 15 pages including cover page, table of contents, footnotes/endnotes, charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5-inch by 11-inch paper with 1-inch margins (top, bottom, left and right) double spaced with font no smaller than 12-point.

Applicants shall prepare the TMP in the format provided in Appendix I of this FOA. Save this plan in a single file named "TMP.pdf" and click on "Add Other Attachment" to attach.

xxiii. Project Management Plan (PMP)

The PMP must not exceed 15 pages including cover page, table of contents, footnotes/endnotes, charts, graphs, maps, photographs, and other pictorial presentations, when printed using standard 8.5-inch by 11-inch paper with 1-inch margins (top, bottom, left and right) double spaced with font no smaller than 12-point. Applicants shall prepare the PMP in the format provided in Appendix J of the FOA. Save this information in a file named "PMP.pdf," and click on "Add Optional Other Attachment" to attach.

xxiv. Technical Research Plan

Applicants are required to submit a Technical Research Plan that is to be executed during performance of the project. Guidance for preparing the plan is provided in Section I.B.iv. The Technical Research Plan should use standard 8.5-inch by 11-inch paper with 1-inch margins (top, bottom, left and right) double spaced with font no smaller than 12-point. Save this plan in a single file named "TRP.pdf" and click on "Add Other attachment" to attach.

xxv. Teaming Plan

Applicants are required to submit a teaming plan that describes the proposed project team, which should include a coal-based resource supplier, small pilot-scale (or larger-scale) MREO/MRES and/or CMM facility operator, advanced separation and purification and reduction to metal(s) process developers, and an industrial partner(s) whose expertise is in manufacturing and/or production of intermediate and/or end-use products containing REE and/or CMM, as described in Section I.B.iv. Save this plan in a single file named "TP.pdf" and click on "Add Other attachment" to attach.

xxvi. Photograph(s)

Applicants are required to submit photograph(s) of largest facility in use or previously used to generate products that will provide the feedstock materials/concentrates for the various process circuit(s), as described in Section I.B.iv. Photo(s) should also be included of each processing stage/circuit that may be modified for use as a newly developed, advanced circuit (e.g., solvent extraction, thermal processing, etc.). Photo(s) should include some reference gauge of dimension (e.g., a quarter, a person, etc.), and should also include captions describing the circuit(s) depicted. Save the photo-containing document in a file named "Photos.pdf," and click on "Add Optional Other Attachment" to attach.

D. 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 non-exhaustive list of examples information that may be required:

- Personnel proposed to work on the project and collaborating organizations (See Section VI.B.xix. Participants and Collaborating Organizations);
- Current and Pending Support (See Sections IV.C.xvii. and VI.B.xx. Current and Pending Support);
- 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;
- Updated Environmental Questionnaire;
- Cybersecurity Plan, if applicable.

E. 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) Be registered in the SAM at https://www.sam.gov before submitting its application; (2) provide a valid UEI number in its application; and (3) continue to maintain an active SAM registration with current information at all times during which it has an active federal award or an application or plan under consideration by a federal awarding agency. DOE may not make a federal award to an applicant until the applicant has complied with all applicable 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, the DOE will determine that the applicant is not qualified to receive a federal award and use that determination as a basis for making a federal award to another applicant.

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 utilize 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**.**

F. Submission Dates and Times

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

G. Intergovernmental Review

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

H. 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 their project and such costs may not be recognized as allowable cost share. Nothing contained in the pre-award cost reimbursement regulations or any pre-award costs approval letter from the Contracting Officer override 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 DOE 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. 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 that term is defined in Section 70914 of the Bipartisan Infrastructure Law, 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 the implementation guidance from the Office of Management and Budget (OMB) 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: (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 manufactured products domestically 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 the Bipartisan Infrastructure Law. 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, and 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 of 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 3 years after the completion of the project and must make those payrolls available to the DOE or the United States 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 the DOE.
(7) cooperating with any authorized representative of the Department of Labor in their 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.
(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 to maintain competency in Davis-Bacon Act compliance. The Contracting Officer will notify the recipient of any DOE sponsored Davis-Bacon Act compliance trainings. The 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 Part 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 Davis-Bacon 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.

The Department of Labor's (DOL) Office of Federal Contractor Compliance Programs (OFCCP) uses a neutral process to schedule compliance evaluations. Consult OFCCP's Technical Assistance Guide[42] to gain an understanding of the requirements and possible required actions the recipients, subrecipients, contractors, and subcontractors must take. Additional guidance may also be found in the National Policy Assurances, produced by DOE.

xiv. Foreign Collaboration Considerations

a. Consideration of new collaborations with foreign entities, organizations, and governments. The recipient will be required to provide DOE with advanced written notification of any potential collaboration with foreign entities, organizations, 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, organization, or government regarding the potential collaboration or negotiating the terms of any potential agreement.
b. Existing collaborations with foreign entities, organizations, 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

[42] 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

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 polies and procedures.

V. Application Review Information

A. Technical Review Criteria

i. Full Applications

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

Criterion 1: Scientific and Technological Merit (35%)
This criterion involves consideration of the following factors:

- Adequacy of the description of the proposed technology and degree to which the proposed technology or methodology meets the stated objectives of the FOA and the relevant Topic Area.
- Degree to which the Applicant comprehensively advances arguments and provides details that clearly distinguishes the proposed R&D and why it is needed now relative to prior work.
- Feasibility of the proposed concept; the degree to which the proposed work is based on sound scientific and engineering principles.
- Likelihood of the proposed project meeting the success metrics and the degree to which the proposed project meets and exceeds the minimum goal of producing and processing rare earth and critical minerals and materials (Topic Area 1) or critical minerals and materials (Topic Area 2) at reduced cost (e.g., ~20%).
- Adequacy of the proposed Technical Research Plan and other required attachments.
- If proposed, adequacy and feasibility of the Applicant's plan to produce value-added product(s) with a current commercial market and the likelihood that the products will positively impact economics of the overall process.
- Degree to which the capital and operating expenses are reduced compared to conventional technologies.

Criterion 2: Technical Approach and Understanding (30%)
This criterion involves consideration of the following factors:

- Adequacy and feasibility of the Applicant's approach to achieving the objectives of the FOA and the relevant Topic Area.
- Feasibility, appropriateness, rationale, and completeness of the proposed Statement of Project Objectives, such that there is a logical progression of work and a clear path forward toward meeting the goals and objectives of the FOA and the relevant Topic Area.

- The adequacy and completeness of the Project Management Plan in establishing baselines (technical scope, budget, schedule) and in managing project performance relative to those baselines; defining the actions that will be taken when these baselines must be revised; and identification of project risks and strategies for mitigation.

Criterion 3: Technical and Management Capabilities (20%)
This criterion involves consideration of the following factors:

- Demonstrated experience of the applicant and partnering organizations in the technology areas addressed in the application and in managing projects of similar size, scope, and complexity. This includes the credentials, capabilities, and experience of key personnel and partnering organizations to perform the work, in order to produce MREO/MRES, CMM, and/or REM at the quantities and purities as identified in this FOA and the relevant Topic Area, and to complete the required analyses.
- Appropriateness and extent of credentials, capabilities, and experience across all circuits addressed in the application and work to be performed by the key personnel and partnering organizations (e.g., partners, sub-recipients, consultants, students, etc.)
- Clarity and likely effectiveness of the project organization, including sub-recipients or partners, to successfully complete the project, including the extent to which the Technical Research Plan includes industrial partners that extend across the entire REE and/or CMM supply chain for the relevant Topic Area.
- Adequacy and availability of proposed personnel, facilities, equipment, and resource materials to perform project tasks.

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

<u>Diversity, Equity, Inclusion, and Accessibility</u>

- 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.

Budget Information Evaluation Criteria

The budget evaluation, which is not point scored, will be conducted to determine the following:

- Reasonableness, allowability, and allocation of the proposed cost and cost share.
- Completeness and adequacy of the supporting documentation for the cost estimate.
- Alignment and agreement of the SOPO tasks to the budget, and adequacy of associated supporting documentation.
- Correspondence between the budget estimate and the magnitude of the work proposed.

The Selection Official (SO) may consider the results of this evaluation when making selections.

Environmental Evaluation Criteria

The Applicant must submit an environmental questionnaire providing for the work of the entire project. The Applicant is also responsible for submitting a separate environmental questionnaire for each proposed subrecipient performing at a different location. The environmental questionnaire is available at

https://netl.doe.gov/sites/default/files/2018-02/451_1-1-3.pdf. NOTE: If selected for award and if a subrecipient's location is not known at the time of application, a subsequent environmental questionnaire will be needed prior to them beginning work at an alternate location

The SO may consider the results of this evaluation when making selections.

B. Standards for Application Evaluation

Applications that are determined to be eligible will be evaluated in accordance with this FOA 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:

- It may be desirable to select for award a project, or group of projects, that represent a diversity of technical approaches and methods under this FOA or the overall program.
- It may be desirable to support complementary and/or similar projects which, when taken together, will best achieve the program's research goals and objectives.
- It may be desirable that different kinds and sizes of organizations be selected for award in order to provide a balanced programmatic effort and a variety of technical perspectives under this FOA or the overall program. For example, it may be desirable to select a project, or group of projects, that exhibit team member diversity, with participants including but not limited to those from MSIs [e.g., Historically Black Colleges and Universities (HBCUs) and other Minority Institutions].[43]
- In order to best achieve the program's research goals and objectives, it may be desirable to select for award a project or group of projects with a broad or specific geographic distribution under this FOA or the overall program.

[43] Minority Serving Institutions (MSIs), including HBCUs and other Minority Institutions as educational entities recognized by the Office of Civil Rights (OCR), U.S. Department of Education, and identified on the OCR's Department of Education U.S. accredited postsecondary minorities' institution list. See https://www2.ed.gov/about/offices/list/ocr/edlite-minorityinst.html.

- It may be desirable to select a project, or group of projects, if such a selection will optimize use of available funds.
- It may be desirable to select a project, or group of projects, if such a selection presents lesser schedule risk, lesser budget risk, lesser technical risk, and/or lesser environmental risks. Environmental risk includes, but is not limited to, an adverse impact to air, soil, water, or increase in overall cradle to grave greenhouse gas footprint (carbon dioxide equivalent).
- It may be desirable to select an entity located in an urban and economically distressed area including a Qualified Opportunity Zone (QOZ) or to select a project, or group of projects, if the proposed project(s) will occur in a QOZ or otherwise advance the goals of a QOZ, including spurring economic development and job creation in distressed communities throughout the United States.
- It may be desirable to select for award a project, or group of projects, that represent a diversity of technologies or feedstocks under this FOA.
- It may be desirable to select for award a project, or group of projects, that leverage existing public-private partnerships and/or Federal resources.
- It may be desirable to select for award a project, or group of projects, with a higher level of industry involvement and demonstrated ability to accelerate commercialization and overcome key market barriers.
- 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; and
- The degree to which the proposed project will employ procurement of U.S. iron, steel, manufactured products, and construction materials.

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

V.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

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

VI. Award Administration Information

A. Award Notices

i. Ineligible Submissions

Ineligible 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. The notification letter will state the basis upon which the Full Application is ineligible and not considered for further review.

ii. 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 Grants.gov. 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.

iii. Successful Applicants

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

The award negotiation process will take approximately 60 days. Applicants must designate a primary and a backup point-of-contact in Grants.gov 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 IV.H.ii. of the FOA for guidance on pre-award costs.

iv. 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. As an alternate, 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.

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

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

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

3. **Grants.gov**
   Register in Grants.gov (https://www.grants.gov/) to receive automatic updates when Amendments to this FOA are posted.

4. **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 Grants.gov

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

ii. Award Administrative Requirements

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

iii. Foreign National Participation (April 2023)

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, will be required to provide DOE with specific information about each foreign national to satisfy requirements for foreign national participation and access approvals. 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.

Approval for foreign nationals in Principal Investigator/Co-Investigator roles, from countries of risk (i.e., China, Iran, North Korea, and Russia), or from countries identified on the U.S. Department of State's list of State Sponsors of Terrorism (https://www.state.gov/state-sponsors-of-terrorism/) may require written authorization from DOE before they can participate in the performance of any work under an award.

A "foreign national" is defined as any person who is not a United States citizen by birth or naturalization. DOE may elect to deny foreign national's participation in the award. Likewise, DOE may elect to deny a foreign national's access to a DOE sites, information, technologies, equipment, programs, or personnel.

Applicants selected for award negotiations must include this requirement in subawards.

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. Flood Resilience

Applications should indicate whether the proposed project location(s) is within a floodplain, how the floodplain was defined, and how future flooding will factor into the project's design. The base floodplain long used for planning has been the 100-year floodplain, that is, a floodplain with a 1.0 percent chance of flooding in any given year. As directed by Executive Order 13690, Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input (2015), Federal agencies, including DOE, continue to avoid development in a floodplain to the extent possible. When doing so is not possible, Federal agencies are directed to "expand management from the current base flood level to a higher vertical elevation and corresponding horizontal floodplain to address current and future flood risk and ensure that projects funded with taxpayer dollars last as long as intended." The higher flood elevation is based on one of three approaches: climate-informed science (preferred), freeboard value, or 0.2 percent annual flood change (500-year floodplain). EO 13690 and related information is available at https://www.energy.gov/nepa/articles/eo-13690-establishing-federal-flood-risk-management-standard-and-process-further.

viii. Applicant Representations and Certifications

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

2. **Corporate Felony Conviction and Federal Tax Liability Representations**
   In submitting an application in response to this FOA, the applicant represents that:
   - **a.** It is **not** a corporation that has been convicted of a felony criminal violation under any federal law within the preceding 24 months; and
   - **b.** It is **not** a corporation that has any unpaid federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability.

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

3. **Nondisclosure and Confidentiality Agreements Representations**
   In submitting an application in response to this FOA the applicant represents that:
   - **a.** It **does not and will not** require its employees or contractors to sign internal nondisclosure or confidentiality agreements or statements prohibiting or otherwise restricting its employees or contactors from lawfully reporting waste, fraud, or abuse to a designated investigative or law enforcement representative of a federal department or agency authorized to receive such information.
   - **b.** It **does not and will not** use any federal funds to implement or enforce any nondisclosure and/or confidentiality policy, form, or agreement it uses unless it contains the following provisions:
     - **(1)** *''These provisions are consistent with and do not supersede, conflict with, or otherwise alter the employee obligations, rights, or liabilities created by existing statute or Executive Order relating to (1) classified information, (2) communications to Congress, (3) the reporting to an Inspector General of a violation of any law, rule, or regulation, or mismanagement, a gross waste of funds, an abuse of authority, or a substantial*

and specific danger to public health or safety, or (4) any other whistleblower protection. The definitions, requirements, obligations, rights, sanctions, and liabilities created by controlling Executive Orders and statutory provisions are incorporated into this agreement and are controlling.''

(2) The limitation above shall not contravene requirements applicable to Standard Form 312 Classified Information Nondisclosure Agreement (https://fas.org/sgp/othergov/sf312.pdf), Form 4414 Sensitive Compartmented Information Disclosure Agreement (https://fas.org/sgp/othergov/intel/sf4414.pdf), or any other form issued by a federal department or agency governing the nondisclosure of classified information.

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

ix. Statement of Federal Stewardship

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.

x. 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 as a whole. Substantial involvement includes, but is not limited to, the following.
Recipient's Responsibilities. The Recipient is responsible for:

- Performing the activities supported by this award in accordance with the Project Management Plan (PMP), including providing the required personnel, facilities, equipment, supplies and services.
- Managing and controlling project activities in accordance with established processes and procedures to ensure tasks and subtasks are completed within schedule and budget constraints defined by the current PMP.
- Implementing an approach to identify, analyze, and respond to project risks that is commensurate with the complexity of the project.
- Defining and revising approaches and plans, submitting the plans to DOE for review, and incorporating DOE comments.
- Coordinating related project activities with subrecipients and external suppliers, including contractors, to ensure effective integration of all work elements.
- Attending annual project review meetings and reporting project status.
- Participating in peer review evaluations of the project, or peer review evaluations of the program that their project supports.
- Submitting technical reports and publicly releasable documents that incorporate DOE comments.
- Presenting the project results at appropriate technical conferences or meetings as directed by the DOE Project Officer.
- Participate in monthly status meetings with DOE NETL and FECM personnel.
- Submitting sample materials to DOE of REE and CMM products produced during conduct of this FOA.
- Submitting materials characterization information and other relevant data collected during conduct of the project to DOE for public release in NETL's Energy Data eXchange (EDX).
- Participate in the Critical Materials Collaborative including, but not limited to, an in-person annual symposium, virtual coordination meetings, and periodic presentations on research progress.

DOE Responsibilities. DOE has the right to intervene in the conduct or performance of project activities for programmatic reasons. Intervention includes the interruption or modification of the conduct or performance of project activities. Suspension or termination of the cooperative agreement under 2 CFR part 200, as amended by 2 CFR part 910 (DOE Financial Assistance Regulations) does not constitute intervention in the conduct or performance of project activities.

DOE is responsible for:

- Reviewing in a timely manner project plans, including project management, testing and technology transfer plans, and recommending alternate approaches, if the plans do not address critical programmatic issues;
- Participating in project management planning activities, including risk analysis, to ensure DOE's program requirements or limitations are considered in performance of the work elements;
- Conducting annual project review meetings and monthly status meetings to ensure adequate progress and that the work accomplishes the program and project objectives. Recommending alternate approaches or shifting work emphasis, if needed;
- Providing substantial involvement to ensure that project results address critical system and programmatic goals established by DOE FECM, in coordination with DOE's FECM Minerals Sustainability program;
- Promoting and facilitating technology transfer activities, including disseminating program results through presentations and publications;
- Serving as scientific/technical liaison between awardees and other program or industry staff; and
- Reviewing and concurring with ongoing technical performance to ensure that adequate progress has been obtained within the current Budget Period authorized by DOE before work can commence on subsequent Budget Periods.

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 ten (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 their licensees or assignees to stimulate such utilization. The reports must include information regarding the status of development, date of first commercial sale or use, gross royalties received by the prime recipient, and such other data and information as 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. Energy Data eXchange (EDX) Requirements

The DOE is required to improve access to federally funded research results, proper archiving of digital data, and expanded discovery and reuse of research

datasets per DOE and Executive Orders. The Energy Data eXchange (EDX) is a data laboratory developed and maintained by NETL to find, connect, curate, use, and re-use data to advance fossil energy and environmental research and development (R&D).

Data products generated under the resulting award will be required to be submitted in the EDX at https://edx.netl.doe.gov/. Data products include but are not limited to software code, tools, applications, webpages, portfolios, images, videos, and datasets.

EDX uses federation and web services to elevate visibility for publicly approved assets in the system, including connections with DOE's Office of Scientific and Technical Information (OSTI) systems, Data.gov, and Re3Data. This ensures compliance with federal requirements, while raising visibility for researcher's published data products to promote discoverability and reuse.

EDX supports a wide variety of file types and formats including: 1) data, 2) metadata, 3) software/tools, and 4) articles (provided that there is an accompanying Government use license). A partial list of file formats accepted by EDX is provided below, however, EDX is designed for flexibility and accepts all types of file formats.

- Common Data Product Submission Formats: ASC, AmiraMesh, AVI, CAD, CSV, DAT, DBF, DOC, DSV, DWG, GIF, HDF, HTML, JPEG2000, JPG, MOV, MPEG4, MSH/CAS/DAT, NetCDF, PDF, PNG, PostScript, PPT, RTF, Surface, TAB, TIFF, TIFF Stacks, TXT, XLS, SML, Xradio, ZIP, and others.
- Geographic Formats: APR, DBF, DEM, DLG, DRG, DXF, E00, ECW, GDB, GeoPDF, GeoTIFF, GML, GPX, GRID, IMG, KML, KMZ, MOB, MrSID, SHP, and others.

Information provided to EDX will be made publicly available, unless authorized under the resulting award. Additional information on EDX is available at https://edx.netl.doe.gov/about.

When data products are submitted to EDX, the data product will need to be registered with a digital object identifier (DOI) through OSTI to ensure more visibility in other search repositories (i.e., osti.gov, data.gov, Google Scholar, etc.). The OSTI DOI can be established through an application programming interface (API) by completing just a few additional fields.

The Recipient or subrecipient should coordinate with the Project Manager on an annual basis to assess if there is data that should be submitted to EDX and identify the proper file formats prior to submission. All final data products shall be submitted to EDX by the Recipient prior to the completion of the project.

xiv. Reporting

Reporting requirements are identified on the Federal Assistance Reporting Checklist and Instructions, DOE F 4600.2, attached to the award agreement.

Additional reporting requirements apply to projects funded by BIL. 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 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 sub-contractors 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 (IP) Generation and IP Utilization

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 United States government of a conference held by any Executive branch department, agency, board, commission, or office for which the cost to the United States government would otherwise exceed $20,000, thereby circumventing the required notification by the head of any such Executive Branch department, agency, board, commission, or office to the Inspector General (or senior ethics official for

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

xvi. Indemnity

Awards resulting from this FOA will contain the following provision reminding Recipients of DOE's right of indemnification.

The Recipient shall indemnify the Government and its officers, agents, or employees for any and all liability, including litigation expenses and attorney's fees, arising from suits, actions, or claims of any character for death, bodily injury, or loss of damage to property or to the environment, resulting from the project, except to the extent that such liability results from the direct fault or negligence of Government officers, agents or employees, or to the extent such liability may not be covered by applicable allowable costs provisions.

xvii. Uniform Commercial Code (UCC) Financing Statements

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

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

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

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

xix. 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 IV.C.xvii.

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 VIII.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)[44] 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

[44] 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.

recipient must include all financial conflicts of interest (FCOI) (i.e., managed and unmanaged/unmanageable) in their 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 (DMP)

Each Full Application is required to include a DMP. A DMP explains how, when appropriate, data generated in the course of the work performed under a DOE award will be shared and preserved in order 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.

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. 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 an acceptable cybersecurity plan to DOE prior to receiving funding.[45] These plans are intended to foster a cybersecurity-by-design approach for BIL efforts. The Department will also 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.

The Department 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

[45] 42 U.S.C. § 18725

(C2M2).[46] 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'.[47]

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

xxvii. 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 award under this FOA, the recipient 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 where the recipient expects to submit disposition instructions); acknowledgement that the recipient shall not sell or

[46] 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).

[47] 42 U.S.C. § 18725

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

VII. 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 as described below. Specifically, questions regarding this FOA must be submitted through the FedConnect portal. You must register with FedConnect to respond as an interested party to submit questions, and to view responses to questions. It is recommended that you register as soon after release of the FOA as possible to have the benefit of all responses. Applicants are encouraged to review previously issued Questions and Answers prior to the submission of questions.

Questions and comments concerning this FOA shall be submitted not later than 3 business days prior to the application due date. 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 the FedConnect portal at: https://www.FedConnect.net. DOE will attempt to respond to a question within 3 business days, unless a similar question and answer has already been posted on the website.

Questions relating to the registration process, system requirements, how an application form works, or the submittal process must be directed to Grants.gov at 1-800-518-4726 or support@grants.gov. DOE/NNSA cannot answer these questions.

VIII. Other Information

A. FOA Modifications

Amendments to this FOA will be posted on the Grants.gov system and the FedConnect portal. However, you will only receive an email when an amendment or a FOA is posted on these sites by registering with FedConnect as an interested party for this FOA. DOE 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 Government's right to use the information if it is obtained from another source.

If an applicant chooses to submit business sensitive, trade secrets, proprietary, or otherwise confidential information, the applicant must provide **two copies** of the submission (e.g., 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 business sensitive, trade secrets, 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 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 business sensitive, trade secrets, proprietary, or otherwise confidential information:

> **Notice of Restriction on Disclosure and Use of Data:**
> Pages [list applicable pages] of this document may contain business sensitive, trade secrets, 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 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 business sensitive, trade secrets, proprietary, or otherwise confidential information must be marked as follows: "Contains Business Sensitive, Trade Secrets, 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 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 which describe and promote the understanding of scientific and technical aspects of specific energy technologies, but not those which encourage or support political activities such as the collection and dissemination of information related to potential, planned or pending legislation.

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

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

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. In order to avail itself of the class waiver, a domestic large business must agree that any products embodying or produced through the use of a subject invention first created or reduced to practice under this program will be substantially manufactured in the United States.

- Advance and Identified Waivers: For an applicant not covered by a Class Patent Waiver or the Bayh-Dole Act, the applicant may request a patent waiver that will cover subject inventions that may be invented under the award, in advance of or within 30 days after the effective date of the award. Even if an advance waiver is not requested or the request is denied, the recipient will have a continuing right under the award to request a waiver for identified inventions, i.e., individual subject inventions that are disclosed to DOE within the timeframes set forth in the award's intellectual property data terms and conditions. Any patent waiver that may be granted is subject to certain terms and conditions in 10 CFR 784.
- DEC: On June 07, 2021, DOE approved a DETERMINATION OF EXCEPTIONAL CIRCUMSTANCES (DEC) UNDER THE BAYH-DOLE ACT TO FURTHER PROMOTE DOMESTIC MANUFACTURE OF DOE SCIENCE AND ENERGY TECHNOLOGIES. In accordance with this DEC, all awards, including sub-awards, under this FOA shall include the U.S. Competitiveness Provision in accordance with Section VI.B.xxi. U.S. Manufacturing Commitments of this FOA. A copy of the DEC can be found at https://www.energy.gov/gc/determination-exceptional-circumstances-decs. Pursuant to 37 CFR 401.4, any nonprofit organization or small business firm as defined by 35 U.S.C. § 201 affected by any DEC has the right to appeal it by providing written notice to DOE within 30 working days from the time it receives a copy of the determination.
- DOE may issue and publish on the website above further DECs prior to the issuance of awards under this FOA. DOE may require

additional submissions or requirements as authorized by any applicable DEC.

K. Government Rights in Subject Inventions

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

Government Use License

The United States 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 United States 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 United States 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 United States 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 awards intellectual property terms and conditions and a listing of unlimited rights data (i.e., non-protected data) must be inserted into the data clause in the award. In addition, invention disclosures may be protected from public disclosure for a reasonable time in order to allow for filing a patent application.

M. Copyright

The prime recipient and subrecipients may assert copyright in copyrightable works, such as software, first produced under the award without 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 uses *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. The term "PII" refers to information which can be used to distinguish or trace an individual's identity, such as their name, social security number, biometric records, alone, or when combined with other personal or identifying information which is linked or linkable to a specific individual, such as date and place of birth, mother's maiden name. (See OMB Memorandum M-07-16 dated May 22, 2007, found at: https://www.whitehouse.gov/sites/whitehouse.gov/files/omb/memoranda/2007/m07-16.pdf

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

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

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

APPENDIX A – COST SHARE INFORMATION

Cost Sharing or Cost Matching

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

How Cost Sharing Is Calculated

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

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

What Qualifies For Cost Sharing

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(B) Valuing and documenting contributions

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

a. The certified value of the remaining life of the property recorded in the recipient's accounting records at the time of donation; or

b. The current fair market value. If there is sufficient justification, the Contracting Officer may approve the use of the current fair market value of the donated property, even if it exceeds the certified value at the time of donation to the project. The Contracting Officer may accept the use of any reasonable basis for determining the fair market value of the property.

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

(3) Valuing volunteer services. Volunteer services furnished by professional and technical personnel, consultants, and other skilled and unskilled labor may be

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

(4) Valuing property donated by third-parties.

- **a.** Donated supplies may include such items as office supplies or laboratory supplies. Value assessed to donated supplies included in the cost sharing or matching share must be reasonable and must not exceed the fair market value of the property at the time of the donation.
- **b.** Normally only depreciation or use charges for equipment and buildings may be applied. However, the fair rental charges for land and the full value of equipment or other capital assets may be allowed, when they will be consumed in the performance of the award or fully depreciated by the end of the award, provided that the Contracting Officer has approved the charges. When use charges are applied, values must be determined in accordance with the usual accounting policies of the recipient, with the following qualifications:
  - **i.** The value of donated space must not exceed the fair rental value of comparable space as established by an independent appraisal of comparable space and facilities in a privately-owned building in the same locality.
  - **ii.** The value of loaned equipment must not exceed its fair rental value.

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

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

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

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

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

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

Each task must be calculated individually as follows:

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

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

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

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

The calculation may then be completed as follows:

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

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

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

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 economy security.[48] 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 U.S. Competitiveness Provision (see Section VI.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 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);

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

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.

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

As set forth in Section IV.H.iii., all work under funding 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 United States 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 domestic American manufacturing of products and/or services;
8. A description of the likelihood of Intellectual Property (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.
12. Information about the entity(ies) involved in the work proposed to be conducted the United States. (i.e., entity seek a waiver and the entity(ieds) that will conduct the 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 REQUIREMENT FOR INFRASTRUCTURE PROJECTS

A. Definitions

For purposes of the Buy America Requirement, 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[49]—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.

[49] 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 Requirement 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[50] are produced in the United States—this means that all manufacturing processes for the construction material occurred in the United States.

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

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

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 manufactured products domestically that are deemed available in sufficient and reasonable 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 Requirement 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 percent.

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 Product Service Codes (PSC) and North American Industry Classification System (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

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 ABBREVIATIONS

AMD	Acid mine drainage
AOR	Authorized Organizational Representative
API	Application programming interface
BIL	Bipartisan Infrastructure Law
CEJST	Climate and Economic Justice Screening Tool
CETs	Critical and Emerging Technologies
CFR	Code of Federal Regulations
CMC	Critical Materials Collaborative
CMM	Critical minerals and materials
Co	Cobalt
COI	Conflict of Interest
Cr	Chromium
CSF	Cybersecurity Framework
DEC	Determination of Exceptional Circumstances
DEIA	Diversity, Equity, Inclusion, and Accessibility
DMP	Data Management Plan
DOE	Department of Energy
DOL	Department of Labor
Dy	Dysprosium
EBiz POC	Electronic Business Point of Contact
Eu	Europium
FFATA	Federal Funding and Transparency Act of 2006
FFRDC	Federally Funded Research and Development Center
Ga	Gallium
Gd	Gadolinium
Ge	Germanium
HBCUs	Historically Black Colleges and Universities
IIJA	Infrastructure Investment and Jobs Act
In	Indium
IP	Intellectual Property
Ir	Iridium
ISHP	Individually separated, high purity
Li	Lithium
Lu	Lutetium
Mn	Manganese
MPIN	Marketing Partner ID Number
MREO	Mixed rare earth oxides
MRES	Mixed rare earth salts
NAICS	North American Industry Classification System

Nb	Niobium
Nd	Neodymium
NEPA	National Environmental Policy Act
NETL	National Energy Technology Laboratory
Ni	Nickel
NSF	National Science Foundation
OFCCP	Office of Federal Contractor Compliance Program
OIG	Office of Inspector General
OMB	Office of Management and Budget
OSTI	Office of Science and Technology
PFD	Process Flow Diagram
PLA	Project labor agreements
PMP	Project Management Plan
POC	Proof of concept
PPM	Parts per million
Pr	Praseodymium
PSC	Product Service Codes
Pt	Platinum
QOZ	Qualified Opportunity Zone
R&D	Research and Development
RD&D	Research, Development, and Demonstration
REE	Rare earth elements
REM	Rare earth metals
REO	Rare earth oxides
RES	Rare earth salts
SABP	Systems Analysis Best Practices
SAM	System for Award Management
SciENcv	Science Experts Network Curriculum Vita
SEM	Scanning electron microscopy
Sm	Samarium
SMART	Specific, Measurable, Achievable, Relevant, and Timely
Sn	Tin
SO	Selection Official
SOPO	Statement of Project Objectives
SOTA	State of the art
Sr	Strontium
SX	Solvent extraction
t	Metric tons
Tb	Terbium
TEA	Technoeconomic analysis
Ti	Titanium

TMP	Technology Maturation Plan
TRA	Technology Readiness Assessment
TRL	Technology Readiness Level
UCC	Uniform Commercial Code
UEI	Unique Entity Identifier
V	Vanadium
WBS	Work Breakdown Structure
WP	Work Proposal
Y	Yttrium

APPENDIX G – STATEMENT OF PROJECT OBJECTIVES

STATEMENT OF PROJECT OBJECTIVES
Title of Project
(Insert the title of the work to be performed. Be concise and descriptive)

This should be a standalone document that states the work to be conducted and should not include any proprietary/confidential information.

A. OBJECTIVES

Include one paragraph on the overall objective(s) of the work. Note: if the project will be performed in phases, include specific objective(s) for each phase of the work.

B. SCOPE OF WORK

This section should not exceed one-half page and should summarize the effort and approach to achieve the objective(s) of the work. Note: if the project will be performed in phases, includes specific scope statement(s) for each phase.

C. TASKS TO BE PERFORMED

This section provides a brief summary of the planned approach to this project. Tasks/subtasks, concisely written, should be provided in a logical sequence and should be divided into the phases of the project, as appropriate. In writing the Statement of Project Objectives (SOPO), avoid 1) the use of proper nouns to minimize SOPO modifications in the event of changes to the project team, facilities, etc.; 2) figures and equations; 3) references to other documents and publications; and 4) details about past work and discussion of technical background (which should be covered elsewhere in the application narrative).

Task 1.0 - Project Management and Planning

Subtask 1.1 – Project Management Plan (REQUIRED; APPLICANT INSERT THE LANGUAGE PROVIDED BELOW IN QUOTES)

“The Recipient shall manage and direct the project in accordance with a Project Management Plan to meet all technical, schedule and budget objectives and requirements. The Recipient will coordinate activities in order to effectively accomplish the work. The Recipient will ensure that project plans, results, and decisions are appropriately documented and project reporting and briefing requirements are satisfied.

The Recipient shall update the Project Management Plan 30 days after award and as necessary throughout the project to accurately reflect the current status of the project. Examples of when it may be appropriate to update the Project Management Plan include: (a) project management policy and procedural changes; (b) changes to the technical, cost, and/or schedule baseline for the project; (c) significant changes in scope, methods, or approaches; or (d) as otherwise required to ensure that the plan is the appropriate governing document for the work required to accomplish the project objectives.

Management of project risks will occur in accordance with the risk management methodology delineated in the Project Management Plan in order to identify, assess, monitor and mitigate technical uncertainties as well as schedule, budgetary and environmental risks associated with all aspects of the project. The results and status of the risk management process will be presented during project reviews and in quarterly progress reports with emphasis placed on the medium- and high-risk items."

Subtask 1.2 – Technology Maturation Plan (REQUIRED; APPLICANT INSERT THE LANGUAGE PROVIDED BELOW IN QUOTES)

"The Recipient shall develop a Technology Maturation Plan (TMP) that describes the current technology readiness level (TRL) of the proposed technology/technologies, relates the proposed project work to maturation of the proposed technology, describes the expected TRL at the end of the project, and describes any known post-project research and development necessary to further mature the technology. The initial TMP is due 90 days after award and should be updated as needed throughout the project period of performance. A final TMP should be submitted at the completion of the project."

APPLICANT continue with tasks/sub-tasks as necessary. If the project is structured in Phases, clearly delineate which tasks/subtasks are in each Phase.

Task 2.0 - (Title)
Task descriptions should include a concise description of the work to be conducted for each task. If the task includes subtasks, provide a general description of how each subtask is related to the overall scope of the task.

Subtask 2.1 - (Title)
Subtask descriptions should include a concise description of the work to be conducted for each subtask.

Subtask 2.2 - (Title)

D. DELIVERABLES (Required: Applicant insert the Language provided below in quotes and continue to complete.)

"The periodic and final reports shall be submitted in accordance with the "Federal Assistance Reporting Checklist" and the instructions accompanying the checklist. In addition to the reports specified in the "Federal Assistance Reporting Checklist", the Recipient must provide the following to the NETL Project Manager (identified in Block 15 of the Assistance Agreement as the Program Manager)."

Task / Subtask Number	Deliverable Title	Due Date
1.1	Project Management Plan (PMP)	Update due 30 days after award. Revisions to the PMP shall be submitted as requested by the NETL Project Manager.
1.2	Technology Maturation Plan (TMP)	Updated plan due 90 days after award. Updates to the TMP shall be submitted, as needed, throughout the project period of performance. A final TMP is due as an attachment to the Final Report.
X.X	Split Samples	Due 30 days prior to project completion.
X.X	Chemical Characterization and Analytical Data	Analysis will be included in the Final Technical Report and be uploaded to NETL's publicly available Energy Data eXchange (EDX) database platform in the format provided by NETL). EDX can be found by can be found by accessing the following URL link: https://edx.netl.doe.gov/ree-cm/

APPLICANT continue to identify deliverables (other than those identified on the "Federal Assistance Reporting Checklist") that will be delivered using the format provided in the table above. Ensure the delivery date to NETL is also identified. For examples: Delivery to NETL X months after completion of task/subtask X.

NOTE: If the application is selected for award, DOE may require the Recipient to include additional deliverables, provided that such deliverables are consistent with the budget, schedule, and scope of the project.

E. BRIEFINGS/TECHNICAL PRESENTATIONS (Required: Applicant insert the language provided below in quotes and continue to complete.)

"The Recipient shall prepare detailed briefings for presentation to the NETL Project Manager at their facility located in Pittsburgh, PA, Morgantown, WV, Albany, OR, or via WebEx. The Recipient shall make a presentation to the NETL Project Manager at a project kick-off meeting held within ninety (90) days of the project start date. At a minimum, annual briefings shall also

be given by the Recipient to explain the plans, progress, and results of the technical effort and a final project briefing at the close of the project shall also be given."

At the Applicant's discretion, other briefings/presentations may be added to Section E of the SOPO.

NOTE: If the application is selected for award, DOE may require the Recipient to include additional briefings/presentations, provided that such briefings/presentations are consistent with the budget, schedule, and scope of the project.

NOTE: Informal NETL monthly briefings to the Federal Project Manager and Technology Manager will be given by the Recipient to explain the plans, progress, and results of the technical effort. At the discretion of the Awardee and/or DOE, other briefings/presentations may be added to the SOPO, provided that such briefings/presentations are consistent with the budget, schedule, and scope of the project.

APPENDIX H – DATA MANAGEMENT PLAN

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

DMP Requirements

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

At a minimum, the DMP must describe how data sharing and preservation will enable validation of the results from the proposed work, or how results could be validated if data are not shared or preserved.

The DMP must provide a plan for making all research data displayed in publications resulting from the proposed work digitally accessible at the time of publication. This includes data that are displayed in charts, figures, images, etc. In addition, the underlying digital research data used to generate the displayed data should be made as accessible as possible in accordance with the principles stated above. This requirement could be met by including the data as supplementary information to the published article, or through other means. The published article should indicate how these data can be accessed.

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

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

Data Determination for a DMP

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

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

Suggested Elements for a DMP

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

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

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

Sharing and Preservation: A description of the plans for data sharing and preservation. This should include, when appropriate: the anticipated means for sharing and the rationale for any restrictions on who may access the data and under what conditions; a timeline for sharing and preservation that addresses both the minimum length of time the data will be available and any anticipated delay to data access after research findings are published; any special requirements for data sharing, for example, proprietary software needed to access or interpret data, applicable policies, provisions, and licenses for re-use and re-distribution, and for the production of derivatives, including guidance for how data and data products should be cited; any resources and capabilities (equipment, connections, systems, software, expertise, etc.) requested in the research proposal that are needed to meet the stated goals for sharing and preservation (this could reference the relevant section of the associated research proposal and budget request); and whether/where the data will be preserved after direct project funding ends and any plans for the transfer of responsibilities for sharing and preservation. A description of how the recipient intends to make the results of any resulting DOE-funded work available to the public, including the relevant technical community.

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

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

Additional Guidance

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

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

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

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

Definitions

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

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

Digital Research Data: The term digital data encompasses a wide variety of information stored in digital form including: experimental, observational, and simulation data; codes, software

and algorithms; text; numeric information; images; video; audio; and associated metadata. It also encompasses information in a variety of different forms including raw, processed, and analyzed data, published and archived data.

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

(A) Trade secrets, commercial information, materials necessary to be held confidential by a researcher until they are published, or similar information which is protected under law; and

(B) Personnel and medical information and similar information the disclosure of which would constitute a clearly unwarranted invasion of personal privacy, such as information that could be used to identify a particular person in a research study."

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

APPENDIX I – TECHNOLOGY MATURATION PLAN

A technology maturation plan (TMP) is a planning tool that summarizes the necessary research and development (R&D) steps to advance the maturation of a specified technology to a targeted technology readiness level (TRL) and defines the key performance metrics that will be used to determine if the targeted TRL has been successfully achieved. A TMP also documents the current TRL of the specified technology, defines the ultimate commercial application of the technology, and conceptualizes a future commercialization pathway in terms of additional R&D, resources, and schedule. A TMP is a high-level summary document. It is not a collection of detailed test plans.

The National Energy Technology Laboratory (NETL) uses TMPs to enhance its stewardship of R&D project portfolios and improve the value of the technologies it develops. TMPs help NETL to:

- ensure that research questions are resolved in the least expensive and least risky R&D setting (i.e., scale, degree of integration, environment, fidelity)
- focus technology development on the performance metrics that are most important for technical and economic success (at component and system levels)
- identify R&D gaps and critical components that are lagging in maturity
- ensure that R&D projects address what is required for integration into higher-level systems
- make informed decisions at critical stages of research (e.g., moving a technology from a laboratory project to a larger-scale pilot project)
- improve the balance of project portfolios in terms of technology types, pathways, TRLs, redundancy, etc., to mitigate risks and increase the likelihood of R&D success, and
- forecast the cost and duration of technology development through demonstration and commercialization.

The below template should be used to complete a TMP. Instructions, shown in italics, should be deleted/replaced in the completed TMP. Section 3 is provided solely for reference but should be retained as-is in the completed TMP.

TECHNOLOGY MATURATION PLAN
for *{insert project title}*
{Date Prepared}

SUBMITTED UNDER FUNDING OPPORTUNITY ANNOUNCEMENT

DE-FOA-0002619

SUBMITTED BY

{Organization Name}
{Organization Address}
{City, State, Zip Code}

PRINCIPAL INVESTIGATOR

{Name}
{Phone Number}
{E-mail}

SUBMITTED TO

U.S. Department of Energy
National Energy Technology Laboratory

1.0 INTRODUCTION

1.1 Purpose of the Project

Provide a brief summary of the project's objectives as related to maturation of the proposed technology.

1.2 Technology Readiness Assessment System

Technology maturation is quantified by a performing a technology readiness assessment (TRA) on the specified technology system.

- *Identify the specified "TRA System" and describe all the critical components and/or subsystems that comprise it. See "TRA System" definition under Section 3.1.*
- *State whether the current project will test: (1) the total, integrated TRA System, or (2) one or more critical subsystems or components of the TRA System. If the latter, identify which critical subsystems and/or components will be tested.*

1.3 Commercial Application

Provide a one-paragraph description of the targeted commercial application(s) of the TRA System.

2.0 MATURATION OF THE TRA SYSTEM

2.1 Beginning Technology Readiness Level (TRL) of the TRA System

Briefly summarize the prior research that matured the technology to its current state.

Using the Technology Readiness Levels (TRL) descriptions in Sections 3.2 and 3.3, specify the current (i.e., pre-project) TRL of the TRA System. To attain a certain TRL, all aspects of the associated TRL description must be met.

Justify the specified TRL by explaining how all the required TRL aspects have been achieved.

2.2 Proposed Research to Mature the TRA System

Identify the TRL that the project plans to attain.

- *Note that the targeted TRL could be the same as the beginning TRL if the project is aimed at making only incremental progress toward achieving the next TRL.*
- *If the project proposes to advance the TRL by more than one level, explain if that will be accomplished in stages (i.e., first one TRL, then the next) or by skipping a TRL. If the latter, explain how any increased technical, cost and schedule risks associated with skipping a TRL will be mitigated.*

Identify each of the key performance attributes that will be assessed during the research along with the corresponding, quantifiable performance requirements that must be achieved to attain the targeted TRL(s). Explain how the key performance attributes were selected and how the corresponding requirements were determined. Be as specific as practical on any supporting technical/economic assessments (see Section 3.4 for NETL's Systems Analysis Best Practices). As a general principle, all key performance requirements that may be appropriately tested at a particular TRL must be substantially met, thereby supporting the feasibility of commercial success/goal achievement, prior to proceeding to the subsequent TRL.

Briefly summarize the proposed research steps and how they will mature the TRA System to the targeted TRL(s).

2.3 Potential Post-Project Maturation and Commercialization of the TRA System

Assuming the project successfully attains the targeted TRL(s), describe what additional (post-project) work would be required to mature the TRA System to the next TRL. Identify the key performance requirements and goals/measures that would need to be achieved. If possible, provide rough estimates of the cost and duration of the research required to attain the next TRL.

Describe your organization's potential role in a commercialization strategy for the TRA system.

3.0 REFERENCE MATERIAL

3.1 Definition of TRA System

NETL's interpretation (Section 3.2) of the DOE TRL definitions (Section 3.3) is based on a view of technology maturation in which "components" are integrated into a "system" that is being assessed for its technology readiness. To clearly and consistently apply the DOE TRL definitions, one must first precisely identify what "system" is being assessed, defined herein as the "Technology Readiness Assessment (TRA) System." Since most technologies can be viewed as subsystems within larger systems, multiple choices are available for defining the TRA System. However, note that the choice of the "level" of the TRA System affects how TRLs are assessed:

- A TRL 3 is achieved for the specified TRA System when analytical performance predictions for each of the TRA System's critical[51] components have been validated in separate experiments (i.e., without integration across components). Accordingly, the table in Section 3.2 shows the required scope of TRL 3 as "single component" and the required integration of TRL 3 as "none."

[51] A component or subsystem of a TRA System is considered critical if it is new, novel, and necessary for the TRA System to meet its anticipated operational performance requirements or poses major cost, schedule, or performance risk during design or demonstration. Note that a component that is fully mature and non-critical for an established application or operational environment may be considered critical if it is incorporated into a new application or operational environment.

- A TRL 4 or 5 is achieved for a given TRA System when the targeted performance requirements for each of its critical, multi-component subsystems (or the entire TRA system) have been validated in a laboratory environment (TRL 4) or relevant environment (TRL 5) with integration of some or all components.
- Achieving TRLs 6 to 9 requires testing of the entire, fully integrated, TRL system.

To further clarify, consider, for example, a pilot-scale facility to extract, separate, and recover rare earth elements and/or critical minerals and materials from coal and/or coal by-products. The facility may have various critical components, such as a circuit to produce mixed rare earth oxides and/or salts, a circuit to separate the mixed rare earths, a circuit to reduce the separated rare earths to metal(s), and a circuit to produce critical minerals and materials. In turn, each circuit has its own set of critical components. For example, the circuit to separate the mixed rare earths may comprise various solvent extraction stages. If one wished to assess the technology readiness of the pilot-scale facility, the TRA System would be defined as the integrated system of circuits, and a TRL 6 could only be achieved by successfully testing the entire system of integrated circuits. However, if one instead wished to assess the technology readiness of only one circuit, such as the circuit to separate the mixed rare earths, the TRA System could be defined as an integrated system of solvent extraction stages, and a TRL 6 could be achieved by successfully testing just a single, integrated circuit. In both cases, achievement of TRL 6 could be claimed, but only in the context of the properly specified TRA System.

3.2 NETL Interpretations of DOE Technology Readiness Levels in the Context of Fossil Energy and Carbon Management R&D

<table>
<tr><th rowspan="2">TRL</th><th rowspan="2">DOE Definition</th><th colspan="6">Minimum Simultaneous Requirements to Achieve TRL
based on NETL Interpretation of DOE Definitions & Descriptions</th></tr>
<tr><th>Scope</th><th>Integration</th><th>Fidelity</th><th>Scale</th><th>Environment</th><th>Metrics</th></tr>
<tr><td>1</td><td>Basic principles observed and reported</td><td colspan="5" rowspan="2">Any experimentation is limited to discovery and validation of fundamental scientific principles. Formulation of the technology that applies the fundamental science is initiated in conceptual paper studies but experiments on the applied technology have not begun.</td><td>NA</td></tr>
<tr><td>2</td><td>Technology concept and/or applications formulated</td><td rowspan="8">Project-specific TMPs should define cost and/or performance metrics for relevant TRLs. To attain a given TRL, the technology must achieve the metrics for that TRL (or show a likely potential to do so).</td></tr>
<tr><td>3</td><td>Analytical and experimental critical function and/or characteristic proof of concept</td><td>Single Component</td><td>None</td><td>Low (ad-hoc hardware)</td><td rowspan="2">Lab</td><td rowspan="2">Lab (simulated conditions)</td></tr>
<tr><td>4</td><td>Component and/or system validation in laboratory environment</td><td rowspan="2">Total system or multi-component subsystem</td><td rowspan="2">Integration of some or all components</td></tr>
<tr><td>5</td><td>Laboratory scale, similar system* validation in relevant environment</td><td>High (nearly a prototype)</td><td rowspan="3">Relevant (regulated expected conditions)</td></tr>
<tr><td>6</td><td>Engineering/pilot-scale, similar (prototypical) system validation in relevant environment</td><td rowspan="3">Total system

(The total system is equivalent to the “TRA System,” which is the system or subsystem for which technology readiness is being assessed)</td><td rowspan="4">All components and subsystems integrated</td><td rowspan="2">Prototype</td><td>Small Pilot**</td></tr>
<tr><td>7</td><td>Full-scale, similar (prototypical) system demonstrated in relevant environment</td><td>Large Pilot or Full**</td></tr>
<tr><td>8</td><td>Actual system completed and qualified through test and demonstration. Technology has been proven to work in its final form and under expected conditions.</td><td>Actual system in final form</td><td rowspan="2">Full</td><td rowspan="2">Operational (unregulated actual conditions)</td></tr>
<tr><td>9</td><td>Actual operation of the technology in its final form, under the full range of conditions.</td><td>Commercially warranted</td><td>NA</td></tr>
<tr><td colspan="8">* The DOE TRL 5 description states that the “similar system” matches the final application in “almost all respects” and is “almost prototypical.” This table interprets the similar, but not fully prototypical, system as being either: a) the total system for which readiness is being evaluated, or b) a multi-component subsystem of the total system. This interpretation is supported by the DOE TRL 6 description which states that “TRL 6 begins true engineering development of the technology as an operational system.”
** DOE defines TRL 6 as a pilot-scale prototype and TRL 7 as a full-scale prototype. DOE defines TRLs 8 and 9 as involving “actual” systems at full scale. This table assumes that the scale of the TRL 7 full-scale prototype could be less than or equal to the scale of the TRL 8 full-scale actual system. At a minimum, the scale of the TRL 7 prototype must be sufficiently large to support subsequent testing of a TRL 8 full-scale actual system without the need for testing at an intervening scale.</td></tr>
</table>

3.3 Description of DOE Technology Readiness Levels

Source: U.S. Department of Energy, "Technology Readiness Assessment Guide". Office of Management. 2011.

Relative Level of Technology Development	TRL	TRL Definition	Description
System Operations	**9**	Actual system operated over the full range of expected mission conditions.	The technology is in its final form and operated under the full range of operating mission conditions. Examples include using the actual system with the full range of wastes in hot operations.
System Commissioning	**8**	Actual system completed and qualified through test and demonstration.	The technology has been proven to work in its final form and under expected conditions. In almost all cases, this TRL represents the end of true system development. Examples include developmental testing and evaluation of the system with actual waste in hot commissioning. Supporting information includes operational procedures that are virtually complete. An Operational Readiness Review (ORR) has been successfully completed prior to the start of hot testing.
	7	Full-scale, similar (prototypical) system demonstrated in relevant environment	This represents a major step up from TRL 6, requiring demonstration of an actual system prototype in a relevant environment. Examples include testing full-scale prototype in the field with a range of simulants in cold commissioning (1). Supporting information includes results from the full-scale testing and analysis of the differences between the test environment, and analysis of what the experimental results mean for the eventual operating system/environment. Final design is virtually complete.
Technology Demonstration	**6**	Engineering/pilot-scale, similar (prototypical) system validation in relevant environment	Engineering-scale models or prototypes are tested in a relevant environment. This represents a major step up in a technology's demonstrated readiness. Examples include testing an engineering scale prototypical system with a range of simulants. (1) Supporting information includes results from the engineering scale testing and analysis of the differences between the engineering scale, prototypical system/environment, and analysis of what the experimental results mean for the eventual operating system/environment. TRL 6 begins true engineering development of the technology as an operational system. The major difference between TRL 5 and 6 is the step up from laboratory scale to engineering scale and the determination of scaling factors that will enable design of the operating system. The prototype should be capable of performing all the functions that will be required of the operational system. The operating environment for the testing should closely represent the actual operating environment.

Relative Level of Technology Development	TRL	TRL Definition	Description
Technology Development	**5**	Laboratory scale, similar system validation in relevant environment	The basic technological components are integrated so that the system configuration is similar to (matches) the final application in almost all respects. Examples include testing a high-fidelity, laboratory scale system in a simulated environment with a range of simulants (1) and actual waste (2). Supporting information includes results from the laboratory scale testing, analysis of the differences between the laboratory and eventual operating system/environment, and analysis of what the experimental results mean for the eventual operating system/environment. The major difference between TRL 4 and 5 is the increase in the fidelity of the system and environment to the actual application. The system tested is almost prototypical.
Technology Development	**4**	Component and/or system validation in laboratory environment	The basic technological components are integrated to establish that the pieces will work together. This is relatively "low fidelity" compared with the eventual system. Examples include integration of ad hoc hardware in a laboratory and testing with a range of simulants and small-scale tests on actual waste (2). Supporting information includes the results of the integrated experiments and estimates of how the experimental components and experimental test results differ from the expected system performance goals. TRL 4-6 represent the bridge from scientific research to engineering. TRL 4 is the first step in determining whether the individual components will work together as a system. The laboratory system will probably be a mix of on hand equipment and a few special purpose components that may require special handling, calibration, or alignment to get them to function.
Research to Prove Feasibility	**3**	Analytical and experimental critical function and/or characteristic proof of concept	Active research and development (R&D) is initiated. This includes analytical studies and laboratory-scale studies to physically validate the analytical predictions of separate elements of the technology. Examples include components that are not yet integrated, or representative tested with simulants. (1) Supporting information includes results of laboratory tests performed to measure parameters of interest and comparison to analytical predictions for critical subsystems. At TRL 3 the work has moved beyond the paper phase to experimental work that verifies that the concept works as expected on simulants. Components of the technology are validated, but there is no attempt to integrate the components into a complete system. Modeling and simulation may be used to complement physical experiments.
	2	Technology concept and/or application formulated	Once basic principles are observed, practical applications can be invented. Applications are speculative, and there may be no proof or detailed analysis to support the assumptions. Examples are still limited to analytic studies. Supporting information includes publications or other references that

Relative Level of Technology Development	TRL	TRL Definition	Description
Basic Technology Research			outline the application being considered and that provide analysis to support the concept. The step up from TRL 1 to TRL 2 moves the ideas from pure to applied research. Most of the work is analytical or paper studies with the emphasis on understanding the science better. Experimental work is designed to corroborate the basic scientific observations made during TRL 1 work.
	1	Basic principles observed and reported	This is the lowest level of technology readiness. Scientific research begins to be translated into applied R&D. Examples might include paper studies of a technology's basic properties or experimental work that consists mainly of observations of the physical world. Supporting Information includes published research or other references that identify the principles that underlie the technology.

[1] Simulants should match relevant chemical and physical properties.

[2] Testing with as wide a range of actual waste as practicable and consistent with waste availability, safety, ALARA, cost and project risk is highly desirable.

3.4 NETL Systems Analysis Best Practices

NETL has developed Systems Analysis Best Practices (SABP) as an accompaniment to the DOE Technology Readiness Level (TRL) definitions. The SABP serve as a guide for the Principal Investigator/researcher to inform on the level of systems and economic analysis rigor appropriate at each TRL.

System and economic analyses are an essential component of research and development (R&D). They are used to determine appropriate experimental conditions, inform R&D targets and technology maturation plans, assess R&D progress, and estimate the benefits of successful technology development in commercial applications.

Systems analysis is the analytic process used to evaluate the behavior and performance of processes, equipment, subsystems, and systems. Such analyses serve to characterize the relationships between independent (e.g., design parameters and configurations, material properties, etc.) and dependent variables (e.g., thermodynamic state points, output, etc.) through the creation of models representative of the envisioned process, equipment, subsystem, or system. These analyses are used to determine the important variables (i.e., performance attributes) and the associated targets (i.e., performance requirements) that must be achieved through R&D and testing to realize commercial and/or program goals.

The performance requirements are selected such that the equipment, subsystem, or system meets the envisioned objectives in the target commercial application. The target commercial application refers to one specific use for the advanced technology, at full commercial scale. A project may include more than one target commercial application. For example:

1. Technologies that reduce the cost of gasification may be useful for both liquid fuels and power production.
2. Technologies that may be useful to monitor CO_2 storage in more than one type of storage site.

The modeling and simulation effort may use one or more of a variety of tools, such as Excel, MATLAB, Aspen Plus, Aspen Plus Dynamics, Thermoflow, CHEMCAD, etc., depending upon suitability to the specific processes, the scope of the development effort, and the stage of development.

An integral part of systems analysis is economic analysis - the process of estimating and assigning costs to equipment, subsystems, and systems corresponding to models of and specifications for the commercial embodiment of the technology. Such analyses include the estimation of capital costs, as well as operating and maintenance costs. Component service life and corresponding replacement costs are often a crucial aspect of these analyses. See Performing a Techno-economic Analysis for Power Generation Plants, DOE/NETL-2015/1726, July 2015, for further guidance.

As a technology matures, the systems analyses are frequently updated, and are expected to increase in fidelity and complexity commensurate with the available technical understanding, experimental data, and overall level of effort (cost of R&D). The results are used to inform the next stage of development and provide specific experimental and analysis success criteria (the performance requirements).

As a general principle, the performance requirements that may be appropriately tested at a particular TRL must be substantially met, thereby supporting the feasibility of commercial success/goal achievement, prior to proceeding to the subsequent TRL. Note that, as with the TRL descriptions, these SABP are "gate-in;" that is, prerequisites to achieving the associated TRL.

NETL supports a wide range of RD&D projects, from small, short-duration materials development and property characterization projects up to large-scale power plant demonstrations. The nature and complexity of the technology under development and the scope of the project must be taken into account when applying the SABP – they may not be strictly applicable as written to every project. For example, it is an unreasonable expectation for a project developing a sensor, or fuel cell cathode, or thermal boundary coating for a turbine airfoil to perform a full-scale power plant simulation to determine the performance requirements of the specific technology in the course of pursuing TRL 4. However, the project must explicitly tie the quantitative goals/objectives for the technology to referenced system studies as well as relevant industry and/or market requirements in such a manner that their pedigree is readily traceable. On the other hand, a project endeavoring to develop a full system concept incorporating novel components and process integration is expected to perform more robust, extensive analyses.

Descriptions of the SABP associated with each TRL are provided in the table below.

TRL	DOE Definition	Systems Analysis Best Practices
1	Basic principles observed and reported	Assessment: Perform an assessment of the core technology resulting in (qualitative) projected benefits of the technology, a summary of necessary R&D needed to develop it into the actual technology, and principles that support of the viability of the technology to achieve the projected benefits.
2	Technology concept and/or applications formulated	White Paper: A white paper describing the intended commercial application, the anticipated environment the actual technology will operate in, and the results from the initiation of a detailed analysis (that will at least qualitatively justify expenditure of resources versus the expected benefits and identify initial performance attributes).

TRL	DOE Definition	Systems Analysis Best Practices
3	Analytical and experimental critical function and/or characteristic proof of concept	Performance Model and Initial Cost Assessment: This performance model is a basic model of the technology concept, incorporating relevant process boundary conditions, that provides insight into critical performance attributes and serves to establish initial performance requirements. These may be empirically- or theoretically based models represented in Excel or other suitable platforms. In addition, an initial assessment and determination of performance requirements related to cost is completed.
4	Component and/or system validation in laboratory environment	System Simulation and Economic Analysis: These models incorporate a performance model of the technology (may be a simple model as developed for TRL 3, or something more detailed – either should be validated against empirical data gathered in the laboratory) into a model of the intended commercial system (e.g., power plant). In addition, an economic analysis (e.g., cost-of-electricity) of the technology is performed, assessing the impact of capital costs, operating and maintenance costs, and life on the impact of the technology and its contributions to the viability of the overall system in a commercial environment. These analyses serve to assess the relative impact of known performance attributes (through sensitivity analyses) and refine performance requirements in the context of established higher-level technical and economic goals (e.g., programmatic or DOE R&D goals). These models are typically created in process simulation software (e.g., ASPEN Plus) or other suitable platforms. DOE maintains guidance on the execution of techno-economic analyses [1].
5	Laboratory scale, similar system* validation in relevant environment	System Simulation and Economic Analysis Refinement: A more detailed process model for the technology, validated against empirical data gathered in the laboratory, will be developed and incorporated into system simulations. This provides greater fidelity in the performance and cost estimation for the technology, facilitating updates to performance attributes and requirements (including updates to the economic analysis). This also allows greater evaluation of other process synergy claims (e.g., state-of-the-art technology is improved by the use of the new technology). Cost estimation should be either vendor-based or bottom-up costing approaches for novel equipment.
6	Engineering/pilot-scale, similar (prototypical) system validation in relevant environment	System Simulation and Economic Analysis Refinement: Performance and cost models are refined based upon relevant environment laboratory results, leading to updated performance attributes and requirements. Preliminary steady-state and dynamic (if appropriate for the technology) modeling of all critical process parameters (i.e., upper and lower operating limits) of the system prototype is completed. Cost estimation should be either vendor-based or bottom-up costing approaches for novel equipment. Key process equipment should be specified to the extent that allows for bottom-up estimating to support a feasibility study of the integrated system.

TRL	DOE Definition	Systems Analysis Best Practices
7	Full-scale, similar (prototypical) system demonstrated in relevant environment	System Simulation and Economic Analysis Refinement: Performance and cost models are refined based upon relevant environment and system prototype R&D results. The refined process, system and cost models are used to project updated system performance and cost to determine if the technology has the potential to meet the project goals. Performance attributes and requirements are updated as necessary. Steady-state and dynamic modeling all critical process parameters of the system prototype covering the anticipated full operation envelope (i.e., upper and lower operating limits) is completed. Cost models should be based on vendor quotes and traditional equipment estimates should be minimal.
8	Actual system completed and qualified through test and demonstration. Technology has been proven to work in its final form and under expected conditions.	System Simulation and Economic Analysis Validation: The technology/system process models are validated by operational data from the demonstration. Economic models are updated accordingly.
9	Actual operation of the technology in its final form, under the full range of conditions.	Commercial Use: Models are used for commercial scaling parameters.

APPENDIX J – PROJECT MANAGEMENT PLAN

REMINDER: APPLICANTS SHOULD DOUBLE SPACE THE PROJECT MANAGEMENT PLAN IN ACCORDANCE WITH THE FORM AND CONTENT REQUIREMENTS IN SECTION IV AND REMOVE THIS BLOCK PRIOR TO SUBMISSION.

The Applicant's Project Management Plan is an approved document that defines how the Applicant will execute, monitor, and control the project to accomplish the objectives. The specific contents, level of detail, and inclusion of subsidiary planning documents are tailored according to the needs of the project. Consequently, every PMP will be different based on the risk, visibility, and/or complexity of the project and the Recipient's established processes, procedures, and systems.

Title Page:

PROJECT MANAGEMENT PLAN

{Insert Project Title}

{Date Prepared}

SUBMITTED BY
{Organization Name}
{Organization Address}
{City, State, Zip Code}

Project Director
{Name}
{Phone Number}
{E-mail}

SUBMITTED TO
U.S. Department of Energy
National Energy Technology Laboratory

This plan should be formatted to include the following sections with each section to include the information as described below:

A. Executive Summary: Provide a description of the project that includes the objective, project goals, and expected results. For purposes of the application, this information is included in the Project Narrative and should be simply copied to this document for completeness, so that the Project Management Plan is a stand-alone document.

B. Project Organization and Structure: Provide the following information in this section:

- Organizational Chart(s): Include a complete project organizational chart and sub-organization charts (if applicable), accompanied by a discussion of how the organizational structure will facilitate the performance of the Tasks and achievement of the objectives described in the SOPO within the time frame specified in the application.
- Roles and Responsibilities of Participants: Provide a discussion of key project team members, and the capacity in which each team member will assist in achieving the overall objective(s) of the proposed project. For multi-organizational or multi-investigator projects, describe the roles to be performed by each participant/investigator within the context of the Task/subtask structure contained in the SOPO. Include descriptions of any business agreements or intellectual property issues between the Applicant and other members of the project team, and how these agreements will be integrated and managed.
- Decision-making and Communication Strategy: Provide a discussion of how communication and decision-making will occur within the context of the organizational structure, with particular emphasis on scientific/technical direction and mechanisms for controlling project scope, cost, and schedule. Include a discussion of how the project team will communicate with DOE and external stakeholders during the performance of the project.
- Management Capabilities: Provide information relevant to the capabilities and experience of the PI and key project team members in managing technical projects of similar nature and complexity. If applicable, include examples that demonstrate the ability to successfully meet research objectives within scope, budget and schedule.

C. Risk Management Plan: Provide a summary description of the proposed approach to identify, analyze, and respond to perceived risks associated with the proposed project. Project risk events are uncertain future events that, if realized, impact the success of the project. Risk is inherent to all projects regardless of complexity, cost, or visibility. An effective Risk Management Plan will identify perceived risks and explain mitigation strategies for each risk. At a minimum, the Risk Management Plan shall include the initial identification of significant financial, cost/schedule, technical/scope, management, planning and oversight, ES&H, external factors, and management issues that have the potential to impede project progress and strategies to minimize impacts from those issues.

The following table format is provided but is not required:

Perceived Risks and Mitigation Strategies

Perceived Risk	Risk Rating			Mitigation/Response Strategy
	Probability	Impact	Overall	

	(Low, Med, High)			
Financial Risks:				
Cost/Schedule Risks:				
Technical/Scope Risks:				
Management, Planning, and Oversight Risks:				
ES&H Risks:				
External Factor Risks:				

D. Milestone Log: Provide a summary of milestones for each budget period of the project to demonstrate success.

Each milestone should be linked to a specific Task or Subtask and include a title, planned completion date, and a description of the method/process/measure used to verify completion. A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be Specific, Measurable, Achievable, Relevant, and Timely, and must demonstrate a technical achievement rather than simply completing a task. Conversely, periodic, mandatory progress reports are not considered to be Milestones.

Milestones are presumed to lie on the critical path of the project, i.e., unless all milestones are achieved, the Objectives as defined in the SOPO cannot be met completely. Applicants must provide at least two milestones with at least one SMART technical milestone per year throughout the course of the project. Depending on the project, more milestones may be necessary to comprehensively demonstrate progress.

Milestone Format

Task/ Subtask	Milestone Title & Description	Planned Completion Date	Verification method

[Note: During project performance, the Recipient will report the Milestone Status as part of the required quarterly progress report as prescribed under the Federal Assistance Reporting Checklist. The Milestone Status will present actual performance in comparison with Planned Milestones, and include:

(1) the actual status and progress of the project,
(2) specific progress made toward achieving the project's milestones, and,
(3) any proposed changes in the project's schedule required to complete milestones.]

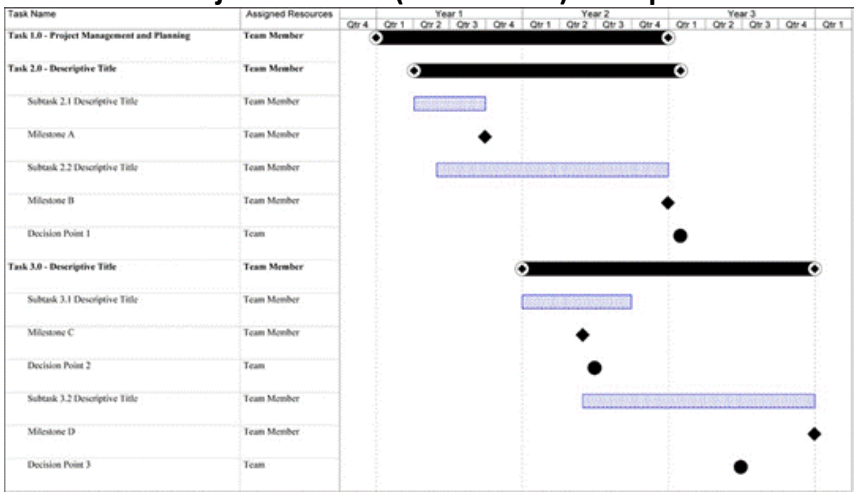
E. Costing Profile: Provide a table (the Spend Plan) that projects the expenditures of government funds by government fiscal year for each project team member.

Spend Plan by Fiscal Year Format

	FY 20XX		FY 20XX		FY 20XX		FY 20XX		Total	
	DOE Funds	Cost Share	DOE Funds	Cost Share	DOE Funds	Cost Share	DOE Funds	Cost Share	DOE Funds	Cost Share
Applicant										
Sub-recipient A, if proposed										
Sub-recipient B, if proposed										
FFRDC/NL, if proposed										
Total ($)										
Total Cost Share %										

F. Project Timeline: Provide a timeline of the project (similar to a Gantt chart) broken down by each task and subtask, as described in the Statement of Project Objectives. The timeline should include for each task, a start date, and end date. The timeline should show interdependencies between tasks and include the milestones that are identified in the Milestone Log (Section D).

Project Timeline (Gantt Chart) Example



G. Success Criteria: Success criteria are used by the DOE to determine if specific goals and objectives were met at the end of budget period(s), Go/No-Go decision points, and/or project completion. The success criteria should be objective and stated in terms of specific, measurable, and repeatable data. Usually, the success criteria pertain to desirable outcomes, results, and observations from the project.

[Note: As the first task in the Statement of Project Objectives, successful Applicants will revise the version of the Project Management Plan that is submitted with their applications by including details from the negotiation process. This Project Management Plan will be updated by the Recipient as the project progresses, and the Recipient must use this plan to report scope, schedule, and budget variances.]

APPENDIX K – 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[52] 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),[53] 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.[54] 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 ensuring all

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[52] 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

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

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

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:[55]

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 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

[55] 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

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. [56]

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.

DOE 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:

- 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;

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

- 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);[57] 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:

[57] 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

- 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-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

DOE 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?