Financial Assistance
Notice of Funding Opportunity
Part 1

U.S. DEPARTMENT *of* ENERGY

Department of Energy (DOE)
Advanced Materials and Manufacturing Technologies Office (AMMTO) and Office of Geothermal (OG)
Critical Minerals and Materials Accelerator Notice of Funding Opportunity

Notice of Funding Opportunity Number: DE-FOA-0003589

Letter of Intent Due:
All Topic Areas: 04/21/2026 5pm ET

Application due:
Topic Area 1: 05/26/2026 5pm ET
Topic Area 2: 06/22/2026 5pm ET
Topic Area 3: 07/20/2026 5pm ET

Modifications

Mod. No.	Date	Description of Modification
0001	4/15/2026	Corrected units in Figure 3; Replaced instances of 'FOA' with 'NOFO' in Section D. Expected Performance Goals, Application Metrics; Corrected LOI character limit in Section IV.C.

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

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Before You Begin

A. Navigating the Notice of Funding Opportunity

To reduce the burden on applicants in the Notice of Funding Opportunity (NOFO) process and limit the length of the NOFO information requests, we separated the NOFO into two parts.

The NOFO Part 1 describes the DOE program goals and evaluation criteria, eligibility, and other components specific to each funding opportunity. NOFO Part 2 includes the fixed DOE requirements that generally do not change from NOFO to NOFO, including standard information for the application phase, expectations for award negotiations, and post-award requirements. You must review both parts before applying. To assist you in the process, you will find references throughout this document to additional information in Part 2.

You must also take several one-time actions before applying. Some of these actions may take several weeks, so be sure to allow yourself enough time to complete them. If you don't complete all required steps, it could interfere with application and negotiation deadlines or your ability to receive an award if selected. If you already completed these one-time registrations, make sure they are active and up to date. All registrations are free. You can find additional information about registration in NOFO Part 2, *Get Registered*.

Hyperlinks are provided for the applicant's ease of reference. Links, and the information contained in them, may change over time. It is up to an individual applicant to make sure that they have the current information that is contained in the links.

This announcement is published with NOFO Part 2 Version 4.

I. Basic Information

A. Key Facts

Issuing Agency	Department of Energy, Advanced Materials and Manufacturing Technologies Office (AMMTO) and Office of Geothermal (OG)
Funding Opportunity Title	Critical Minerals and Materials Accelerator Notice of Funding Opportunity
Announcement Version	Initial
Funding Opportunity Number	DE-FOA-0003589
Funding Instrument	Cooperative Agreements or Funding Agreements with FFRDCs
Expected Total Available Funding	$69,000,000
Assistance Listing Number and Name	81.086 -- Conservation Research and Development
Announcement Type	Research, Development and Demonstration
Funding Opportunity Description	This NOFO supports critical minerals and materials. Critical minerals and materials (CMM) are the building blocks for technologies foundational to U.S. energy dominance, national security, and industrial competitiveness. To build a secure domestic supply of CMMs, the U.S. Department of Energy (DOE) aims to support collaborative industry partnerships to prototype and pilot innovative processing technologies that are currently only proven at the bench scale to address CMM challenges in high impact areas. The CMM Accelerator program will advance these mid-stage innovations through validation, benchmarking, access to national lab test beds, testing in industry relevant environments, technoeconomic analysis, and life-cycle assessment. The program establishes a pipeline to support technology maturation to ultimately unlock private capital investments. It also will leverage other DOE lab-based activities, such as the Critical Materials Innovation Hub (CMI Hub) and the Minerals to Materials Supply Chain Research Facility (METALLIC). Technologies resulting from the program are expected to have a path to domestic commercialization within 3-7 years.

KEY DATES

All deadlines are 5:00 p.m. ET unless indicated otherwise

Notice of Funding Opportunity Issue Date:
4/7/2026

Letter of Intent Deadline:
4/21/2026

Informational Webinar:
4/16/2026

Application Deadline:
TA1 – 5/26/2026
TA2 – 6/22/2026
TA3 – 7/20/2026

Anticipated Selection Notification Date:
July 2026 – August 2026

Anticipated Award Date:
September 2026 – December 2026

Estimated Period of Performance:
September 2026 – December 2029

Program Goals & Objectives	The goals of this NOFO are to: • Foster industry partnerships to prototype and pilot technologies and processes proven at the bench scale to accelerate adoption of innovative solutions to address critical material challenges in high impact areas; • Validate the materials and manufacturing technologies that reduce demand of critical materials; • Enable informed decisions, optimize processes, and build confidence in technology scale up through Life-Cycle Assessment (LCA) and Techno-Economic Analysis (TEA); • Address the urgency to meet critical material demand with secure and sustainable critical material manufacturing technologies.
Topic Areas	• **Topic Area 1:** Production and material efficiency for critical materials including rare earth elements. Inclusive of the following sub-topics: o 1A: Recovery and production from postindustrial manufacturing scrap o 1B: Recovery and production from postconsumer scrap (with an emphasis on electronic waste and drivetrains) o 1C: Recovery and production from combinations of feedstocks including mine tailings, postindustrial scrap, and postconsumer scrap • **Topic Area 2:** Processes to refine and alloy gallium, gallium nitride, germanium, and silicon carbide for use in semiconductor applications. • **Topic Area 3:** Cost-competitive direct lithium extraction, separation, and processing. Inclusive of the following sub-topics: o 3A: Cost-competitive direct lithium extraction o 3B: Advancing pre- and post- treatment and disposal technologies for direct lithium extraction and from geothermal brines o 3C: Exploration and Characterization of Critical Materials and Rare Earth Elements from Volcanically Hosted Geothermal Systems
Eligible Applicants	• Domestic Entities (Institutes of higher education; for-profit entities; non-profit entities; state and local government entities and Indian Tribes)

	• DOE FFRDCs, non-DOE FFRDCs, and Federal Research Agencies as prime applicants or subrecipients for topic areas 3b and 3c, and subrecipients only for all other topic areas.
eXCHANGE URL and Helpdesk	eere-exchange.energy.gov eere-exchangesupport@hq.doe.gov (include NOFO name and number in the subject line)
NOFO URL and Email	**Important Note: This NOFO has 3 topic areas. Each topic area has a unique NOFO webpage on eere-exchange.energy.gov and a unique application deadline. Applicants are responsible for ensuring their application is submitted to the correct NOFO webpage for each specific topic area, and ensuring the application is submitted by the correct deadline for the specific topic area. Letters of Intent must also be submitted to the correct topic area exchange webpage, and by the Letter of Intent deadline. Applications that are submitted to the wrong topic area's exchange webpage, past the topic area's deadline, or without a previously submitted Letter of Intent, will be ineligible.** **Topic Area 1:** **eXCHANGE: Funding Opportunity DE-TA1-0003589** **Topic Area 2:** **eXCHANGE: Funding Opportunity DE-TA2-0003589** **Topic Area 3:** **eXCHANGE: Funding Opportunity DE-TA3-0003589**
Email	cmmacceleratornofo@ee.doe.gov

1. Funding Details

Multiple Topic Areas

Approximate total available funding including all topic areas: $69,000,000. The following Topic Areas were selected based on where prototyping and pilot-scale demonstration are needed to advance promising technologies and on the production of priority materials for energy systems.

Phase 1: Prototype-scale funding opportunity

The estimates listed below reflect anticipated selections for Phase 1, or prototyping work.

Topic Area 1: Production and material efficiency for critical materials including rare earth elements (Advanced Materials and Manufacturing Technologies Office (AMMTO))

- Approximate total available funding: $24,000,000

- Approximate number of awards: 10-14
- Approximate dollar amount of individual awards: Up to $2,000,000
- Minimum cost share required: 20%
- Approximate award project period: Up to 36 months
- Anticipated length of budget periods: Up to 24 months

Topic Area 2: Processes to refine and alloy gallium, gallium nitride, germanium, and silicon carbide for use in semiconductors (Advanced Materials and Manufacturing Technologies Office (AMMTO))

- Approximate total available funding: $6,000,000
- Approximate number of awards: 1-5
- Approximate dollar amount of individual awards: Up to $2,000,000
- Minimum cost share required: 20%
- Approximate award project period: Up to 36 months
- Anticipated length of budget periods: Up to 24 months

Topic Area 3: Cost-competitive direct lithium extraction, separation, and processing, exploration, and co-production (Advanced Materials and Manufacturing Technologies Office (AMMTO))

Topic Area 3A: Cost-competitive direct lithium extraction (Advanced Materials and Manufacturing Technologies Office (AMMTO))

- Approximate total available funding: $8,000,000
- Approximate number of awards: 4-6
- Approximate dollar amount of individual awards: Up to $2,000,000
- Minimum cost share required: 20%
- Approximate award project period: Up to 24 months
- Anticipated length of budget periods: Up to 24 months

Topic Area 3B: Advancing pre- and post- treatment and disposal technologies for direct lithium extraction of geothermal brines (Office of Geothermal)

- Approximate total available funding from Office of Geothermal: $9,000,000
- Approximate number of awards: 3-9
- Approximate dollar amount of individual awards: $1,000,000 - $3,000,000
- Minimum cost share required: 20%
- Approximate award project period: Up to 24 months
- Anticipated length of budget periods: Up to 12 months

Topic Area 3C: Exploration and characterization of critical materials and rare earth elements (REEs) from volcanic-hosted geothermal systems (Office of Geothermal)

- Approximate total available funding from Office of Geothermal: $6,000,000
- Approximate number of awards: 3-6
- Approximate dollar amount of individual awards: $1,000,000 - $3,000,000

- Minimum cost share required: 20%
- Approximate award project period: Up to 36 months
- Anticipated length of budget periods: Up to 12 months

Phase 2: Pilot-scale funding opportunity (Advanced Materials and Manufacturing Technologies Office (AMMTO))

Awarded projects from Topics 1, 2, and 3A will be eligible to compete for a subsequent Phase 2 pilot-scale funding opportunity through a down-select process, provided they successfully complete Phase 1 work and establish a compelling business case, develop necessary partnerships, and secure commitments for a 50% cost-share.

- Approximate total available funding: $16 million
- Approximate number of awards: 0-4
- Approximate dollar amount of individual awards: up to $8 million per project
- Minimum cost share required: 50% for Phase 2 costs
  - Note: Total project cost share % will be the combination of Phase 1 costs with 20% minimum cost share and Phase 2 costs with 50% minimum cost share.
- Approximate award project period: Up to 36 months
- Anticipated length of budget periods: Up to 24 months

Equity Considerations for Negotiation

DOE may be interested in obtaining equity interests in recipient entities in order to ensure successful completion of projects and to safeguard the government's investment in emerging technologies. Entities may indicate in their application whether they would consider offering equity interests. Such equity considerations may be offered and addressed during negotiations.

Applicants' decision to indicate the availability of equity interests will not be a factor in the merit review or selection process.

2. Period of Performance

We anticipate making awards under multiple budget periods. If applicable, project continuation will depend on available funding and our Go/No-Go decision which will be made at the conclusion of a budget period. You can find a complete list of post-award requirements and more information on the Go/No-Go review in NOFO Part 2, *Award Administration Information*. Funding for all budget periods, including the initial budget period, is not guaranteed.

B. Executive Summary

The Critical Minerals and Materials (CMM) Accelerator program is an initiative from the U.S. Department of Energy to strengthen domestic CMM supply chains. This Notice of Funding Opportunity (NOFO), issued by the Advanced Materials and Manufacturing Technologies Office (AMMTO) and the Office of Geothermal (OG), provides up to $69 million to directly address the national imperative to secure a reliable, predictable, and affordable domestic supply of CMMs which are foundational to U.S. energy dominance, national security, and industrial competitiveness.

The CMM Accelerator program targets innovative CMM production technologies that have demonstrated promising results at the bench scale (Technology Readiness Level 3-4) but require further development to achieve commercial viability. A significant challenge lies in advancing these laboratory-scale innovations beyond the "valley of death" to industrially relevant scales. This NOFO is designed to overcome this barrier by funding collaborative industry partnerships for prototyping and small-scale piloting of these critical processes and materials. Over a decade of DOE funding has laid the groundwork, and this program builds upon that to validate technologies and establish the confidence needed for substantial follow-on investment.

The primary goals are to foster industry partnerships, validate technologies for material optimization and cost-competitive production, enable informed decisions through rigorous analysis, and accelerate domestic CMM manufacturing capabilities. The NOFO includes three key Topic Areas: **(1)** recovery and production of critical materials from secondary sources such as post-industrial scrap and e-waste; **(2)** processes to refine and alloy gallium, gallium nitride, germanium, and silicon carbide for semiconductor applications; and **(3)** technologies for cost-competitive direct lithium extraction, separation, and processing. Projects are expected to mature technologies to Technology Readiness Levels 6 (TRL 6), demonstrating economic viability, material efficiency, and reduced reliance on external CMM sources. Projects must also significantly reduce adoption readiness risks, meaning they should address non-technical barriers such as market acceptance, resource availability, supply chain integration, cost-effectiveness, and regulatory hurdles to ensure these technologies can be successfully integrated and utilized commercially.

The target audience for this NOFO includes a broad range of domestic entities. Eligible applicants are defined below in section II.A. This NOFO intends to fund a collaborative approach to harness the full spectrum of innovation. Awarded Phase 1 projects will also be eligible to compete for a distinct Phase 2 pilot-scale project through a down-select process, furthering the program's commitment to delivering technologies ready for real-world deployment and impact.

C. Teaming Partner List

DOE is compiling a Teaming Partner List to help create project teams for this NOFO. The Teaming Partner List allows organizations interested in participating on a project to express their interest to other applicants and explore potential partnerships.

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

SUBMISSION INSTRUCTIONS:

To view this NOFO's Teaming Partner List (listed in the Key Facts section), click "Teaming Partners" on the eXCHANGE homepage in the left-hand navigation pane. To join the Teaming Partner List:

- Click "Submit Entry to Teaming Partner List"
- Select the appropriate Teaming Partner List from the drop-down menu

- Fill in all required information: Investigator Name, Organization Name, Organization Type, Topic Area, Background and Capabilities, Website, Contact Address, Contact Email, and Contact Phone.

DISCLAIMER:

When you submit a request to be included on the Teaming Partner List, the requesting organization consents to publication of the registration information. By facilitating the Teaming Partner List, DOE is not endorsing, sponsoring, or otherwise evaluating the qualifications of the individuals and organizations that ask to be placed on the Teaming Partner List. DOE will not pay for any information you provide, nor will it compensate any applicants or requesting organizations for developing such information.

D. Agency Contact Information

For questions relating to this NOFO, email us at cmmacceleratornofo@ee.doe.gov.

II. Eligibility

To be considered, your submission must meet the criteria set forth below. If your application does not meet these eligibility requirements, it will be removed from consideration for any award. DOE will not determine eligibility for potential applicants before the application due date. The information in this document is specific to this NOFO. You can find the eligibility requirements that apply to all NOFOs in NOFO Part 2, *Eligibility*.

A. Eligible Applicants

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.

1. Domestic Entities

Domestic entities are eligible to apply as recipients or subrecipients. The following types of domestic entities are eligible to participate as a recipient or subrecipient of this NOFO:

Table 1: Eligibility of different entities to be a primary recipient or sub-recipient.[1]

Entity	Eligible as Prime Recipient (TA1, TA2, TA3A)	Eligible as Prime Recipient (TA3B, TA3C)	Eligible as Subrecipient (all topic areas)
Institutions of higher education	✓	✓	✓
Federally funded research and development centers (FFRDC)		✓	✓
For-profit organization	✓	✓	✓
Nonprofit organization	✓	✓	✓
State and local government entities	✓	✓	✓
Indian Tribes, as defined in section 4 of the Indian Self-Determination and Education Assistance Act, 25 U.S.C. § 5304[1]	✓	✓	✓

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 (U.S.) or under the laws of the U.S.; have majority domestic ownership and control; and have a physical place of business in the U.S.

Participant Limitations

Participation of the following entities are limited as follows.

- DOE FFRDCs[2] are eligible to apply for funding as a recipient (Topic Areas 3B & 3C) or subrecipient (All Topic Areas).
- Non-DOE FFRDCs are eligible to participate as a subrecipient but are not eligible to apply as a recipient.
- Federal agencies and instrumentalities (other than DOE) are eligible to participate as a subrecipient but are not eligible to apply as a recipient.
- NETL is eligible to apply as a subrecipient

[1] "**Indian Tribe,**" for the purposes of this NOFO and as defined in in section 4 of the Indian Self-Determination and Education Assistance Act (25 U.S.C. § 5304), means any Indian tribe, band, nation, or other organized group or community, including any Alaska Native village or regional or village corporation as defined in or established pursuant to the Alaska Native Claims Settlement Act (85 Stat. 688) [43 U.S.C. § 1601, et seq.], which is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.

[2] FFRDCs are Federally funded research and development centers that conduct research for the U.S. Government. A listing of FFRDCs can be found at https://ncses.nsf.gov/resource/master-gov-lists-ffrdc.

2. Foreign Entity Participation

In general, foreign entities are not eligible to apply as either a recipient or subrecipient. In limited circumstances, we may approve a waiver to allow a foreign entity to participate as a recipient or subrecipient.

A foreign entity may apply to this NOFO, but the application must be accompanied by an explicit written waiver request. Likewise, if you want to include a foreign entity as a subrecipient, you must submit a separate explicit written waiver request in your application for each proposed foreign subrecipient. NOFO Part 2, *Application Content Requirements*, explains the requirements for submitting a foreign entity waiver request. DOE's determination of a waiver request is final and you cannot appeal an adverse decision on a waiver request.

3. Performance of Work in the United States

All work for the awards under this NOFO must be performed in the United States. To request a waiver of this requirement, you must submit an explicit waiver request in the application. Without an approved waiver, such costs will not be allowed under the award. NOFO Part 2, *Application Content Requirements*, lists the requirements for submitting a foreign work waiver request.

4. Ineligible Participants

The following entities are ineligible for this NOFO as a recipient, subrecipient, or subcontractor:

- In accordance with 2 CFR 200.214, Entities banned from doing business with the U.S. government, such as entities debarred, suspended, or otherwise excluded from or ineligible for participating in federal programs (2 CFR § 200.214)
- Entities identified on the Department of the Treasury Office of Foreign Assets Control Treasury's Sanctions Program Specially Designated Nationals list. (OFAC – Sanctions List Service [treas.gov])
- Nonprofit organizations described in section 501(c)(4) of the Internal Revenue Code of 1986 that engaged in lobbying activities after December 31, 1995

Entity of Concern Prohibition

Entities of Concern are prohibited from participating in projects under this NOFO. You can find details and definitions in NOFO Part 2, *Eligibility, Other Eligibility Information, Entity of Concern Prohibition*.

B. Limitation on Number of Applications Eligible for Review

See table below for restrictions on number of applications permitted per topic area/subtopic area. If an entity submits more than one application, the DOE will only review the last submission. Any other submissions received listing the same entity as the applicant for the same topic area/subtopic area will not be eligible for further consideration. This limitation does not prohibit an applicant from collaborating on other applications (e.g., as a potential subrecipient or partner) so long as the entity is only listed as the applicant on one application for each topic area/subtopic area of this NOFO.

Type	Topic Area 1 (All Subtopics)	Topic Area 2	Topic Area 3A	Topic Area 3B	Topic Area 3C
Limited to 1 Full Application per Topic Area	✓	✓			
Limited to 1 Full Application per Subtopic Area			✓	✓	✓

C. Cost Sharing

You must follow through on the estimated cost share commitments you proposed in your application if selected for award negotiations. You can find more information on cost sharing in NOFO Part 2, *Eligibility*.

1. Cost Share Requirements

This NOFO is comprised of two phases of work, Phase 1 aiming to prototype technologies and Phase 2 aiming to demonstrate technologies at a pilot scale. The cost share must be at least 20% of the Phase 1 project costs[3] for initial research and development tasks and 50% of the Phase 2 project costs if selected for Phase 2 demonstration and commercial application tasks[4].

Applications that do not meet the minimum required cost share will be deemed ineligible during the initial compliance review and will not be further reviewed. The cost share must come from non-Federal sources unless otherwise allowed by law.

The cost share percentage is calculated by dividing the cost share by the total allowable project costs for the award where the total allowable project costs include government share (including FFRDC costs if applicable) and cost share. To help applicants calculate proper cost share amounts, DOE has included a cost share information sheet and sample cost share calculation in the NOFO Part 2, *Eligibility—Cost Sharing, Cost Share Calculation Examples*.

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

[4] 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.

2. Unallowable Cost Share Sources

The recipient or subrecipients may not use the following sources to meet cost share obligations including but not limited to:

- Cost share derived from Federal sources (unless otherwise authorized by law).
- Cost share that does not meet:
  - Requirements set forth in 2 C.F.R. §§ 200.306 and 910.130
  - Cost principles set forth in 2 C.F.R. §§ 200.400-476 and 2 C.F.R. §§ 910.352
  - For State Energy Programs, requirements set forth in 10 C.F.R. §§ 420
- Cost share derived from the DOE loan program
- Revenues or royalties from the prospective operation of an activity beyond the project period
- Proceeds from the prospective sale of an asset of an activity
- Federal funding or property (e.g., Federal grants, equipment owned by the Federal Government)
- Expenditures that were reimbursed under a separate Federal program
- Cash or in-kind contributions used to meet cost share requirements for another Federal project or program
- Existing data as an in-kind contribution (e.g., data owned by an entity that is not routinely sold commercially but is instead donated to the project and assigned a value)

D. FFRDC Eligibility Criteria

1. DOE FFRDCs as the Applicant – Topic Areas 3B & 3C Only

Provided that there is no conflict, a DOE Federal Funded Research and Development Center (FFRDC) is eligible to apply for funding under this NOFO if its Cognizant Contracting Officer provides written authorization and you submit this authorization with the application.

> The following wording is acceptable for the authorization:
> *Authorization is granted for the laboratory to participate in the proposed project. The work proposed for the laboratory is consistent with or complements the missions of the laboratory and will not adversely affect the DOE assigned programs at the laboratory.*

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

2. DOE and Non-DOE FFRDCs as a Subrecipient

As long as they have no conflict, DOE and non-DOE FFRDCs may be proposed as a subrecipient on another entity's application subject to the following guidelines:

Authorization for non-DOE 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.

Authorization for DOE 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 prior to any award. The use of a FFRDC must be consistent with the contractor's authority under its award.

Funding, Cost Share, and Subaward with FFRDCs

The value of and funding for the FFRDC portion of the work will not normally be included in the award. DOE FFRDCs participating as a subrecipient on a project will be funded directly through the DOE Work Authorization process in accordance with DOE O 412.1A, non -DOE FFRDCs participating as a subrecipient will be funded through an interagency agreement with the sponsoring agency.

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

All DOE FFRDCs are required to enter into a Cooperative Research and Development Agreement[5] (CRADA) or, if the role of the DOE FFRDC is limited to technical assistance and intellectual property is not anticipated to be generated from the DOE FFRDC's work, a Technical Assistance Agreement (TAA), with at least the recipient. A fully executed CRADA or TAA must be in place or be compliant with a Master Scope of Work process prior to the FFRDC starting work directly allocable to the award.

A CRADA is used to ensure accountability for project work and provide the appropriate management of intellectual property (IP), e.g., data protection and background IP. A Data Management and Sharing Plan is not suited for this purpose.

Responsibility

The 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 recipient and the FFRDC.

Limit on FFRDC Effort – Topic Areas 1, 2, and 3A Only

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

[5] A cooperative research and development agreement is a contractual agreement between a national laboratory contractor and a private company or university to work together on research and development. For more information, see DOE O 483.1B.

Type	Topic Area 1 (All Subtopics)	Topic Area 2	Topic Area 3A	Topic Area 3B	Topic Area 3C
Lead Office	AMMTO	AMMTO	AMMTO	OG	OG
Letter of Intent (LOI) Due	4/21/2026	4/21/2026	4/21/2026	4/21/2026	4/21/2026
Full Applications Due	5/26/2026	6/22/2026	7/20/2026	7/20/2026	7/20/2026
Limited to 1 Full Application per Topic Area	✓	✓			
Limited to 1 Full Application per Subtopic Area			✓	✓	✓
Eligible for Phase 2 Funding	✓	✓	✓		
FFRDC Eligible as Prime Recipient				✓	✓
FFRDC Eligible as Subrecipient	✓	✓	✓	✓	✓

III. Program Description

A. Background and Context

The Advanced Materials and Manufacturing Technologies Office (AMMTO) and the Office of Geothermal (OG), in coordination with the Critical Material Collaborative, are issuing this Notice of Funding Opportunity (NOFO) through the Critical Minerals and Materials (CMM) Accelerator Program. This NOFO makes available up to $69 million of base appropriations to support innovative CMM production technologies. The CMM Accelerator program is designed to derisk and scale processes and technologies crucial for establishing a competitive and robust domestic supply chain of CMM. The program specifically targets innovative technologies and processes that have demonstrated proof-of-concept at the bench scale but require further development to reach commercial viability.

Critical Minerals and Materials (CMMs) are indispensable to modern technologies, underpinning everything from advanced electronics to energy systems and national defense applications. The availability, affordability, and the security of their supply chains are thus directly tied to the economic prosperity, technological leadership, and national security of the U.S. Demand for these materials, particularly for advanced energy technologies, is accelerating globally due to their importance across energy, defense, and consumer electronics applications. The U.S. currently evidences significant import reliance, being 100% import dependent for 12 of the 50 minerals identified as critical by the U.S. Geological Survey and over 50% import reliant for another 28. This vulnerability is exacerbated by the fact that China dominates the

midstream processing and refining of critical materials, accounting for 40% to 90% of the world's supply of rare earth elements, lithium, cobalt, and copper. This escalating demand, coupled with existing vulnerabilities in global CMM supply chains—such as concentrated extraction and processing, geopolitical risks, and environmental considerations—presents a significant strategic challenge for the U.S. This NOFO directly responds to and supports the policy directives outlined in recent Executive Orders. Executive Order 14241 ("Immediate Measures to Increase American Mineral Production") emphasizes boosting domestic critical mineral production and directs Federal agencies to expedite priority mineral production projects. Executive Order 14156 ("Declaring a National Energy Emergency") identifies the lack of a reliable, diversified, and affordable supply of critical minerals as an imminent threat to the U.S. prosperity and national security. Furthermore, Executive Order 14154 ("Unleashing American Energy") directs Federal agencies to review burdens on domestic energy resource development, including critical minerals, and specifically instructs the Secretary of Energy to ensure Federal support for critical mineral projects.

The U.S. Department of Energy (DOE) recognizes the urgency of this situation. For over a decade, DOE has invested in basic and applied research and development (R&D) to address the scientific and technological challenges in the CMM sector. Despite robust early-stage research, a persistent "valley of death" exists for many CMM innovations, where promising bench-scale technologies struggle to secure the necessary investment and infrastructure for commercial viability. To facilitate this necessary transition and accelerate commercialization, AMMTO and OG plan to fund collaborative industry partnerships for prototyping and small-scale piloting of technologies crucial to the CMM supply chain. Projects funded under this NOFO will mature and validate technologies or processes proven at the bench scale, addressing critical material challenges in high-impact areas. To support this maturation, project teams can collaborate with national laboratory test beds, analytical expertise, and specialized testing environments, crucial for optimizing and qualifying these technologies. Through this structured advancement, scaffolded by rigorous technoeconomic analyses (TEA) and life-cycle assessments (LCA) that benchmark performance and cost against industry standards, teams will effectively derisk essential technologies and attract private capital.

Awarded projects from Topics 1, 2, and 3A will be eligible to compete for a subsequent Phase 2 pilot-scale project through a down-select process of up to $8 million per project, provided they successfully complete Phase 1 work and establish a compelling business case, develop necessary partnerships, and secure commitments for a 50% cost-share. Additional details can be found in Section III.D, Expected Performance Goals and IV.D.3, Technical Volume requirements.

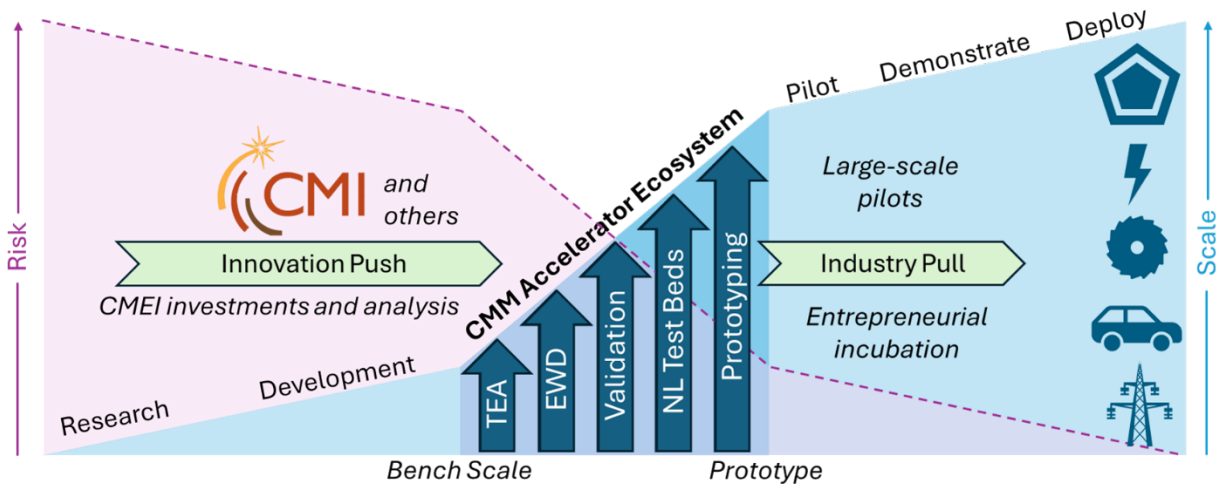

Figure 1: The CMM Accelerator scales and derisks innovative technologies and processes to validate for industry relevant adoption and follow-on investment.

The work funded under this NOFO is integral to the DOE's overarching CMM vision: to build reliable, resilient, affordable, and secure domestic critical mineral and materials supply chains that support the energy, manufacturing, and transportation economies while promoting safe solutions to meet current and future needs.[6] The anticipated outcome is the development of a robust pipeline for technology maturation, leading to domestic commercialization within 3 to 7 years, thereby strengthening the reliability and security of the U.S. CMM supply chain. The activities funded under this NOFO directly support the DOE's overarching Critical Minerals and Materials Strategy, which aims to ensure a more secure, predictable, and affordable supply of CMMs. This strategy is centered on key pillars: (1) Broaden and Expand Supply: Identify and secure substantial resources from a wide variety of feedstocks including primary and secondary sources, co-produced materials from existing operations, and international partners; (2) Develop Alternatives: Produce new materials that have less disruption potential and design manufactured parts and systems that require little to no critical materials to function; (3) Improve Materials and Manufacturing Efficiency: Design for atom economy, reduce waste through efficient use, and improve overall efficiency of mining through manufacturing and recycling to minimize environmental impacts while maximizing yield; (4) Reuse and Recycle: Remanufacture, refurbish, repair, reuse, recycle, and repurpose all materials that are used in a modern economy to extend the lifetime of materials and/or partially offset the need for virgin material extraction.

The activities to be funded by AMMTO under this NOFO are authorized under sections 7002(g) of the Energy Act of 2020, as codified at 30 U.S.C. 1606(g) and Section 911 (a)(2)(C) of the Energy Policy Act of 2005, as codified at 42 U.S.C. § 16191(a)(2)(C). The activities to be funded by OG under this NOFO are authorized under the Energy Independence and Security Act of 2007 (EISA 2007) as amended by the Energy Act of 2020, Sections 613(a) and (b) (42 U.S.C. 17193(a) and (b); 616(a) (42 U.S.C. 17195A(c)).

[6] DOE Critical Minerals and Materials Program: https://www.energy.gov/cmm/critical-minerals-and-materials-program

B. Program Purpose

The Advanced Materials and Manufacturing Technologies Office (AMMTO) and the Office of Geothermal (OG) issue this NOFO to address key challenges in the critical minerals and materials sector (CMM). This funding, provided through the Critical Minerals and Materials Accelerator program, will accelerate the maturation of innovative processing and manufacturing technologies vital for America's energy future, national security, and industrial competitiveness. These efforts directly support AMMTO's aim to transform materials and manufacturing to advance the energy economy and develop reliable supply chains for the nation's energy future. This NOFO also aligns with OG's objectives to advance energy technologies, particularly where critical materials are integral.

Specifically, the CMM Accelerator program aims to overcome the "valley of death" faced by promising bench-scale innovations, enabling their progression to commercially viable solutions. This initiative builds upon over a decade of DOE funding in CMM R&D, leveraging prior work to further validate technologies and establishing confidence required for follow-on investment. This NOFO plans to fund collaborative industry partnerships for prototyping and small-scale piloting of technologies crucial to the CMM supply chain, thereby accelerating their commercialization. Technology maturation within this program will be scaffolded by robust technoeconomic analyses (TEA) and life-cycle assessments (LCA), access to national laboratory test beds and other collaborative user facilities and characterization tools to benchmark against industry state-of-the-art. For all topics except 3B and 3C, this scaffolding will be accessible through a voucher system facilitating access to National Laboratory expertise for areas such as subject matter expertise, TEA and LCA support, training and workforce development opportunities, and leveraging capabilities like those at the Minerals to Materials Supply Chain Research Facility (METALLIC).[7]

Through strategic funding, the program will advance material supply chains by developing capabilities for mineral and material resources necessary to manufacture next-generation energy technologies, and by supporting technological frameworks for product and material recovery, reuse, and recycling. Such efforts are essential for achieving a more secure, predictable, and affordable domestic supply of critical minerals and materials, benefiting a broad array of U.S. industries and reinforcing the nation's strategic position.

C. Program Goals and Objectives

The Critical Minerals and Materials Accelerator NOFO seeks applications to rapidly derisk and scale breakthrough technologies and processes that can serve to establish a secure, reliable, and competitive domestic supply chain for critical minerals and materials essential to U.S. energy, national security, and industrial leadership. Successful proposals will outline plans to achieve the following programmatic goals.

[7] The Minerals to Materials Supply Chain Research Facility (METALLIC): https://netl.doe.gov/metallic

CMM Accelerator Goals:

1. **Foster Industry Partnerships to Prototype and Pilot Technologies:** Cultivate and strengthen collaborations among industry, National Laboratories, and academia to accelerate the adoption of innovative solutions for critical material challenges in high-impact areas.
2. **Derisk and Validate the Effectiveness of Technologies and Processes:** Mature and demonstrate the effectiveness of materials and manufacturing technologies that reduce the need for critical materials.
3. **Enable Informed Decisions, Optimize Processes, and Build Confidence in Technology Scale-Up:** Utilize Life-Cycle Assessment (LCA) and Techno-Economic Analysis (TEA) to guide process improvements and enhance confidence in technological advancement.
4. **Address Urgency for Material Demand with Secure Manufacturing Technologies to Access Untapped and Under-explored Resources:** Develop and deploy domestic manufacturing technologies and expand domestic critical material resources that ensure a stable supply of critical materials.

Topic Areas

The following Topic Areas were selected based on where prototyping and pilot-scale demonstration are needed to advance promising technologies and on the production of priority materials for energy systems.

Topic Area 1: Production and material efficiency for critical materials including rare earth elements. Inclusive of the following sub-topics:

1A: Recovery and production from postindustrial manufacturing scrap

1B: Recovery and production from postconsumer scrap (with an emphasis on electronic waste and drivetrains)

1C: Recovery and production from combinations of feedstocks including mine tailings, postindustrial scrap, and postconsumer scrap

Topic Area 2: Processes to refine and alloy gallium, gallium nitride, germanium, and silicon carbide.

Topic Area 3: Cost-competitive direct lithium extraction, separation, processing, exploration, and co-production. Inclusive of the following sub-topics:

3A: Cost-competitive direct lithium extraction

3B: Advancing pre- and post- treatment and disposal technologies for direct lithium extraction of geothermal brines

3C: Exploration and characterization of critical materials and REEs from volcanic hosted geothermal systems

Coordination with DOE's CMM Innovation Ecosystem

Critical Materials Collaborative (CMC)

To help ensure a secure domestic supply of critical minerals and materials (CMM), the DOE is seeking to accelerate production of CMMs from a diverse set of sources (e.g., secondary,

unconventional, conventional) and working with other government and private agencies as part of a government-wide CM strategy.

As part of this strategy, the DOE has established a Critical Materials Collaborative (CMC)[8] to be a centralized entity for multidisciplinary, collaborative, critical materials applied research, development, and demonstration (RD&D). The Collaborative coordinates CMM innovation across the DOE, other government agencies, industry, and academia, as well as providing enabling technologies to reduce commercialization time and risk.

All selected projects from this NOFO are required to participate as a member of the CMC, which is a coalition of DOE offices, Federal agencies, and Federally funded R&D programs to:

- Align the DOE research portfolio to achieve national security goals and crosscutting science and technology objectives;
- Advance crosscutting applied research, development and demonstration 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.

The Recipient's principal investigators or a member of their research team are required to participate in coordination efforts including, but not limited to, an in-person annual symposium, virtual coordination meetings, and periodic presentations on research progress. There are no membership fees associated with participation in the CMC.

The proposed Recipients to this NOFO should take into consideration possible collaboration with the programs supported by other DOE program offices. Projects funded as a result of this NOFO will be encouraged to explore opportunities to coordinate with projects funded by other DOE offices and Federal agencies through the CMC in order to maximize the scientific and technological impact.

Recipients are required to participate in the CMC throughout the project and may potentially participate up to one year after the period of performance has concluded.

Other Funding Opportunities from DOE:

DOE recently issued other funding opportunities covering different challenges and topics important to the CMM sector. In particular, the Hydrocarbons and Geothermal Energy Office issued a NOFO DE-FOA-0003583, "Infrastructure Investment and Jobs Act (IIJA) – Mines & Metals Capacity Expansion – Piloting Byproduct Critical Minerals and Materials Recovery at Domestic Industrial Facilities." The NOFO issued by the Hydrocarbons and Geothermal Energy Office focuses funding on U.S. industrial facilities that have the potential to produce valuable mineral byproducts from existing industrial processes. These technologies must be piloted at an

[8] Critical Materials Collaborative: https://www.energy.gov/cmm/critical-materials-collaborative

industrial scale in an industrial facility where material feedstocks can be processed to derisk the technical uncertainty and financial risk for commercial deployment. The NOFO can be found on https://netl-exchange.energy.gov/.

Additionally, the Office of Critical Minerals and Energy Innovation (CMEI) issued a NOFO DE-FOA-0003585, "Infrastructure Investment and Jobs Act (IIJA) Section 40207 Battery Materials Processing & Battery Manufacturing and Recycling Grant Programs." The NOFO issued by CMEI through its Manufacturing Deployment Office focuses on the development of demonstration and commercial facilities to increase the domestic supply of critical minerals and materials for advanced batteries. The NOFO can be found on https://infrastructure-exchange.energy.gov/.

D. Expected Performance Goals

This NOFO is divided into two phases: prototyping and pilot demonstration. Detailed goals for each Topic Area are included in the description below. In general, the goal of Phase 1 is to complete a first-of-a-kind prototype of a novel technology that addresses an important CMM supply chain challenge. Prototyping will further derisk the technology and will enable a credible techno-economic and lifecycle analysis to be performed. This data will highlight where additional derisking and innovation is necessary as well as support future investment.

As described below, the high-impact and cost-competitive technologies that complete Phase 1 will be eligible to compete for Phase 2 funding through a down-select process (up to $8 million per award with a 50% cost share), which will result in a pilot scale demonstration of the novel process. Note that technologies from Topics 3B and 3C are not eligible for a Phase 2 award through this NOFO. The goal of Phase 2 is to cultivate supply chain partnerships and sufficiently derisk technologies for which full scale demonstration and commercialization is the next stage.

Pilot-Scale Preparedness

The work funded through the CMM Accelerator NOFO is designed to mature technologies towards pilot-scale readiness. Awarded projects will be eligible to subsequently compete for a distinct Phase 2 pilot-scale project through a down-select process funding opportunity under the CMM Accelerator program. Successful progression to Phase 2 will require teams to have established a compelling business case, developed key partnerships, and secured commitments for a 50% cost-share for the pilot. Over the course of the Phase I prototyping project, teams are expected to develop a detailed plan that outlines the necessary steps and preparations for building and operating a pilot-scale version of the proposed technology or process. This plan should inherently demonstrate how the work performed in Phase I has prepared the technology for such public or private follow-on investment and scale-up, and should address the following criteria:

a. Performance Targets: Quantifiable targets for increased scale, throughput, performance, and cost reduction at the pilot stage.
b. Supply Chain Integration: Strategies for identifying and engaging upstream and downstream partners to optimize material handoffs, off-take agreements, and overall supply chain integration.

c. Additional Expertise: Identification of new personnel, expertise, and organizational structures required for pilot-scale development and operation.
d. Investor Engagement: Evidence of preliminary engagement with potential investors or strategic partners to support a future 50% cost-share pilot-scale funding.
e. Follow-on Investment Pathway: A clear outline of how the Phase 1 project's outcomes will establish confidence and attract the necessary commitments for a subsequent pilot-scale funding opportunity. Phase 1 awarded projects will be eligible for this potential Phase 2 pilot-scale funding under the CMM Accelerator program.
f. Business Case Development: A clear and compelling business case for the proposed technology, including market analysis, value proposition, and competitive advantages that would justify follow-on funding for pilot-scale implementation.

The work performed during the Phase 1 project should include plans to prepare a competitive application and pilot-scale plan as described above.

Technical Assistance

Derisking promising laboratory-scale innovations into commercially viable solutions requires robust support systems. To ensure successful technology maturation and accelerate commercialization, projects funded under this NOFO may strategically integrate technical assistance into their development plans.

Statement of Project Objectives (SOPO) is required to be comprehensive of all project activities, including any technical assistance requested by the project team. If used, the SOPO should detail how technical assistance will be leveraged in their project; this includes but is not limited to initial plans for conducting TEA and LCA, input and output material characterization, entrepreneurship training, and utilizing appropriate testbeds. Competitive proposals will demonstrate how integrated technical assistance activities will scaffold the scaling, derisking, and validation of their technology or process. Such assistance may involve:

- Robust Analysis and Benchmarking: analytical support and rigorous testing against industry benchmarks to qualify performance, cost-effectiveness, yield, and throughput.
- Testbeds and Validation: test, demonstrate, and optimize technology and process operation in an industry-relevant environment.
- Material Characterization and Qualification: comprehensive material characterization and qualification to meet eventual offtake requirements.
- Entrepreneurship Resources: training and mentorship to enhance commercialization pathways through sustainable business models and effective stakeholder engagement.
- Workforce Development: Supporting students and educations who will gain industry experience and training through engagement with the project. Building a skilled workforce essential for the technology's eventual deployment and informing the creation of industry-relevant training and educational materials and programs

To support the expedited achievement of these goals and maximize the probability of success, AMMTO will provide financial support for technical assistance to awardees as described above. Further details on financial support for technical assistance are described in the "**Financial Support for Technical Assistance"** section below.

To assist in identifying potential partners at DOE's National Labs for technical assistance, applicants are encouraged to review DOE's September 29, 2025 webinar on national lab capabilities related to CMM (https://www.youtube.com/watch?v=kUlJkjSqyLM).

One of the more recently established capabilities is the Minerals to Materials Supply Chain Research Facility[6] (METALLIC) program, whose focus is grounded in establishing a CMM innovation ecosystem to (1) validate and test technologies, (2) connect technology developers to technology users (and vice versa) and (3) identify pathways for CMM production from new feedstocks. METALLIC is run by the National Energy Technology Laboratory and includes participation from eight other U.S. Department of Energy (DOE) National Laboratories (Ames National Laboratory, Argonne National Laboratory, Idaho National Laboratory, Berkeley Lab, Lawrence Livermore National Laboratory, National Laboratory of the Rockies, Oak Ridge National Laboratory, and Pacific Northwest National Laboratory). METALLIC aims to deliver high impact return on investment by creating an innovative ecosystem under a virtual roof that leverages the nation's leading capabilities for accelerating and derisking critical minerals and materials technology development and commercialization. The METALLIC team will achieve this by integrating process modeling and optimization; artificial intelligence and machine learning for energy, materials, and geoscience research; LCA; data science and warehousing; and supply chain analysis and modeling capabilities. METALLIC will both leverage and expand national lab capabilities of the participating national labs under a virtual roof, organized into different centers according to areas of the supply chain and laboratory expertise. Centers are focused on feedstock beneficiation, extractions and separations, refining, and alloy development and advanced manufacturing. Inquiries regarding METALLIC collaborations can be sent to Work-With-METALLIC@netl.doe.gov.

Additionally, applicants can utilize the Partnering List (section E of this NOFO) to identify entities offering technical assistance. Entities who provide technical assistance should provide their information to the Partnering List system to further enhance collaboration opportunities.

Financial Support for Technical Assistance

Projects funded under this NOFO are encouraged to leverage the specialized expertise and facilities of the DOE's National Laboratories and other domestic test beds for various aspects of their work. To facilitate this crucial collaboration, a voucher system to relevant labs will be available for projects wishing to engage in auxiliary activities that augment or supplement primary SOPO efforts. This voucher system will cover third party costs associated with the agreed-upon technical assistance work. Costs covered by the voucher require no additional cost share. Costs incurred by the project team for their engagement in voucher-related activities should be included in the project budget and will be subject to cost share requirements. For example, if a voucher is provided for characterization at a lab facility, lab use and national lab scientist time will be covered by the voucher, but the cost of materials and the project PI time to engage with the national lab should be included in the budget.

Applicants interested in utilizing these technical assistance engagements should detail the proposed scope of work including a brief justification for their involvement and the expected

benefits to the project, within the application's Technical Volume. Applications will be scored on how well the proposed technical assistance effectively scaffolds their technology advancement. Letters of support from entities providing technical assistance, agreeing to support the proposed project, are highly encouraged. It is important to note that proposals will not be evaluated based on the forecast of unidentified or uncommitted technical assistance. For awarded projects, further direction and advice regarding the utilization of these engagements and the voucher system will be provided during the award negotiation process.

All selected projects will be required to participate as a member of the Critical Materials Collaborative (CMC)[7], which is a coalition of DOE offices, Federal agencies & Federally-funded R&D programs to support DOE's CMM Vision. See section I.F to read more about engaging with the CMC.

All work under CMEI funding agreements must be performed in the U.S. See Section IV.E.iii. and Appendix C.

Application Metrics

The purpose of the NOFO is to fund projects that will prototype technologies and processes proven at the bench scale that solve critical material challenges in high impact areas. Projects funded for Phase 1 work under this opportunity will advance technology readiness from the bench scale (TRL 3) to prototyping in a relevant environment (TRL 6). This 'beakers to buckets' approach can be achieved by industry or partnerships with industry. Metrics can vary by topic area, however, applications are encouraged to address the relevant considerations in Table 2 to demonstrate alignment with the goals and purpose of this NOFO. Projects funded for Phase 2 work under this opportunity will advance technology readiness from prototype scale (TRL6) to pilot scale (TRL 7).

Table 2: Considerations for NOFO applications.

Group	Considerations
Technology Related Considerations: the following principles are generally relevant to advancing a technology, process, or material.	**Scalability**: Proposed work demonstrates pathway to scale manufacturing to reach industrial levels. This includes developing materials and prototypes of comparable size or weight to operate in commercially deployed energy technologies. Similarly, the work should demonstrate the potential to produce or operate at a rate that can meet industrial demand.
	Reliability: Evaluate reproducibility and consistency of performance and outputs in a relevant operating environment.
	Performance: Materials, components, and processes developed should exhibit key performance metrics that compete with the current state of the art.
	Energy Efficiency: Evaluate the energy requirements of the process. Quantify the embodied energy of any outputs.
	Resource Efficiency: Identify where chemical, water, and energy intensity are reduced relative to current and competing technologies.

	Compatibility and Interoperability: Alternative materials and processes should be compatible with existing components and systems of energy technology manufacturing and operation. In instances where other components need modification, the project should demonstrate the steps and costs necessary to achieve integration. Similarly, where possible, proposed work should exhibit how alternative materials and processes can adapt to different energy technology systems.
Cost Considerations: How cost of production and/or operation compares to current and projected market prices.	**Economies of Scale**: Identify potential cost savings with increased production volume and the time and investments necessary to reach that scale.
	Competitiveness: Determine how affordability can be optimized to drive technology uptake.
	Integration Costs: Consider how the cost of integrating the material or process into existing components, energy technology systems, and value chains will impact the competitiveness.
Environmental Health Considerations: Ensure compliance with safety and regulatory standards. Assess any potential health and safety risks associated with the production process.	**Environmental Impact**: Assess the chemical, water, and energy footprint and of the technology and identify opportunities to improve sustainability.
	Health and Safety: Identify the materials or conditions used that are potentially harmful to human or biological health and how their use will be controlled and limited. Compare with current manufacturing practices where possible. This consideration should be taken for both the worker and the community where the technology would be used.
	Training: Determine what experience, education, or expertise is necessary to safely operate the process or technology. This can include degrees, certificates, specific courses, or on-the-job training.
Commercialization considerations: Advancing a technology or approach from bench scale to prototyping requires an understanding of corresponding market and supply chain factors.	**Collaboration**: Identify the necessary partners and agreements to provide resources necessary to develop, scale, validate, and protype the technology. See section I.A.v for more information about partnering.
	Market Analysis: Analyze market demand for the critical material and assess its potential value and what business model would be most successful. Identify potential customers or industries that could benefit from the material.
	Regulatory Awareness: Examine regulatory standards to understand the steps that are necessary to achieve compliance and approval for production. Where possible, compare with currently deployed technologies.
	Resource Access: Indicate the availability of necessary resources, including raw materials, feedstocks, equipment, and expertise.
	Technology Transfer: Plan for knowledge transfer and training to ensure successful implementation of the technology.

	Durability: Key performance indicators are sustained through the full range of operating conditions experienced by the same end-use technology commercially deployed since 2013 or later.
	Return on Investment: Based on the cost of the set up and operation, how quickly can an organization payback the initial investment and begin making revenue
	TRL Advancement: Understand the current TRL of the technology and identify a path to transition the technology to prototyping Applications are encouraged to make preliminary indications of the additional work necessary to bring the approach/technology from prototype to full-scale production.
	ARL Advancement: consider how the proposed project actively advances its Adoption Readiness Level (ARL), demonstrating a strategic plan to address non-technical barriers alongside technical development. This includes outlining actionable steps to mature the technology's value proposition, market acceptance, resource infrastructure, key partnerships and offtake agreements, and license to operate.

E. Topic Areas

Topic Areas

The following Topic Areas were selected based on where prototyping and pilot-scale demonstration are needed to advance promising technologies and on the production of priority materials for energy systems.

Topic Area 1: Production and material efficiency for critical materials including rare earth elements. Inclusive of the following sub-topics:

1A: Recovery and production from postindustrial manufacturing scrap

1B: Recovery and production from postconsumer scrap (with an emphasis on electronic waste and drivetrains)

1C: Recovery and production from combinations of feedstocks including mine tailings, postindustrial scrap, and postconsumer scrap

Topic Area 2: Processes to refine and alloy gallium, gallium nitride, germanium, and silicon carbide.

Topic Area 3: Cost-competitive direct lithium extraction, separation, and processing. Inclusive of the following sub-topics:

3A: Cost-competitive direct lithium extraction

3B: Advancing pre- and post- treatment and disposal technologies for direct lithium extraction

3C: Exploration and characterization of critical materials and REEs from volcanic-hosted geothermal systems

Topic Area 1: Production and material efficiency for critical materials including rare earth elements.

This Topic Area seeks to derisk and validate technologies and processes that establish and expand the amount of Critical Minerals and Materials (CMM) recovered from domestic secondary sources. The primary goal is to prototype recycling and recovery methods for these CMMs from various secondary sources, including post-industrial manufacturing scrap, post-consumer scrap, and combination of feedstocks (e.g., operational mine tailings). This funding aims to bolster the domestic supply chain, reduce reliance on external sources, and improve economic and environmental aspects of CMM production. Rare earth elements, which are critical to efficient energy conversion and of strategic importance for national security, are of particular interest for Topic Area 1.

Topic Area 1 is organized into three categories:

A. Recovery and production from postindustrial manufacturing scrap;
B. Recovery and production from postconsumer scrap; and
C. Recovery and production from combinations of feedstocks including mine tailings, postindustrial scrap, and postconsumer scrap.

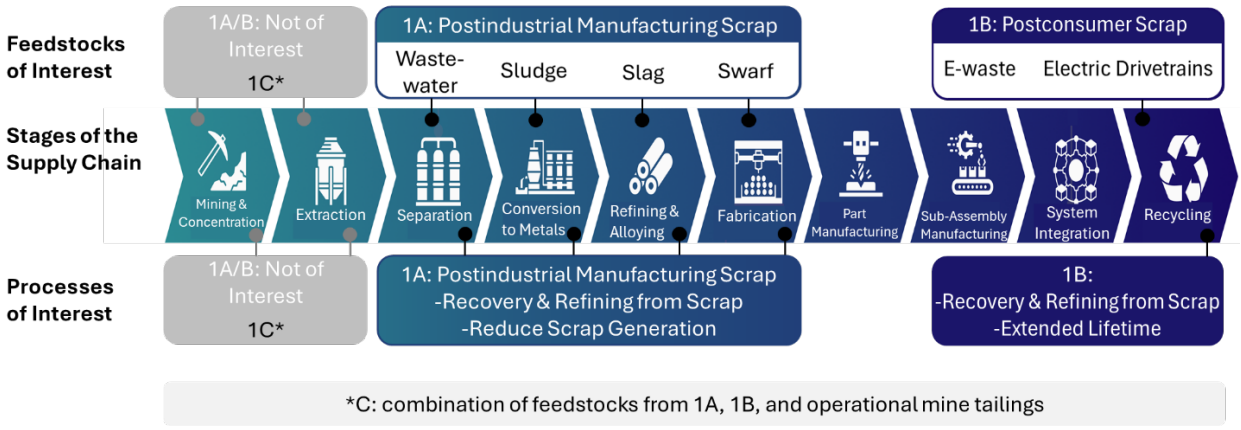

Figure 2. Scrap feedstocks (and illustrative examples) of interest and improved processes of interest as they correspond to the supply chain for each Topic Area 1 category.

Each Topic Area 1 category seeks projects to validate and prototype processes or technologies that improve recycling recovery and refining of CMM from scraps and improve efficiency where possible. More details are provided about each category.

1A: Recovery and production from postindustrial manufacturing scrap

Topic Area 1A seeks projects to validate and prototype processes or technologies that improve recovery and refining of CMM from postindustrial manufacturing scrap or that reduce CMM-containing waste generated during the separation, refining or manufacturing process. For the purposes of the NOFO, postindustrial manufacturing scrap is defined as waste generated during the refining of intermediate CMM products and waste containing CMM generated during the refining of other primary metal products or manufacturing of components that contain CMM (see Figure 2). Examples of scrap feedstocks of interest include, but are not limited to, slag generated from steel making, magnet swarf generated from griding and cutting magnet blocks,

copper anode slimes generated during copper refining, and sludge generated during zinc refining. Projects can advance processes to recover CMM from scrap, recover *and* refine intermediate products or purified products from CMM scrap, or reduce waste generation during the production of intermediate products, refined/purified products or fabricated components.

Increasing domestic manufacturing is an important priority for the Administration. As domestic production increases, post-industrial waste will become an increasingly important source of critical materials. By increasing the material efficiency of these processes, either through reducing waste during primary production or by valorizing waste to produce CMMs, domestic manufacturing will be more efficient and competitive. For example, 6% to 73% of a sintered neodymium-iron-born magnet block is transformed into manufacturing scrap, or magnet swarf, through cutting and grinding[9]. Swarf makes up to an estimated 90% of global secondary rare earth supply[10].

1B: Recovery and production from postconsumer scrap

Topic Area 1B seeks projects to validate and prototype processes or technologies that improve recovery and refining of CMM from postconsumer scrap. Postconsumer scrap of interest includes electronic waste (e-waste) and electric drivetrains containing permanent magnet machines (motors or generators). Postconsumer lithium batteries are not of interest. Projects can advance processes to recover CMM from scrap or recover *and* refine intermediate products or purified products from CMM scrap.

For the purposes of this NOFO:

- E-waste is defined as waste electrical and electronic equipment such as consumer electronics, home appliances, medical or office equipment, and anything else powered by electricity;
- Electric drivetrains refer to any permanent magnet machine-containing drivetrain; and
- Devices that contain permanent magnet motors or actuators such as heat pumps and power tools are considered e-waste.

Electric drivetrains contain multiple critical materials including: neodymium (Nd), praseodymium (Pr), dysprosium (Dy) and terbium (Tb) in neodymium-iron-boron magnets; electrical steel in the motor back iron; copper (Cu) in the stator windings; aluminum in the casing; and silicon carbide, silicon and gallium in the power electronics. For example, plug-in hybrid electric vehicles (PHEV) have an estimated 354 to 531g of NdPr, 45 to 153 g of DyTb, and 60 grams Cu per vehicle.[11] For PHEV sales in the U.S. alone from 2018 to 2024[12], that translates to a conservative estimate[13] of 3,842 to 5,763 metric tons of NdPr, 492 to 1,663 metric tons of DyTb, and 651 metric tons of Cu available for recycling at end-of-life.

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[9] https://www.osti.gov/servlets/purl/1833543

[10] https://www.iea.org/reports/recycling-of-critical-minerals.

[11] https://www.energy.gov/sites/default/files/2023-07/doe-critical-material-assessment_07312023.pdf

[12] Electric Power Monthly - U.S. Energy Information Administration (EIA)

[13] Assuming all car sales and excluding vans, buses, and trucks that contains more critical materials.

E-waste covers a range of electronics including consumer electronics, lighting, energy, medical, and office equipment, networking and communication equipment, hard drives, and batteries embedded in consumer electronics and home appliances. E-waste is the fastest growing waste stream in the U.S. and is projected to reach approximately 1,362 kt in 2025. Despite containing significant amounts of CMMs, substantial losses occur throughout the recycling value chain (Figure 3). Between end-of-life and reintroduction, about 54% of CMMs from U.S. e-waste are landfilled, 44% are exported, and only 2% are recovered domestically.

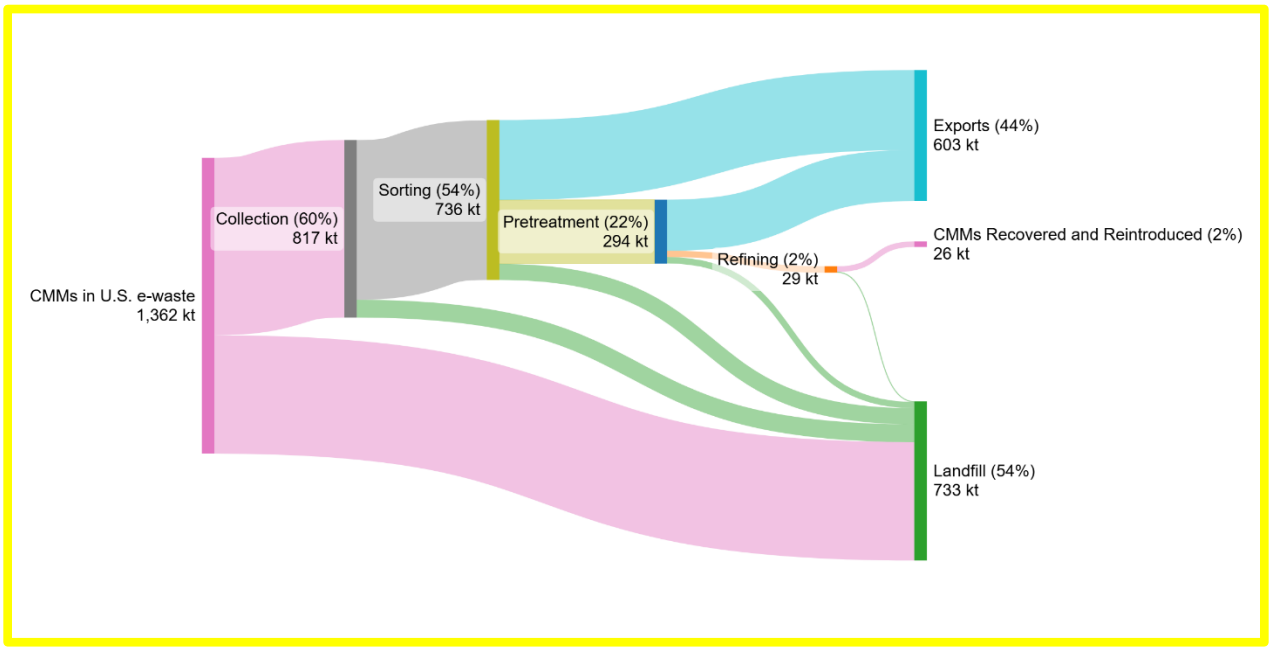

Figure 3. E-waste (inclusive of electric motors) in the U.S.: estimated losses of CMM.

The challenges leading to the landfill or export of CMM in the e-waste recycling value chain include:

- **Collection:** Low capture rates and limited take-back infrastructure prevent many devices from entering the formal recycling system. Inconsistent volumes and unpredictable feedstock flows make it difficult to plan operations and maintain economic viability. Safety and logistical challenges associated with batteries and other hazardous components further constrain transport and centralized processing. A lack of data on the composition and condition of discarded devices also hinders efficient routing to appropriate processing facilities.
- **Sorting and Separation:** Manual dismantling remains labor intensive and struggles to keep pace with device innovation and the use of complex, bonded assemblies. Bulk shredding and non-selective physical processing often result in the loss of components rich in CMM such as magnets and thin-film layers. Existing sensor-based systems, including optical, X-ray, and eddy current technologies, can be slow, insufficiently selective, or cost-prohibitive when applied to fine fractions.
- **Recovery and Refining:** Pyrometallurgical processes are effective at recovering base metals but often result in the loss of critical elements such as rare earths, gallium, indium, and tantalum. Hydrometallurgical methods face challenges related to costs, waste generation, and scalability when treating complex or mixed feedstocks. Recovery of low-

concentration metals also remains economically challenging, as processing costs frequently exceed the value of the recovered material.

- **Qualification and Reintroduction:** A lack of standardized qualification procedures and testing protocols for recovered materials entering domestic supply chains. Variability in purity and composition limits direct use and often necessitates blending with virgin feedstock. Limited third-party testing and certification capacity further slows adoption of recovered materials by manufacturers.

End-of-life electronics, such as home appliances and consumer electronics, represent a domestic source of CMM. At present, the U.S. recycling infrastructure targets abundant and valuable metals such as aluminum, gold, and copper. However, the recycling rates for many CMMs remains significantly low. For example, less than 1% of neodymium is currently recycled from e-waste, meaning nearly all of the 3000 tons of neodymium (which represents approximately 32% of U.S. neodymium demand in 2025) in end-of-life products is exported or landfilled each year.

Proposals addressing CMM recovery from e-waste may consider the following technical solutions to address the challenges as outlined above.

- **Collection**: Strengthening regional and domestic collection infrastructure; implementing product passports and enhanced data transparency; and improving capture of materials from manufacturing scrap streams.
- **Sorting and Separation**: Advancing automated disassembly technologies; leveraging product passports and improved labeling; integrating novel sorting and separation techniques into existing recycling infrastructure; integrating in-situ characterization mechanisms to identify and sort valuable components and materials out of complex waste streams; and developing enhanced part and product recognition systems for advanced disassembly.
- **Recovery and Refining**: Developing cost-effective and modular processing technologies that can integrate into the existing recycling infrastructure; implementing flexible and selective recovery processes for CMMs from complex waste streams; and promoting design-for-recyclability approaches and next-generation material recovery methods.
- **Qualification and Reintroduction**: Establishing purity assurance protocols for off-take markets; establishing material quality and cost benchmarks and connect with third-party material characterization capabilities to qualify recovered material; and developing qualification methodologies to enable the integration of recovered materials into domestic manufacturing supply chains.

1C: Recovery and production from combinations of feedstocks including mine tailings, postindustrial scrap, and postconsumer scrap

Price volatility, demand uncertainty, and supply insecurity are all features of the CMM landscape. Agile manufacturing, which focuses on flexibility and responsiveness, is an important feature of a secure supply chain because it can address many of these challenges. Projects can advance processes to recover CMM from a combination of scrap or recover *and* refine intermediate products or purified products from a combination of scrap. By developing processes that can refine CMM from multiple feedstocks, we can introduce agility into the

midstream of CMM supply chains. This Topic Area seeks projects to validate and prototype processes or technologies that are able to either process blended feedstock or demonstrate the ability to process multiple individual feedstocks. These feedstocks may include postconsumer scrap, postindustrial manufacturing scrap, and operational mine tailings such as phosphoric acid sludge, red mud from bauxite, and tailings from metal mines like nickel, gold, copper and platinum. Fossil fuel-derived mine tailings and legacy mine tailings are not of interest.

Topic Area 1 Specific Consideration:

Projects should aim to reduce cost and environmental impact compared to industry state -of -the -art. This includes strategies like reagent cost reduction, process intensification, improved selectivity, higher yield and throughput, faster kinetics and mass transfer, reduced chemical intensity, reduced water demand, improved reliability, and automation. Recycling methods may include pyrometallurgical, hydrometallurgical, or other innovative approaches. Projects are encouraged to utilize digital twins, artificial intelligence (AI), and machine learning (ML) tools for process enhancement. Any AI/ML usage must be scientifically grounded, incorporate feedback loops with real-world expertise, and not replace experimental validation. Projects are expected to evaluate the adoption readiness level (ARL) of their technology or process and outline in their proposal how the work will serve to advance the ARL over the course of the project.

- **Topic Area 1B Specific Considerations**: Projects are encouraged to prototype a technology or process that if deployed at commercial scale would establish or expand the recovery of CMM from postconsumer scrap, including e-waste and electric drivetrains. Projects are encouraged to qualify recovered material for introduction into domestic manufacturing supply chains through engagement with potential off takers or downstream partners.

Project Timelines: Proposed projects should have already demonstrated proof of concept (TRL 3) and target a 12-to-18-month scope of work to validate and prototype technologies at industrially relevant scales (TRL 6). For recycling challenges not yet ready for prototyping, it is permissible to propose an R&D concept to prototyping project that advances TRL 2 to TRL 6 over a 24-to-36-month scope of work.

Topic Area 1 Specific Deliverables:

- A prototype CMM recycling or refining process demonstrated in a relevant environment (TRL 6) using real-world feedstocks (excluding model compounds or synthesized materials).
- Demonstrate that recovered CMMs meet industry standards and can serve as an affordable feedstock for manufacturing processes.
- Conduct TEA including a bill of materials, manufacturing equipment list, and cost estimates for material/component production.
- Quantify the technology's potential to impact energy and resource efficiency through LCA.

Topic Area 1 Specific Applications of Interest

- Translational recycling technologies that can be tailored to recover different target materials.
- Projects that co-produce multiple CMM and other valuable commodities contained in a given waste stream.
- Projects that valorize by-production of a singular high value CMM such as cobalt or strategically important CMM that can readily close the gap between domestic supply and demand such as gallium or germanium.
- Improvements to refining and manufacturing processes that reduce the generation of CMM waste such as reduction or elimination of defects.

Topic Area 1A Specific Applications of Interest

- Modular recycling technologies that can be co-located at a refining or manufacturing site.
- Rare earth elements (particularly magnet rare earth elements neodymium, praseodymium, dysprosium and terbium), gallium, germanium, silicon, nickel, cobalt, copper, and aluminum are materials of interest for this Topic Area as targets for recovery.

Topic Area 1B: Topic specific applications of interest

- Modular, drop-in technologies that can integrate into existing recycling infrastructure.
- Rare earth elements (particularly magnet rare earth elements neodymium, praseodymium, dysprosium and terbium), gallium, germanium, silicon, nickel, cobalt, copper, aluminum, and electrical steel are materials of interest for this topic as targets for recovery.
- Sorting methods that improve characterization of the chemical speciation of scrap containing mixed materials (e.g. shredded e-waste or shredded automative scrap).
- Disassembly methods that minimize impurities and enable production of high purity materials (e.g. dismantle before shredding to prevent contamination of Al and Cu).
- Refining and manufacturing processes that upgrade scrap into high purity value material forms (e.g. through improvement of microstructure).
- Projects that address the topics in Table 3:

Table 3: Focus areas for valorization and specific challenges pertaining to CMM recovery from e-waste and electric drive trains

	E-waste	Electric Drivetrains
Valorization	• Collection	
	• Disassembly • Sorting • Multi-material recovery	
Specific Challenges	• Hard disk drive recycling • Integration of CMM separation into existing recycling infrastructure	• Short loop recycling of electrical steel • Removal of impurities to enable secondary production of high purity copper and aluminum
	• Power electronics recycling • Efficient separation of critical materials from components	

Topic Area 1C: Topic specific applications of interest

- Rare earth elements (particularly magnet rare earth elements neodymium, praseodymium, dysprosium and terbium), gallium, germanium, silicon, nickel, cobalt, copper, aluminum, and electrical steel are materials of interest for this topic as targets for recovery.

Topic Area 1 Specifically Not of Interest:

- Projects that advance recovery of CMM from geothermal brines (see TA 3).
- Projects that advance recovery of CMM from lithium battery manufacturing scrap.
- Projects that advance secondary CMM production from postconsumer lithium batteries.
- Projects that advance secondary CMM production from postindustrial scrap associated with fossil fuel production inclusive of produced waters.
- Projects that advance secondary CMM production on mine operational coal mines or legacy mine tailings. Applicants interested in recovery only from mine tailings recovery are encouraged to consider NOFO DE-FOA-0003583, "Infrastructure Investment and Jobs Act (IIJA) - Mines & Metals Capacity Expansion – Piloting Byproduct Critical Minerals and Materials Recovery at Domestic Industrial Facilities."
- Projects funded by other government programs

Topic Area 1A Specifically Not of Interest:

- Projects that advance secondary CMM production from postconsumer scrap (see TA 1B).
- Projects that advance secondary CMM production from a combination of postindustrial manufacturing scrap, postconsumer scrap, and/or operational mine tailings (see TA 1C).

Topic Area 1B Applications Specifically Not of Interest:

- Projects that advance secondary CMM production from postindustrial manufacturing scrap (see TA 1A).

- Projects that advance secondary CMM production from a combination of postindustrial scrap, postconsumer scrap, and/or operational mine tailings (see TA 1C).

Topic Area 1C Applications Specifically Not of Interest:

- Projects that solely focus on secondary CMM production from postindustrial manufacturing scrap (see TA 1A).
- Projects that solely focus on secondary CMM production from postconsumer scrap (see TA 1B).
- Projects that solely focus on secondary CMM production from mine tailings from operational mines. Applicants interested in recovery only from mine tailings are encouraged to consider NOFO DE-FOA-0003583, "Infrastructure Investment and Jobs Act (IIJA) – Mines & Metals Capacity Expansion – Piloting Byproduct Critical Minerals and Materials Recovery at Domestic Industrial Facilities."

Topic Area 1 Candidate Metrics & Targets:

Applicants must identify and justify appropriate target metrics for their technology and specify an appropriate baseline for comparison. Proposed targets should aim to address the specific considerations and deliverables listed in TA 1 categories above, consider the application metrics encouraged in the Application Metrics portion of section III.D above, and showcase the technical merit of the proposed solution. Applications must clearly identify and justify the starting and ending adoption readiness level[14] and technology readiness level for the project. Benchmarks/baselines, minimum targets, and stretch targets should be specified for each metric. Topic-specific metric categories are provided for reference in the table below; proposed metrics should not be limited to these examples. Applicants should consider the metrics in Table 4 and, where possible, how they compare to currently deployed technologies. Proposed metrics should not be limited to the ones suggested below.

[14] Adoption Readiness Level framework: https://www.energy.gov/technologycommercialization/adoption-readiness-levels-arl-framework

Table 4: Candidate metrics for TA 1 applications.

Goal/Outcome	Metric	Minimum Target	Stretch Target	Baseline
Value-added through co- or by-production	$ added per unit of CMM produced*	N/A	N/A	Applicant Defined
Material Cost	$/kg	N/A	N/A	Applicant Defined
Throughput	Volume/time or mass/time	N/A	N/A	Applicant Defined
Material Yield	% recovery	95%	99%	Applicant Defined Example: 99% hydrogen decrepitation, 96% hydrometallurgical (REEs)
Purity of Material Recovered	CMM purity	95%	>99%	Applicant Defined
Purity of Material Refined	CMM purity	>99%	99.999% (5N)	Applicant Defined
Reduced waste	kg/unit process	20% decrease	50% decrease	Applicant Defined
Embodied energy	J/kg	20% decrease	50% decrease	Applicant Defined
Water use	m^3/kg	20% decrease	50% decrease	Applicant Defined
Human toxicity	kg (1,4)-dichlorobenzene eq/metric ton	20% decrease	50% decrease	Applicant Defined

Topic Area 2: Processes to refine and alloy gallium, gallium nitride, germanium, and silicon carbide.

This Topic Area focuses on advancing the domestic supply chain for critical semiconductor materials: gallium (Ga), gallium nitride (GaN), germanium (Ge), and silicon carbide (SiC). These materials are essential for next-generation power electronics, advanced communications, and other high-performance semiconductor components crucial for national security and technological leadership. The U.S. demonstrates strong capabilities in silicon carbide crystal growth and GaN device fabrication on existing substrates, and some capacity for germanium crystal growth for specialized applications. Vulnerabilities exist not only in the domestic production of high-purity Ge and Ga metal and bulk GaN crystal growth, but also in the sourcing of specialized precursor chemicals required for their synthesis. These gaps contribute to supply chain reliance on external sources at critical stages.

This topic seeks to fund prototyping initiatives for processes that can take primary or secondary feedstocks, extract and purify these elements to semiconductor-grade specifications,

and/or form them into alloyed compositions or specific material presentations (e.g., powders, boules, ingots, single crystals) suitable for downstream product manufacturing. As seen in Table 5, there are several stages of the supply chain for which the U.S. has very little or no capacity. The priority of this topic is to address those gaps. The objective is to validate, derisk, and scale these processes to address specific domestic supply chain gaps or strengthen existing U.S. capabilities and capacity, thereby establishing a robust and competitive domestic supply chain.

Projects funded under this NOFO will focus on advancing technologies from TRL 3 to TRL 6 within a 12–24-month project timeline. However, proposals for R&D concepts advancing from TRL 2 to TRL 6 over a 24–36-month period are also permissible. Applicants should refer to Table 5, which illustrates the current U.S. capacity to support demand across the value chain for these materials, to identify areas of particular interest for their proposed innovations.

Table 5: Ga, Ge, and SiC value chain with colors indicating U.S. capacity to support demand, where red is limited to no capacity, yellow is low capacity, and green is medium to high capacity. Note that * indicates stages of the supply chain being supported by other DOE funding initiatives[15].

	Extraction	**Purification**	**Refining**	**Alloying / Reduction**	**Crystallization, powder, ingot, boule formation**	**Recycling**
Ga / GaN	From secondary sources*	4N purity*	6N purity	GaN	Ga and GaN	See topic 1B
Ge	From secondary sources	4N purity	6N purity GeO_2	Reduction	Ge crystal growth, wafering, powder deposition	See topic 1B
SiC	Electronic-grade Si	6N purity Si	8N purity Si, minimize detrimental contaminants	SiC powder	SiC boule	See topic 1B

Proposals must clearly identify a specific gap in the U.S. domestic supply chain for Ga, GaN, Ge, or SiC that the proposed innovation will address. Applicants should demonstrate how their technology directly strengthens or integrates with existing U.S. capabilities and/or capacity in materials processing, crystal growth, or manufacturing. For projects that include extraction and separation of Ga, Ge, or Si from secondary feedstocks, the proposed process must also

[15] TRACE – Ga, funding opportunity: https://www.energywerx.org/opportunities/technology-for-recovery-and-advanced-critical-material-extraction-gallium

include subsequent steps to refine these materials to the required purity levels. Projects focusing solely on extraction and separation without integrated refinement should consider submitting an application to Topic Area 1 instead. A primary focus should be on achieving and validating the ultra-high purity levels required for semiconductor applications, or precise compositional control for alloyed applications. This includes ensuring minimal introduction of contaminants during purification and subsequent forming steps.

Collaborative efforts with identified upstream feedstock providers and downstream material users/product manufacturers are crucial. Applicants should clearly articulate how the proposed process fits into and strengthens a domestic material supply chain, ensuring relevance and market alignment. Letters of support from potential upstream and downstream partners are highly encouraged. While prototyping, projects must outline a clear path to pilot scale production, considering throughput, energy intensity, and economic viability. Projects are expected to evaluate the adoption readiness level (ARL) of their technology or process and outline in their proposal how the work will serve to advance the ARL over the course of the project.

Projects should consider and address the domestic sourcing and purification of ultra-high purity chemicals and precursors essential for refining, alloying, and growing these semiconductor materials (e.g., UHP ammonia, metalorganic gallium compounds). The output material (e.g., refined metal, alloy, powder, boule, ingot, single crystal) should be in a form directly usable by domestic downstream manufacturers for device fabrication or component production. Final products should meet material standards required by U.S. manufacturers of power electronics, advanced communications, and high-performance semiconductor components crucial for advanced energy products, national security, and technological leadership.

Topic Area 2 Specific Deliverables: The following deliverables are required as part of the scope of work:

- A functional prototype process successfully demonstrated at TRL 6, producing purified elements or alloys compositions of Ga, GaN, Ge, or SiC in a form that is acceptable by downstream manufacturers.
- Detailed characterization of output materials, verifying achieved purity levels or specific alloy compositions, and demonstrating fitness-for-purpose for semiconductor applications based on industry standards.
- TEA and LCA comparing the proposed process against current best available technologies for cost-competitiveness, resource efficiency, and environmental implications within the U.S. context.
- A detailed plan outlining identified upstream feedstock sources and downstream users, including an analysis of how the proposed technology will enable a competitive, integrated domestic supply chain for these materials by addressing identified gaps or strengthening existing segments.
    - For Ge, GeO_2 is an acceptable output material if the project has identified a downstream partner to demonstrate reduction of the oxide into pure Ge metal that meets the objectives outlined in the table below.

Topic Area 2 Specific Applications of Interest:

- Prototyping of processes for the purification, refining, solidification, crystallization, powder and ingot formation, and single crystal growth for raw gallium, gallium nitride, germanium, or silicon carbide to semiconductor-grade purity, specifically targeting areas with limited domestic capability.
- Processes that reduce or eliminate the precursor and process chemicals sourced from outside the U.S. to purify and prepare metals and alloys for use by the U.S. semiconductor industry.
- Methods for producing bulk GaN single crystals or high-purity gallium metal from domestic sources and feedstocks.
- Technologies to reduce or eliminate critical impurities in Ga, Ge, GaN, or SiC during processing and forming.
- Processes for alloying gallium, germanium, or silicon to create specific semiconductor compounds with controlled stoichiometry and purity, with clear domestic market integration.

Topic Area 2 Specific Applications Not of Interest:

- Basic research (TRL 1-2) into the fundamental properties of these materials without a clear path to processing and purification.
- Technologies for producing these materials that do not aim for semiconductor-grade purity or direct applicability to the U.S. semiconductor industry.
- Processes without identified or potential upstream feedstock sources or downstream off-takers within a domestic supply chain context.
- Proposals focusing solely on device fabrication without addressing the material production and purification aspects.
- Projects focusing solely on extraction and separation of Ga, Ge, or Si without explicit integration of subsequent refinement steps.
- Projects already funded by other Federal Government programs.

Topic Area 2 Candidate Metrics & Targets:
Applicants should consider the following metrics where possible:

Table 6: Candidate metrics for TA 2 applications.

Objective/Goal	Metric	Minimum Target	Stretch Target	Baseline
Ga, GaN, and SiC material purity	% of target metal in output material	99.9999% (6N) for Ga 99.999% (5N) for GaN, SiC	99.9999% (6N) for Ga, Ge 99.999% (5N) for GaN, SiC	N/A
Ge material purity	% of Ge in output material	99.9999% (6N) Ge or GeO_2 precursor	99.999999% (8N) Ge or GeO_2 precursor	N/A
Ge yield from feedstock	% of Ge recovered from feedstock	≥ 70%	≥ 85%	N/A
Reduced cost	% reduction in cost to produce output material	≥ 20%	≥ 50%	Applicant defined - based on imported market price, or - based on competing technologies such as Si (for GaN applications)
Increase domestic sourcing of materials to produce GaN	% mass of chemicals sourced domestically to produce GaN	75% of chemicals to alloy Ga into GaN	100% of chemicals to alloy Ga into GaN	Applicant defined
Production rate of extraction, purifying and refining	kg of metal per day	1kg of metal per day	5 kg of metal per day	N/A

Topic Area 3: Cost-competitive direct lithium extraction, separation, and processing.

This Topic Area seeks to develop cost-competitive methods to extract, separate, and process lithium from brine and clay sources. It further seeks to expand the sources of potential geothermal brines that can be used for lithium extraction and to develop pre- and post-processing capabilities to ensure cost-effective and environmentally safe extraction.

Under Topic Area 3 only, applicants are permitted to submit one application under each subtopic area. Applicants are not allowed to submit multiple applications under the same subtopic. For example, 'University A' can submit one application each under subtopic

A, B, and C; but is not permitted to submit multiple applications under any one subtopic (A, B, or C).*

Topic Area 3A - Cost-competitive direct lithium extraction:

Direct Lithium Extraction (DLE) represents a transformative approach for recovering lithium from diverse domestic resources such as geothermal brines, produced water, and clay formations. This method offers a pathway to overcome the limitations of conventional broad-area evaporation ponds, which struggle to meet the escalating global demand for lithium driven by the rapid expansion of energy storage applications. Further, lithium extraction from evaporations ponds requires long processing times (months to years), low recovery rate, large land area requirements with approximate cost close to $5580 per ton of lithium carbonate equivalent (LCE).[16] The U.S. possesses abundant lithium resources,[17] and a substantial domestic market exists for its utilization in energy storage and other advanced technologies. This subtopic seeks to validate and derisk technologies and ultimately reduce the cost of producing lithium domestically.

Proposals should focus on developing DLE prototypes that demonstrate a clear pathway to cost-competitive lithium production in the U.S. Applicants are required to have access to real-world, relevant lithium feedstock (e.g., geothermal brines, Smackover brine, produced water) for technology validation. Projects should prioritize advancements that improve economic viability by reducing chemical intensity, enhancing chemical re-use, lowering capital and operating costs, and improving energy and water efficiency. Any DLE technologies that show significant potential for cost reduction compared to current DLE approaches are of interest. The interested DLE technologies include but are not limited to adsorption, ion-exchange, membrane, electro-chemical, magnetic, or a combination of technologies. Other innovative DLE technologies are also welcome provided they show significant cost reductions compared to current DLE technology, referenced below.

Applicants should have already demonstrated proof of concept, technology feasibility, and functionality of the DLE technology (TRL 3). Proposed projects should target a 12–24-month scope of work and prioritize advancing DLE technologies and processes capable of producing lithium to meet industrially relevant scales by end of the Phase 1 project (TRL 6).

Topic Area 3A Specific Considerations:

Coordination and partnership with up-stream (resource provider) entities to access the real lithium feedstock are encouraged. If possible, show an easy integration of the DLE

[16] Wesselkaemper J, Hendrickson T, Smith S, Rao P, Haddad A. Optimization of processing costs can make lithium extraction from clay competitive to conventional sources of brines and hard rock ores. ChemRxiv. 2025; doi:10.26434/chemrxiv-2025-ht4m3. This content is a preprint and has not been peer-reviewed.

[17] Dobson, Patrick, et al. *Characterizing the Geothermal Lithium Resource at the Salton Sea*. Lawrence Berkeley National Laboratory, 2023, doi:10.2172/2222403. Karl, N.A., Mauk, J.L., Reyes, T.A., and Scott, P.C., 2019, Lithium Deposits in the United States: U.S. Geological Survey data release, https://doi.org/10.5066/P9ZKRWQF

prototype development with high lithium recovery yield (>70%) while ensuring consistent performance for extended operating cycles. Coordination with downstream partners (post processing, metallization, end users) is also encouraged to meet and validate precise requirements for industrial grade lithium purity (>99%) such as lithium carbonate, lithium hydroxide, etc. (subtopic B).

- Recently, Haddad et. al.[18] showed that reagent costs are the main driver of DLE operating expenditure. Applications should address how the proposed DLE technology reduces cost for lithium production and will be competitive in the market. Projects that demonstrate reduced cost of reagents, or strategies that lower operating expenditure toward reagents, such as reduced reagent intensity, reuse or recycling, or substitute reagents with lower cost alternatives are encouraged.
- Projects that aim to optimize DLE processes to achieve a purity level greater than 99% by improving lithium selectivity thereby reducing the number of processing steps required to reach the desired purity level that further reduce the cost.

Subtopic A applicants are encouraged to collaborate with pre- and post-processing experts and companies. Pre- and post- processing companies that are non-prime participants of Subtopic A are welcome to apply as prime recipients themselves to Subtopic B. Review Subtopic B description to understand key considerations for successful pre- and post-treatment technologies and processes. In the event a Subtopic A application is selected as well as a partner's application to Subtopic B, each project scope will need to be closely coordinated to ensure there is no duplication of work.

Topic Area 3A Specific Deliverables:

The following deliverables are required as part of the scope of work:

- Develop a functional modular and compact DLE prototype utilizing state-of-the-art technology capable of continuous operation
- Produce LCE at a cost that is ≥20% less than the industry benchmark of $5580/ton LCE
- Flow rate exceeding 2 gallons/hour
- Demonstrate a lithium recovery yield of greater than 70%
- Purity level greater than >99%
- Demonstration of credible performance indicators using real-world brine or clay over synthetic brine or clay. Sources of real-world material should be representative of abundant domestic resources.
- Identify pathways to lower the production costs of LCE through optimization of key process elements such as minimizing reagent consumption, reducing energy and water usage, extending the lifespan of materials/membrane etc. Quantify cost or material benefits compared to currently deployed LCE production methods.
- Conduct techno-economic analyses and life-cycle analyses to evaluate environmental impact and economic feasibility of the respective DLE technology. The techno-economic

[18] Wesselkaemper J, Hendrickson T, Smith S, Rao P, Haddad A. Optimization of processing costs can make lithium extraction from clay competitive to conventional sources of brines and hard rock ores. ChemRxiv. 2025; doi:10.26434/chemrxiv-2025-ht4m3. This content is a preprint and has not been peer-reviewed.

analysis should include a bill of materials, list of manufacturing equipment, and equipment cost required to produce the material or component.
- Projects are expected to evaluate the adoption readiness level (ARL) of their technology or process and outline in their proposal how the work will serve to advance the ARL over the course of the project.
- Projects are expected to develop a detailed plan for building and operating a pilot-scale version of the proposed technology or process. More information on the requirements for this plan can be found in the Technical Volume instructions (Section C.3)

Topic Area 3A Applications of Particular Interest:

Key interests under this subtopic include:
- By the end of the Phase 1 project, the applicant establishes partnership with resource providers to potentially host the piloting of the DLE technology
- By the end of the Phase 1 project, the applicant establishes offtake partners downstream who will facilitate the post-treatment of extracted materials and facilitation to end users.
- Applicants that coordinate upstream and downstream partners (subtopic B) to produce and validate lithium purity from real lithium feedstock
- Technologies that reduce or eliminate the use of energy intensive chemicals (e.g., acid stripping), reduce waste and lower consumption of energy and water
- DLE technologies that can be designed to co-produce multiple critical elements uncovering their commercial value

Topic Area 3A Applications Specifically Not of Interest:
- Basic research (TRL 1-2) into the fundamental properties of these processes without a clear path to prototyping and piloting.
- Applicants who propose not to use real-world brine to demonstrate the performance of their process.
- Applicants that propose incremental improvements to technologies such as forward osmosis and reverse osmosis membranes.
- Applications focused on mining and crushing lithium bearing rocks
- DLE technologies that integrate with low concentrations of lithium (<5 ppm) feedstocks unless applicant provide strong evidence of economic recovery.
- Fundamental understanding and computational modelling of lithium binding and release in materials
- Projects funded by other U.S. agencies or foreign governments

Topic Area 3A Candidate Metrics & Targets:

Applicants should define and justify suitable metrics for their DLE technology while addressing specific considerations and deliverables outlined above. The potential applicant also needs to identify appropriate baseline comparison with their technology. Applications should clearly articulate starting and ending TRLs while also considering ARLs throughout the project performance to ensure scalability, applicability and integration of the technology in real-world settings. For metrics, benchmarks or baselines, minimum targets and stretch targets must be identified. The table below provides potential metrics, but the applicant is encouraged to propose metrics beyond these examples to fully address the scope of their project.

Applicants must meet the minimum targets outlined in Table 7 and should consider the metrics in Table 8. Where possible, applicants should show how their targets compare to currently deployed technologies. Project goals should not be limited to the ones suggested below.

Table 7: Proposed work is required to meet the minimum targets described below.

Objective/Goal	**Metric**	**Minimum Target**	**Stretch Target**	**Baseline**
Total cost reduction of LCE production	$ / metric ton of LCE	≥20% reduction from baseline	≥50% reduction from baseline	$5580 based on cost to produce LCE from Salar brine.[19]
Purity	% LCE per volume	>99% *	NA	NA
Flow rate	Gallons per hour	2 gallons per hour	10 gallons per hour	N/A
Recovery Yield	% Li recovery	>70%	>90%	Total Li present in resource

* Can be achieved in collaboration with a partner if purification is not part of project scope

[19] Wesselkaemper J, Hendrickson T, Smith S, Rao P, Haddad A. Optimization of processing costs can make lithium extraction from clay competitive to conventional sources of brines and hard rock ores. ChemRxiv. 2025; doi:10.26434/chemrxiv-2025-ht4m3. This content is a preprint and has not been peer-reviewed.

Table 8: Proposed work should consider the metrics described below as pathways to achieve goals described in subtopic A and Table 7.

Objective/Goal	Metric	Minimum Target	Stretch Target	Baseline
Reduce water intensity	Liters of water per metric ton of LCE	20% reduction from baseline	50% reduction from baseline	Applicant defined
Reduce reagent costs	Reduction in reagent intensity (unit volume of reagent per unit of LCE)	20% reduction from baseline	50% reduction from baseline	Applicant defined
Reduce reagent costs	Recycle or reuse of reagent (tons of LCE per unit volume of reagent)	50% reduction from baseline	80% reduction from baseline	Applicant defined
Reduce reagent costs	% cost of alternate reagent compared to state of industry reagent cost	50% reduction from baseline	80% reduction from baseline	Applicant defined
Reduce important reliance of reagent material	% of reagent materials sourced domestically	100%	N/A	N/A
Reduce energy costs	KWh per metric ton of LCE	20% reduction from baseline	50% reduction from baseline	Applicant defined

Topic Area 3B - Advancing pre- post- treatment and disposal technologies for direct lithium extraction from geothermal brines:

Direct extraction of lithium and other critical minerals from mineral-rich geothermal brines remains challenging. Minerals such as magnesium, calcium, sodium, and potassium are competing multivalent cations with lithium, making it a challenge to directly extract lithium from geothermal brines (Zhai et al., 2024). To reduce or eliminate these competing cations, pretreatment methodologies should be explored to allow higher selectivity of lithium from mineral rich geothermal brines while reducing post refinement of lithium products such as Li_2CO_3. In addition, geothermal brines rich in critical materials may need to be pretreated to remove hydrocarbons such as those from the Smackover Formation. The separation of hydrocarbons from brines is not a new science, but it remains challenging technically and economically to do so in-situ prior to the DLE process.

After critical materials have been removed during the direct mineral extraction process, there remain potential waste products such as iron, silica, magnesium, zinc, or chemicals such as hydrochloric acid used in the DLE process (Schenker et al., 2024). Materials could also remain on filters or membranes used in the direct lithium extraction process. A clear understanding and documentation of the geothermal brine chemistry post mineral extraction is necessary to identify

whether expensive chemicals used in the extraction process can be extracted and reused and if there are additional revenue streams in waste products, as well as to ensure proper disposal of waste material.

Topic Area 3B Specific Considerations:

Projects may seek to demonstrate:

- Reduced number of steps needed to pre-treat or post-treatment of geothermal brine to achieve a market ready or battery grade product
- Reduced cost of pre-treatment technologies (e.gsilica removal)
- Reduced or reused water, reagent, and energy consumption
- Ensuring pre-treatment technologies can integrate with downstream DLE technologies
- Ensuring all economic minerals are extracted
- Documenting proper disposal of materials post mineral extraction

Topic Area 3B Specific Deliverables:

The following deliverables are required as part of the scope of work:

- Demonstrate materials, membranes, and process with improved capacity and selectivity
- Demonstrate negligible loss of lithium after pretreatment (<10% loss of lithium)
- Recover value-added materials as a part of pretreatment process (kg per unit volume)
- Demonstrate 20% or more reduction in energy, water, and reagent cost
- Demonstrate percentage (%) of impurities removed

Topic Area 3B Applications of Particular Interest:

Applications of specific interest include projects that address pretreatment and/or posttreatment of a geothermal brine that increase the selectivity, yield, and purity of DLE process and reduce the steps needed to produce a battery-grade lithium product. Applications of interest must address the pretreatment by removal or reduction of materials that directly affect the selection of lithium during extraction process, and/or reduce posttreatment of lithium material to achieve battery-grade lithium product. Applicants must clearly identify current technologies and new or novel engineering solutions to address industry needs.

In addition, applications of interest include projects identifying and addressing materials that are disposed of or reinjected after mineral extraction occurs. Applicants must clearly identify naturally occurring materials (meaning materials that are naturally occurring as part of the geothermal brine), or materials and chemicals that have been added as part of pre-treatment, post-treatment, or DLE process, and where these materials will be reinjected, recovered, or disposed of. Applicants must clearly document the current state of practice of these techniques; and identify new or novel techniques that could recapture and reuse chemicals, explore the possibility of additional economic waste streams, and/or proper and safe disposal of materials.

Applications under this topic area can focus on pretreatment, posttreatment, and/or disposal of materials from geothermal brines. Applicants must ensure technologies will operate in geothermal temperatures and conditions. Applications must include all stages of interest in their proposed work.

Topic Area 3B Applications Specifically Not of Interest:

Applications not of interest under this topic area include development or refinement of novel direct lithium extraction technologies, or technologies that focus on non-geothermal brines.

Topic Area 3B Candidate Metrics and Targets:

The geochemistries of geothermal brines are often unique to the reservoir in which they originate. Applicants must test technologies using geothermal brines containing economic quantities of lithium or partner with an owner or operator of a geothermal resource to test pre- and post-treatment solutions, as well as address disposal of materials. Synthetic or lab-created brines are allowed to test initial solutions, but final results must be validated using real-world geothermal brines. Geothermal brines can be from active geothermal power plants, potential geothermal resources that could provide power, or geothermal resources that are or could be used in direct-use applications.

Table 9: Proposed work is required to meet the minimum targets described below.

Objective/Goal	Metric	Minimum Target	Stretch Target	Baseline
Reduced amount of impurities	Kg/L	>20%	50%	Applicant-defined baseline
Recovery of value-added materials	Metric ton of value-added materials recovered per unit volume of brine processed (t/m^3)	Applicant defined	Applicant defined	Applicant-defined baseline
Reduced water usage	Liters of water per metric ton of impurities removed	20% reduction from baseline	50% reduction from baseline	Applicant-defined baseline
Reduced energy costs	KWh per metric ton of impurities removed	20% reduction from baseline	50% reduction from baseline	Applicant-defined baseline

Topic Area 3C - Exploration and characterization of critical materials and REEs from volcanic hosted geothermal systems:

The increasing demand for battery energy storage coupled with the growing market for REEs essential for computing components underscore the immediate need for reliable, abundant, and domestic sources of critical materials including lithium and REEs. Underutilized domestic resources of critical materials and REEs found in volcanically hosted geothermal systems offer a new frontier of domestic exploration for REEs. A consensus on what type of volcanically hosted systems (i.e., rhyolitic or iron-mafic) remains unsolved. As such, all volcanically hosted geothermal systems are eligible under this topic area.

An example of a volcanically hosted system containing geothermal potential, critical materials, and potentially REEs is the McDermitt Caldera. The McDermitt Caldera is a large, ancient volcanic system in northern Nevada and southeastern Oregon, formed by an eruption about 17 million years ago and part of the Yellowstone hotspot track (USGS, 2024). The

McDermit Caldera has been previously explored for mercury, and uranium, and now is host to expansive lithium mining operations. The McDermitt Caldera is also host to many geothermal features including hot springs, but geothermal resource potential in this region is underexplored.

As has been discovered from projects at the Salton Sea and within the Smackover Formation[20, 21], geothermal brines are a rich source of lithium, critical materials, and potentially REEs. Following on these results, OG would like to expand exploration for lithium, critical materials, and REEs to volcanically hosted systems coupled with active geothermal power or direct-use generation, or the potential for either.

Topic Area 3C Specific Considerations:

Applicants must explore and characterize only resources of economic quantities of critical materials and/or REEs. To gain understanding on economic quantities, applicants are encouraged to study projects from the Salton Sea and within the Smackover Formation resources as listed above.

Topic Area 3C Specific Deliverables:

- Discovery and full characterization of underutilize geothermal resource for power or direct use applications and the co-production of critical materials and REEs.

Topic Area Applications of Particular Interest :

Applications of interest include projects that explore and characterize critical materials and REEs of economic quantities found in geothermal brines that are hosted in volcanic systems. At a minimum, applicants should respond to the following questions:

1. What economic critical material(s) and/or REEs are found in a resource, and what are the quantities?
2. What controls the concentration of these critical material(s) and/or REEs, what are the potential sources, what controls the solubility, and what are the transport mechanisms (i.e. how are these materials getting into the geothermal brines)?
3. How fast will these resources decrease over time as a result of commercial co-production of geothermal power or direct use generation and extraction of critical material(s) and/or REEs?
4. What is the size and nature of the coincident geothermal resource, and what are the potential geothermal power or direct use applications at the site, and how does the co-production of geothermal energy and critical material and/or REEs impact the viability of the resource.

At the conclusion of the project, applicants will need to produce publicly available datasets and a final report that summarizes the work accomplished throughout the project.

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[20] Dobson, Araya, Brounce et al., Characterizing the Geothermal Lithium Resources at the Salton Sea, 2023, escholarship_uc_item_4x8868mf.pdf (lbl.gov).

[21] Katherine J. Knierim *et al.*, Evaluation of the lithium resource in the Smackover Formation brines of southern Arkansas using machine learning. *Sci. Adv.***10**,eadp8149(2024).DOI:10.1126/sciadv.adp8149

Topic Area 3C Applications Specifically Not of Interest:

Applications not of interest under this topic area include:

- Solely desktop or machine learning studies. Desktop and machine learning must be included with active research and field work.
- Development or refinement of novel direct lithium extraction technologies.
- Applications focusing on non-geothermal brine such as mining of clays or sediments.
- Applications focusing on Salton Sea or Smackover Formation.
- Applications focusing on offshore or seafloor hydrothermal or volcanic vents.

Topic Area 3C candidate metrics and targets:

Applicants must have access to their select project sites and have a good understanding of where and how to compile existing data. If applicable, applicants are strongly encouraged to partner with lease holders, powerplant operators, and industry team members. Applicants may choose sites that are currently producing geothermal power or direct use applications and characterize the geothermal resource for critical material or REEs. Small diameter drilling maybe considered to confirm a geothermal resource or collect additional critical material or REE data.

F. Applications Specifically Not of Interest

DOE will not review or consider the following types of applications as determined by DOE without appeal (also refer to the Responsiveness Review section below):

- Applications that fall outside the technical parameters specified in Background and Context and Topic Areas
- Applications for proposed technologies that are not based on sound scientific principles (e.g., violates the laws of thermodynamics)
- Project concepts or approaches not based on established scientific principles

G. Statutory Authority

AMMTO's programmatic authorizing statute is § 911 (a)(2) of the Energy Policy Act of 2005, as codified at 42 U.S.C. § 16191(a)(2); and § 7002(g) of the Energy Act of 2020, as codified as 30 U.S.C 1606(g). OG's programmatic authorizing statute is the Energy Independence and Security Act of 2007 (EISA 2007) as amended by the Energy Act of 2020, Sections 613(a) and (e) (42 U.S.C. 17193(a) and (e).

Awards made under this announcement are subject to the OMB Guidance for Federal Financial Assistance (e.g., 2 C.F.R. Part 200) as adopted and DOE's Financial Assistance Regulations, 2 C.F.R. Part 910.

IV. Application Content and Form

This section includes application information specific to this NOFO. Refer to NOFO Part 2, *Application Content and Form*, for standard information that applies to all DOE NOFOs, such as formatting and content requirements and other requirements.

A. Use and Disclosure of Application Information

In addition to the information provided in NOFO Part 2, *Use and Disclosure of Application Information*, for compliance with implementation of Presidential Memorandum Simplifying the Funding of Energy Infrastructure and Critical Mineral and Material Projects, the Department of Energy may share and use within the Government any application information provided by or on behalf of the applicant. Accordingly, in accordance with applicable law and notwithstanding any other provisions herein, by submitting an application or agreeing to a financial assistance arrangement with the Department of Energy under this NOFO, the applicant is providing consent for any properly marked trade secret, confidential, proprietary, privileged or otherwise sensitive application information provided by or on behalf of the applicant to be disclosed to the Executive Office of the President and relevant Agencies offering loans, grants, equity, guarantees or other federal funding, for the purposes of the Presidential Memorandum on Simplifying the Funding of Energy Infrastructure and Critical Mineral and Material Project.

B. Summary

The application process includes submission phases: letter of intent, and application.

Application Submission Phase	Eligibility for Submission
Letter of Intent	Must be submitted by the specified due date and time to be eligible to submit an application
Application	Must be submitted by the specified due date and time to be eligible for comprehensive merit review.

C. Letter of Intent

You must submit a letter of intent by the specified due date and time to be eligible to submit an application. If you do not submit a letter of intent, you cannot submit an application. We use the letters of intent to plan for the Merit Review Process. Your submission should not contain any proprietary or sensitive business information. We do not use letters of intent to determine which applications will be considered for award, and you are not obligated to apply after you submit your letter. You are not bound to the statements made in your letter of intent; it is reasonable for project partners, locations, or other factors to change during the application development process. We do not provide feedback on letters of intent.

You must provide the following information in your letter of intent.

Letter of Intent Requirements	
Project Title	Be consistent with the project title across all application documents.
Technical Topic or Area	List the topic number and title planned for your application
Lead Organization	Provide the complete legal name of the lead organization.
Percentage Effort Performed by the Lead Organization	Provide the percentage effort the lead organization will perform in terms of overall budget percentage.
Organization Type	Include your organization type: • Academic • Federal Government • Federally Funded Research and Development (FFRDC) • Government owned and operated (GOGO) • Indian/Native American Tribal Government • Individual • Large business • Non-profit • Small business • State or local government
Recipient Technical Point of Contact (POC)	Provide the name and title for the Principal Investigator (PI) or Lead Project Manager (LPM).

The letter of intent must have an abstract, which should be a short explanation of the proposed project. You will enter the abstract in eXCHANGE, so it cannot exceed 6000 characters. You must include the following information:

Abstract Requirements	
Previous Application Submission	Identify whether or not you have previously submitted the proposed project or application to DOE.
Senior/Key Team Members	List individuals who will contribute in a substantive, measurable way to the proposed project and their proposed roles.
Proposed Subrecipients	List all subrecipients planned for the award and their addresses.
Proposed Contractors Subcontractors	List all contractors or subcontractors planned for the award. If not yet identified, list the role each contractor or subcontractor will have in the project (i.e., engineering firm).
Project Description	Limit to 200 words and include a short explanation of the proposed project.

D. Application Content Requirements

Each application must be limited to a single concept. Applications must conform to the following requirements and must not exceed the stated page limits. NOFO Part 2, *Application Content and Form*, includes a complete list of application requirements. You can find detailed guidance on the content and form of NOFO-specific requirements in the Summary of Application Requirements table below.

1. Covered Individual Definition, Designation, and Responsibility

Several of the Application Content Requirements in the table below and in the NOFO Part 2 are required for Covered Individuals.

For this NOFO,
Covered Individual is an individual who both:

- Contributes in a substantive, meaningful way to develop and execute the scope of work of a project proposed for DOE
- Is designated as a Covered Individual by DOE

Often, these individuals have doctoral or other professional degrees, although the following may be considered Covered Individuals if their involvement meets this definition:

- Individuals at the master's or PhD-candidate level
- Consultants
- Graduate students

- Individuals with a postdoctoral role

DOE designates Covered Individuals as any:

- Principal investigator (PI)
- Project director (PD)
- Co-principal investigator (Co-PI)
- Co-project director (Co-PD)
- Project manager
- Any individual functionally performing as a PI, PD, Co-PI, Co-PD, or project manager

You must assess how DOE's definition of a Covered Individual applies to each person listed on your application. You are also responsible for identifying any individual to DOE who should be designated as a Covered Individual if DOE does not already designate them as described above.

When you submit a current and pending support disclosure and biosketch or resume for a person, you are acknowledging that DOE designates that person as a Covered Individual.

We may further designate Covered Individuals during award negotiations or the award period of performance.

Throughout the life of the award, you have an ongoing responsibility to submit:

- Current and pending support disclosure statements and resumes or biosketches for any new Covered Individuals
- Updated disclosures if a current and pending support disclosure statement, resume, or biosketch previously submitted to DOE changes

2. Summary of Application Requirements

Component	File Format	Page Limit	File Name
Application for Federal Assistance (SF-424)	PDF	n/a	ControlNumber_LeadOrganization_424
Technical Volume	PDF	25	ControlNumber_LeadOrganization_TechnicalVolume
Letters of Commitment	PDF	1 page each	ControlNumber_LeadOrganization_LOCs
Impacted Indian Tribes Documentation	PDF	n/a	ControlNumber_LeadOrganization_ ImpactedTribes
Statement of Project Objectives	MS Word	10	ControlNumber_LeadOrganization_SOPO
Budget Information Non-Construction Programs (SF-424A)	PDF	n/a	ControlNumber_LeadOrganization_SF-424A

Budget Justification Workbook	MS Excel	n/a	ControlNumber_LeadOrganization_Budget_Justification
Subrecipient Budget Justification	MS Excel	n/a	ControlNumber_LeadOrganization_Subrecipient_Budget_Justification
Work Proposal for FFRDC, (see DOE O 412.1A)	PDF	n/a	ControlNumber_LeadOrganization_WP
Authorization for Non-DOE or DOE FFRDCs	PDF	n/a	ControlNumber_LeadOrganization_FFRDCAuth
Waiver for Foreign Entity Participation	PDF	n/a	ControlNumber_LeadOrganization_FEW
Performance of Work in the United States (Foreign Work Waiver)	PDF	n/a	ControlNumber_LeadOrganization_FWW
Biosketch (for each Covered Individual)	PDF	n/a	ControlNumber_LeadOrganization_Biosketch
Current and Pending Support (for each Covered Individual)	PDF	n/a	ControlNumber_LeadOrganization_CPS
Digital Persistent Identifier (for each Covered Individual)	n/a	n/a	Include in Current & Pending Support
Research Security Training Requirement (for each Covered Individual)	n/a	n/a	Include in Current & Pending Support
Transparency of Foreign Connections	PDF	n/a	BusinessSensitive_ControlNumber_LeadOrganization_TFC
Potentially Duplicative Funding Notice	PDF	n/a	ControlNumber_LeadOrganization_PDFN
Data Management and Sharing Plan	PDF	n/a	ControlNumber_LeadOrganization_DMSP
Disclosure of Lobbying Activities, if applicable (SF-LLL)	PDF	n/a	ControlNumber_LeadOrganization_SF-LLL
Certification Regarding Lobbying (OMB 4040-0013)	PDF	n/a	ControlNumber_LeadOrganization_Cert Lobbying
Summary for Public Release	PDF	1	ControlNumber_LeadOrganization_Summary
Summary Slide	MS Power Point	1	ControlNumber_LeadOrganization_Slide

3. Impacted Indian Tribes Documentation

For any application that potentially impacts Indian Tribes,[22] including when the potentially impacted Indian Tribe is the applicant, you must submit additional documentation:

22 Indian Tribe as defined in 25 U.S.C. § 5304 and includes Alaska Native Villages and Alaska Native Corporations.

- For projects sited on Tribal lands [23] or intersecting with Tribal subsurface rights:
  - You must submit documentation of support from the relevant Indian Tribes with the application. See below for Requirements for Documentation of Tribal Support.
- For applications potentially impacting Indian Tribes' resources and reserved rights in other ways:
  - We encourage you to submit documentation of support from the relevant Indian Tribes. You must, at a minimum, provide documentation confirming that an authorized representative from each potentially impacted Indian Tribe is aware of the application's nature and its potential impacts to the Indian Tribe. See below for helpful resources for evaluating potential impacts and requirements for documenting Tribal awareness.

We encourage you to reach out to Indian Tribes as early as possible to give them ample time to evaluate and respond. Documentation will not be scored; however, if you do not submit documentation of an Indian Tribe's awareness or a letter of support, it may result in determining your application ineligible, non-responsive to the NOFO, not subject to further review, or not otherwise subject to selection or award.

Documentation of Tribal Support	
Item	**Criteria**
Letter of Support from Tribal Leadership	The letter must be signed by an authorized representative [24] of the Indian Tribe and express support for the project. The signers must be holding their positions while the NOFO is open for applications or when subsequently submitted.
Tribal Council Resolution, Board Resolution, or similar act passed by the legislative body of the Tribal government or Board of Directors of an Alaska Native Corporation	Must express support for the project.

[23] Tribal land is as defined in 25 U.S.C. §§ 3501(2), (3), (4)(A) and (13).

[24] An authorized representative must be an elected official or designated leader according to the traditions, constitution, or charter of the Indian Tribe, or someone with relevant delegated authority within the Tribal government. Examples include Chief, Chairman, Chairwoman, Governor, Nation Representative, President, Chief Executive Officer, Chief Financial Officer, Speaker of the Council, Speaker of the Congress, Tribal administrator.

Documentation of Tribal Awareness	
Item	**Criteria**
Any Documentation of Tribal Support (see above)	See above
An email reply or documentation of certified mail delivery	Must demonstrate that an authorized representative[24] of the Indian Tribe is the one who was notified and made aware of the nature of the project and its potential impacts to the Indian Tribe.

The following resources and guidance may be useful to help determine if a project may impact Indian Tribe resources or reserved rights and to find the appropriate contacts. These resources are not exhaustive, and many Indian Tribes have resources or reserved rights that extend beyond their Tribal lands or are covered within treaties, statutes, or case-law. You should do additional research, while respecting Tribal privacy over sacred sites. Any outreach, impact assessment, and mitigation plans must be documented and made available to DOE on request after award selection or during award negotiation. If the applicant is an Indian Tribe, we recommend these resources and guidance be used to ascertain impacts to other Indian Tribes.

Resources for Evaluating a Project's Potential Impact on an Indian Tribe	
Item	**Location**
Map of Indian Lands	https://bia-geospatial-internal.geoplatform.gov/indianlands/
Tribal Directory Assessment Tool (TDAT)	https://egis.hud.gov/TDAT/
Tribal Treaties Database	https://treaties.okstate.edu/
Directory of Federally Recognized Tribes and Tribal leaders	https://www.bia.gov/service/tribal-leaders-directory
Best Practices for Identifying and Protecting Tribal Treaty Rights, Reserved Rights, and Other Similar Rights in Federal Regulatory Actions	Best Practices For Identifying And Protecting Tribal Treaty Rights, Reserved Rights, And Other Similar Rights In Federal Regulatory Actions And Federal Decision-Making

Guidance on Assessing Potential Impacts to Indian Tribe Resource or Reserved Rights		
Type of Action	**Assessment**	**Mitigation**
Research and Development (R&D)	• Identify any resources you will quantify or model on or near Tribal land, traditional homelands, Tribal historic sites, sacred sites, or in areas where an Indian Tribe maintains rights to these resources • Identify which Indian Tribes may be impacted • Explain any instances of uncertainty or need for confidentiality	Explain any actions you took to mitigate or address any potential impacts identified, including engaging with the potentially impacted Indian Tribes, in the application.
Surface Impacts	• Identify any Indian Land (as defined in 25 U.S.C. § 3501), traditional homelands, or Tribal historic and sacred sites that will be crossed or are near to the proposed infrastructure • Identify which Indian Tribes might be impacted • Explain any instances of uncertainty or confidentiality	
Subsurface Resource Activities (e.g., carbon sequestration, oil & gas, geothermal, critical minerals, groundwater)	• Identify any Tribal mineral rights, subsurface, or water rights at or near the proposed project location • Explain any relevant studies already performed, such as groundwater studies • Identify which Indian Tribes might be impacted • Explain any instances of uncertainty and any potential for subsurface resource migration that has been considered	
Hydropower, Offshore Wind, or Other Water Related Projects	• Identify any Tribal resources or reserved rights (e.g., water, fishing, or other treaty rights) that could be impacted by the proposed project • Identify any Tribal historic sites, sacred sites, or relevant vistas that could be impacted by the project • Identify the potentially impacted Indian Tribes and explain any sources of uncertainty or confidentiality	

Other Actions Not Categorized Above	• Identify any other proposed actions that may impact an Indian Tribe's resources or reserved rights. Tribal resources and reserved rights include, and are not limited to:
	  ○ An Indian reservation or land (as defined in 25 U.S.C. § 3501)
	  ○ Intersecting Tribal sub-surface rights
	  ○ Historic homelands they were removed from
	  ○ Cultural sites
	  ○ Sacred sites
	  ○ Water rights
	  ○ Mineral and other subsurface rights
	  ○ Fishing rights
	  ○ Hunting rights.
	• Identify the Tribes potentially impacted and any sources of uncertainty or confidentiality	

We may share any application that could impact Indian Tribes with those Indian Tribes, subject to any proper Proprietary Information markings on the submission. Accordingly, you should include a "Notice of Restriction on Use and Disclosure of Information" to identify any Proprietary Information (NOFO Part 1, *Use and Disclosure of Applicant Information*). After selection, you may be asked to include a "Notice of Restriction on Disclosure and Use of Data" to identify any Proprietary Information. Properly marked application information will only be used or disclosed for evaluation purposes when we must determine if the proposed project impacts an Indian Tribe, and we will only share that information with the potentially impacted Tribes.

Data you submit once under award that could impact Indian Tribes may be shared with the potentially impacted Indian Tribes, subject to any restrictions included on properly marked data per the award terms.

If you or DOE determines an Indian Tribe will be impacted, you must provide information on the project location, potential impacts, and how you will engage with Indian Tribes during the performance period of the agreement and, if necessary, after the end of the agreement. In addition to your engagement, we will determine if formal government-to-government consultation could be appropriate, and we will conduct that consultation accordingly.

4. 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 Technical Review Criteria.

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 application may not be more than 25 pages, including the cover page, table of contents, and all citations, charts, graphs, maps, photos, or other graphics, and must include all information below. The applicant should consider the weighting of each of the technical review criteria (see Technical Review Criteria) when preparing the Technical Volume.

Technical Volume Content Requirements Overview	
Section	**Approximate Percent Content of the Technical Volume**
Cover Page	N/A
Project Overview	10%
Technical Description, Innovation, and Impact	30%
Workplan	35%
Technical Qualifications and Resources	17%
Pilot-Scale Preparedness	8%

Cover Page:

The cover page must include all the following:

- The project title
- Specific NOFO topic area
- Technical and business POCs
- The project team, including recipient name, entity type and names of all team member organizations
- The project location(s)
- The proposed Federal funding level, cost share and period of performance
- Senior/key personnel and other covered individuals
- 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 its organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the application.
- **Project Goal:** The applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal.
- **DOE Impact:** The applicant should discuss the impact that DOE funding would have on the proposed project. Applicants should specifically explain how DOE funding, relative to prior, current, or anticipated funding from other public and private sources, is necessary to achieve the project objectives.

Technical Description, Innovation, and Impact (Approximately 30% of the Technical Volume)

The Technical Description should contain the following information:

- **Relevance and Outcomes:** The applicant should provide a detailed description of the technology or focus area, including the scientific and other principles and objectives that will be pursued during the project. This section should describe the relevance of the proposed project to the goals and objectives of the NOFO, 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. All applications must also define credible and measurable baselines, supported by prior data from literature and/or experimentation, against which their user defined metrics will be evaluated. The quality and scientific depth of these proposed baselines and metrics will be an important element of the technical evaluation of applications.
- **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. Proposed technologies/approaches must demonstrate economic feasibility supported by preliminary TEA. Technologies or approaches with preliminary LCA that indicate a net decrease in energy consumption, water, emissions, and chemical consumption are strongly encouraged. Anticipated technical barriers should be described, along with a planned approach to overcome them. Applicants should explain the underlying research to date, including any literature review or experimental data to support the proposed R&D approach and justify the R&D needs.
- **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.

Workplan (Approximately 35% of the Technical Volume)

The Workplan should include a summary of the Project Objectives, Technical Scope, Work Breakdown Structure (WBS), Project Tasks, Milestones, Go/No-Go decision points, and project schedule. A detailed statement of project objectives (SOPO) is separately requested as part of the application. The Workplan should not include detailed lists of tasks and milestones, as those are already contained in the SOPO. The workplan can reference the SOPO where necessary. The workplan 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 overall work scope is to be divided by performance periods that are separated by discrete, approximately annual decision points (see below for more information on Go/No-Go decision points). The applicant should describe the specific expected end result of each performance period.

- **Technoeconomic and Lifecycle Analysis Plan:** Technoeconomic Analysis (TEA) continuously evaluates and optimizes the production and operation processes to reduce costs. TEA should consider economies of scale as production volumes increase. Life cycle assessment (LCA) accounts for the technology's material, energy, chemical, water, and environmental footprint and can be used to identify where sustainability can be integrated into the technology development and operation. Applicants must propose to perform TEA and LCA as part of their potential projects. These analyses must include a comparison of the current, commercially available state-of-the-industry technology with the proposed approach, including comparisons of functionality. The comparison should include an initial TEA and an initial LCA that considers: (1) current, commercially-available state-of-the-art technology; (2) relevant preliminary data that demonstrates the current developmental stage of the proposed solution (experimental, literature-based, or both); and (3) the proposed solution's targets that will be achieved by end of project. Preliminary TEA and LCA must be included in the technical volume of the application, should be conducted using credible methodologies and assumptions and will need to be updated throughout the life of selected projects.
- **WBS and Task Description Summary:** The Workplan should describe the work to be accomplished and how the applicant will achieve the milestones, will accomplish the final project goal(s), and will produce all deliverables. The Workplan is to be structured with a hierarchy of performance period (approximately annual), task and subtasks, which is typical of a standard WBS for any project. The Workplan shall contain a concise description of the specific activities to be conducted over the life of the project. The description shall be a full explanation and disclosure of the project being proposed (i.e., a statement such as "we will then complete a proprietary process" is unacceptable). It is the applicant's responsibility to prepare an adequately detailed task plan to describe the proposed project and the plan for addressing the objectives of this NOFO. The summary provided should be consistent with the SOPO. The SOPO will contain a more detailed description of the WBS and tasks.
- **Milestone Summary:** The SOPO should provide a summary of appropriate milestones throughout the project to demonstrate progress and success. A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be Specific, Measurable, Achievable, Relevant, and Timely, and must demonstrate a technical achievement rather than simply completing a task. The minimum requirement is that each project must have at least one milestone per quarter for the duration of the project with at least one SMART technical milestone per year (depending on the project, more milestones may be necessary to comprehensively demonstrate progress). The applicant should also provide the means by which the milestone will be verified. The summary provided should be consistent with the Milestone Summary Table in the SOPO.
- **Go/No-Go Decision Points:** The applicant should provide a summary of project-wide Go/No-Go decision points at appropriate points in the Workplan. At a minimum, each project must have at least one project-wide Go/No-Go decision point for each budget period (12 to 18-month period) of the project. See the Key Facts section above for Go/No-Go and budget period information. The applicant should also provide the specific technical criteria to be used to evaluate the project at the Go/No-Go decision point. The

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

- **End of Project Goal:** The Workplan should include a summary of the end of project goal(s). At a minimum, each project must have one SMART end of project goal. The summary provided should be consistent with the SOPO.
- **Project Schedule (Gantt Chart or similar):** The applicant should provide a schedule for the entire project, including task and subtask durations, any milestones, and any Go/No-Go decision points.
- **Build America Buy America (BABA) Requirements for Infrastructure Projects:** Within the first two pages of the Workplan, include a short statement on whether the project will involve the construction, alteration, maintenance and/or repair of public infrastructure in the U.S. See Build America, Buy America and 2 CFR 184 for applicable definitions and other information regarding Infrastructure Projects and the Buy America Requirement.
- **Project Management:** The applicant should discuss the team's proposed management plan, including the following:
    - The overall approach to and organization for managing the work;
    - The roles of each project team member;
    - Any critical handoffs/interdependencies among project team members;
    - The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices;
    - The approach to project risk management, including a plan for securing a qualified workforce and mitigating risks to project performance including but not limited to conflicts related to siting;
    - Approach to addressing permits and other approvals, including compliance with any current permits, and any permits and natural or cultural resource issues that could require discretionary permits or approvals;
    - A description of how project changes will be handled;
    - If applicable, the approach to Quality Assurance/Control;
    - How communications will be maintained among project team members.
- **Market Transformation Plan:** The applicant should provide a market transformation plan, including the following:
    - Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including a mitigation plan.
    - Identification of a product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, data dissemination, and product distribution.
    - Identification of current industry interest, commitments for adoption if the project is successful, and impact of those commitments across the industry.

- Evaluate the adoption readiness level (ARL) of the technology or process and outline in proposed work will serve to advance the ARL over the course of the project, siting elements that inform ARL.[25]

Technical Qualifications and Resources (Approximately 17% of the Technical Volume)
The Technical Qualifications and Resources should contain the following information:

- A description of the project team's unique qualifications and expertise, including those of key subrecipients;
- A description of the project team's existing equipment and facilities, 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;
- Relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives;
- The time commitment of the key team members to support the project;
- In all cases, letters of commitment from partner organizations, and especially those that pledge cost share, will make for stronger applications.
- A description of the technical assistance and services to be provided by DOE FFRDCs and third parties, if applicable;
  - For technical assistance that the project intends to seek a voucher for, describe how the technical assistance serves to advance the goals of the project, and the estimated budget for the technical assistance. Also indicate through a letter of support who will be providing the technical assistance. Review the description of technical assistance and financial support for technical assistance in section D of the NOFO for more information.
- The skills, certifications, or other credentials of the construction and ongoing operations workforce;
- For multi-organizational projects, describe succinctly:
  - The roles and the work to be performed by the project manager and Senior/Key Personnel at the recipient and subrecipient levels;
  - Business agreements between the applicant and subrecipient;
  - How the various efforts will be integrated and managed;
  - Process for making decisions on technical direction;
  - Publication arrangements;
- Strategy to address known resource, including intellectual property and real property, constraints or challenges; and
- Communication plans.

Pilot-Scale Preparedness (Approximately 8% of the Technical Volume)

- **Pilot-Scale Preparedness:** A detailed plan for building and operating a pilot-scale version of the proposed technology or process. This plan can be useful to develop a pitch to private investors interested in supporting a pilot project or it can be useful to compete

[25] Adoption Readiness Level framework, DOE: https://www.energy.gov/technologycommercialization/adoption-readiness-levels-arl-framework

for a Phase 2 CMM Accelerator award that includes a 50% cost share contribution from DOE. The plan should include:
    - Performance Targets: Quantifiable targets for increased scale, throughput, performance, and cost reduction at the pilot stage.
    - Supply Chain Integration: Strategies for identifying and engaging upstream and downstream partners to optimize material handoffs, off-take agreements, and overall supply chain integration.
    - Additional Expertise: Identification of new personnel, expertise, and organizational structures required for pilot-scale development and operation. This should include a transition of leadership to a private entity during the pilot scale project if one is not already leading the project.
    - Investor Engagement: Evidence of preliminary engagement with potential investors or strategic partners to support a pilot-scale demonstration.
- **Follow-on Investment Pathway:** A clear outline of how the current project's outcomes will establish confidence and attract the necessary commitments for a subsequent pilot-scale funding opportunity. Awarded projects will be eligible for this potential Phase 2 pilot-scale funding under the CMM Accelerator program.
- **Business Case Development:** A clear and compelling business case for the proposed technology, including market analysis, value proposition, and competitive advantages that would justify follow-on funding for pilot-scale implementation.

5. Biographical Sketch

Every Covered Individual at the applicant and subrecipient levels must submit a biographical sketch (biosketch). Use SciENcv (Science Experts Network Curriculum Vitae) to produce a DOE-compliant PDF version of the biosketch. The biosketch does not have page limits, though some fields in SciENcv have character limitations for consistency.

Use the NOFO-Specific Biosketch Instructions and the NSPM-33, Implementation Guidance Pre- and Post-Award Disclosures Relating to the Biographical Sketch and Current and Pending (Other) Support[26] to develop the biosketch.

Instructions for First-Time SciENcv Users:

1. Navigate to SciENcv (Science Experts Network Curriculum Vitae)
2. To log in, click More Options, Login.gov, then sign in
3. From the dashboard, click Manage SciENcv, then click Create New Document
4. Select DOE Biographical Sketch
5. From there, it's an easy web interface to add education and work history
6. When ready, click Download PDF, which will prompt the user to certify their responses, then the document will download and can be added to the NOFO application

The biosketch and CPS Common Forms must together include a list of all sponsored activities, awards, and appointments, whether:

- Paid or unpaid

[26] This table supersedes in its entirety Table 2a and Paragraph 7 of the Disclosure Requirements and Standardization Section of the NSPM-33 Implementation Guidance.

- Full-time, part-time, or voluntary
- Faculty, visiting, adjunct, or honorary
- Cash or in-kind
- Foreign or domestic
- Governmental or private-sector
- Directly supporting your research
- Indirectly supporting your research by supporting students, research staff, space, equipment, or other research expenses.

Every covered individual must also identify all connections with malign foreign talent recruitment programs.

Please note the following:

- All definitions in the biosketch except Covered Individual (which is defined in the NOFO Part 1, *Application Content and Form—Application Content Requirements, Covered Individual Definition, Designation and Responsibility)* are available at: NSPM-33, Definitions.
- If the NOFO-Specific Biosketch Instructions conflict with the NSPM-33, Implementation Guidance Pre- and Post-Award Disclosures Relating to the Biographical Sketch and Current and Pending (Other) Support, follow the DOE NOFO-Specific Biosketch Instructions.

DOE/NNSA NOFO-Specific Biosketch Instructions	
Persistent Identifier (PID) of the Covered Individual	The PID field is required.
Appointments and Positions Reporting Timeframe	Identify all domestic and foreign professional appointments and positions, both inside and outside the primary organization. There should be no lapses in time over the past 10 years or since age 18, whichever is shorter.
Products: Limitation on Number Provided	List up to 10 products most closely related to the proposed project.

6. Current and Pending (Other) Support

Current and pending (other) support (CPS Common Form) helps us identify potential duplication, overcommitment, potential conflicts of interest or commitment, and all other sources of support.

Every Covered Individual at the applicant and subrecipient levels must submit a CPS Common Form. Use SciENcv (Science Experts Network Curriculum Vitae) to produce a DOE-compliant PDF version of the CPS Common Form. The *CPS* Common Form does not have page limits, though some fields in SciENcv have character limitations for consistency.

Use the DOE NOFO-Specific CPS Instructions [27] and the DOE NOFO-Specific CPS Instructions below. All connections with malign foreign talent recruitment programs must be identified in current and pending support. NSPM-33, Implementation Guidance Pre- and Post-Award Disclosures Relating to the Biographical Sketch and Current and Pending (Other) Support[28] to develop the CPS Common Form. The CPS Common Form and the biosketch must together include a list of all sponsored activities, awards, and appointments, whether:

- Paid or unpaid
- Provided as a gift with 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 your research
- Indirectly supporting your research by supporting students, research staff, space, equipment, or other research expenses.

Every covered individual must identify all connections with malign foreign talent recruitment programs in current and pending support.

Please note:

- All definitions in the CPS Common Form, except Covered Individual (which is defined in the NOFO Part 1, *Application Content and Form—Application Content Requirements, Covered Individual Definition, Designation and Responsibility)* are available at: NSPM-33, Definitions.
- If the DOE NOFO-Specific CPS Instructions conflict with NSPM-33, Implementation Guidance Pre- and Post-Award Disclosures Relating to the Biographical Sketch and Current and Pending (Other) Support, follow the DOE NOFO-Specific CPS Instructions.

DOE/NNSA NOFO-Specific CPS Instructions	
Persistent Identifier (PID) of the Covered Individual	The PID field is required.

[28] This table supersedes in its entirety Table 2a and Paragraph 7 of the Disclosure Requirements and Standardization Section of the NSPM-33 Implementation Guidance.

Reporting Timeframe for Proposals, Projects, and In-Kind Contributions	Disclose only **current** and **pending** support, as defined in the "Status of Support" field of the SciENcv CPS Common Form.
Types of Proposals and Active Projects to Disclose	In addition to the guidance listed above, consulting activities must be disclosed under the proposals and active projects section of the form when any of the following scenarios apply: • The consulting activity will require the Covered Individual to perform research as part of the consulting activity • The consulting activity does not involve performing research but is related to the Covered Individual's research portfolio and may have the ability to impact funding, alter time or effort commitments, or otherwise impact scientific integrity • The consulting entity has provided a contract that requires the Covered Individual to conceal or withhold confidential financial or other ties between the Covered Individual and the entity, irrespective of the duration of the engagement
Disclosure Instructions for In-Kind Travel	DOE's in-kind disclosure requirements for the "Travel supported/paid by an external entity to attend a conference or workshop" line of the table titled NSPM-33, Implementation Guidance Pre- and Post-Award Disclosures Relating to the Biographical Sketch and Current and Pending (Other) Support differs as follows: Disclosure is required for: • "Travel supported/paid by an external entity to attend a conference or workshop" located in a foreign country of concern (FCOC) • "Travel supported/paid by an external entity to attend a conference or workshop" when the supporting/paying external entity is located in an FCOC Disclosure is **not** required for: • "Travel supported/paid by an external entity to attend a conference or workshop" that is **not** located in an FCOC • "Travel supported/paid by an external entity to attend a conference or workshop" when the supporting/paying external entity is **not** located in an FCOC
Current and Pending (Other) Support Addendum	All Covered Individuals who submit a Current and Pending (Other) Support disclosure must **also submit the Current and Pending (Other) Support Addendum**. The Addendum is available on SciENcv at the bottom of the SciENcv Current and Pending Other Support form.

E. Additional Requirements

Program-specific requirements that apply to awards funded under this NOFO are identified below. Standard requirements are described in NOFO Part 2, *Additional Requirements*.

Funding Restrictions		
Title	**Location**	**Additional Information**
Buy America Preference for Infrastructure Projects	NOFO Part 1	Applies to awards made under this NOFO
Allowable Costs	NOFO Part 2	Applies to awards made under this NOFO
Pre-Award Costs	NOFO Part 2	Applies to awards made under this NOFO
Performance of Work in the United States (Foreign Work Waiver Requirement)	NOFO Part 2	Applies to awards made under this NOFO
Foreign Travel	NOFO Part 2	Foreign Travel is not allowed for awards made under this NOFO
Equipment and Supplies	NOFO Part 2	Purchasing American-made equipment and supplies applies to this award.

1. Buy America Preference for Infrastructure Projects

Awards funded through this NOFO that are for or contain construction, alteration, maintenance, or repair of public infrastructure in the United States require that:

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

Refer to the DOE's Standard Terms and Conditions and 2 C.F.R. Part 184 to determine whether the Buy America Preference applies and if we should consider the Buy America Preference in the proposed project's budget and schedule. The Buy America Preference does not apply to prime recipients that are for-profit entities.

V. Submission Requirements and Deadlines

You **must** take several one-time actions before applying to this NOFO. Some of these tasks may take several weeks. These requirements are outlined in detail in the NOFO Part 2, *Get Registered and Required Registrations*.

A. Submission Date and Times

You must submit all required submissions to the eXCHANGE site identified in the Key Facts section of this NOFO no later than 5 p.m. ET on the dates provided in the Key Facts section. Letters of intent and the application each have a different deadline.

Applicants are strongly encouraged to submit all required application documents at least 48 hours before the submission deadline. Under normal conditions (i.e., at least 48 hours before the submission deadline), set aside at least one hour to submit application documents. Once you submit the application documents, you can revise or update your submission before the deadline passes. If you change any of your documents, you must resubmit them before the deadline. We will not extend the submission deadline for server or connection congestion.

B. Intergovernmental Review

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

VI. Application Review Information

A. Standards for Application Evaluation

Eligible applications will be evaluated based on this NOFO by the standards set forth in the Office of Energy Efficiency and Renewable Energy's (EERE) Notice of Objective Merit Review Procedure (76 Fed. Reg. 17846, March 31, 2011 and the guidance in the "DOE Merit Review Guide for Financial Assistance," effective October 1, 2020.

B. Responsiveness Review

We will not review or consider the following applications:

- Project concepts or approaches identified as NOT of interest (see the Applications Specifically Not of Interest section above)
- Applicants and applications that do NOT meet the Eligibility Criteria in NOFO Parts 1 and 2

C. Review Criteria

1. Compliance Criteria

All submissions for applications must:

- Comply with the content and form requirements listed in *NOFO Parts 1 and 2, Application Content Requirements and Submission Requirements and Deadlines of the NOFO*
- Include all required documents
- Be uploaded successfully submitted in the eXCHANGE site indicated in the Key Facts section at the beginning of this NOFO
- Meet the submission deadlines stated in Key Facts no later than 5 p.m. ET

DOE will not review or consider submissions submitted that:

- Are not submitted through the correct eXCHANGE site for this NOFO
- Are submitted after the due date and time
- Are incomplete

You must submit a letter of intent by 5:00 p.m. ET on the due date listed in the Key Facts section to be eligible to submit an application.

2. Technical Review Criteria

Applications

Applications will be evaluated against the technical review criteria shown below. Unless indicated in the table below, sub-criteria are of equal weight.

Review Criterion Overview	
Criterion	**Weight**
Technical Merit, Innovation, and Impact	45%
Market Transformation Plan	10%
Project Workplan, Project Management, and Risk Mitigation	30%
Team and Resources	15%

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

This criterion involves consideration of the following sub-criteria:

Technical Merit and Innovation

1. Extent to which the proposed technology, process, or project is innovative or replicable;
2. Degree to which the current state of the technology and the proposed advancement are clearly described;
3. Extent to which the application specifically and convincingly demonstrates how the applicant will move the state of the art to the proposed advancement;
4. Sufficiency of technical detail in the application to assess whether the proposed work is scientifically meritorious and revolutionary, including relevant data, calculations, and discussion of prior work with analyses that support the viability of the proposed work;
5. Extent to which project has buy-in from needed stakeholders to ensure success;
6. Degree to which key manufacturing and supply chain challenges are considered, as applicable, for viable scale-up in this and future demonstrations;
7. Degree to which siting and environmental constraints are considered for deployment;
8. Extent to which project has the potential to reduce emissions and provide energy acceleration benefits for a community or region;
9. Sufficiency of existing infrastructure to support addition of proposed demonstration;
10. Extent to which the proposed project will communicate scientific results through peer-reviewed journals as part of the reporting for sponsored research;

11. Extent to which the proposed project demonstrates hypothesis-driven research articulating clear, falsifiable hypotheses with explicitly defined, measurable criteria, supported by solid experimental designs and statistical methods; and
12. Extent to which the proposed project utilizes practices that enhance falsifiability (e.g., pre-registration of study protocols, use of appropriate control groups) and will encourage transparent reporting of null or negative results in publications and data repositories.

Impact of Technology Advancement

1. Ability of the project to advance industry adoption;
2. Extent to which the project supports the topic area objectives and target specifications and metrics;
3. Potential impact of the project on advancing the state of the art;
4. Extent to which demonstration/deployment is replicable and may lead to future demonstrations; and
5. Extent to which the project facilitates stakeholder relationships across new or existing stakeholders to gain technical buy-in and increase potential for future deployments.

Criterion 2: Market Transformation Plan (10%)

This criterion involves consideration of the following sub-criteria:

1. Identification of target market, competitors, and distribution channels for the proposed technology along with known or perceived barriers to market penetration, including mitigation plan;
2. Comprehensiveness of market transformation plan including but not limited to product development and/or service plan, commercialization timeline, financing, product marketing, legal/regulatory considerations including intellectual property, infrastructure requirements, Open-Source Software Distribution Plan, etc., and product distribution; and
3. Extent of industry adoption, commitments, and interest of the technology/processes including partnerships with upstream and downstream entities.
4. Adequacy of pilot-scale preparedness plan, including performance targets, supply chain integration, , additional expertise, and investor engagement.
5. Extent that project activities may be used to establish confidence in follow on pilot-scale funding (private or public).

Criterion 3: Project Workplan, Project Management, and Risk Mitigation (30%)

This criterion involves consideration of the following sub-criteria:

Project Management

1. Adequacy of proposed project management systems including the ability to track scope, cost, and schedule progress and changes;
2. Reasonableness of budget and spend plan as detailed in the budget justification workbook for proposed project and objectives;
3. Adequacy of contingency funding based on quality of cost estimate and identified risks;
4. Adequacy, reasonableness, and soundness of the project schedule, as well as periodic Go/No-Go decisions prior to further funds disbursement, interim milestones, and metrics to track process;

5. Adequacy, reasonableness, and soundness of the project schedule, as well as annual Go/No-Go decisions prior to a budget period continuation application, interim milestones, and metrics to track process;
6. Adequacy of the identification of risks, including labor and community opposition or disputes, and "timely" and appropriate strategies for mitigation and resolution;
7. Soundness of a plan to expeditiously address environmental, siting, and other regulatory requirements for the project; and
8. Completeness, comprehensiveness, accuracy, and strength of the application deliverables, such that DOE and independent experts will be able to identify project risk.

Research and/or Demonstration Approach, Workplan, and SOPO

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

Identification of Technical Risks

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

Baseline, Metrics, and Deliverables

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

Criterion 4: Team and Resources (15%)

This criterion involves consideration of the following sub-criteria:

1. Capability of the project manager(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team;
2. Comprehensiveness of expertise and perspectives of the team and the involvement of industry partners that will amplify impact;
3. Sufficiency of the facilities to support the work;
4. Degree to which the proposed consortia/team demonstrates the ability to facilitate and expedite further demonstration, development, and commercial deployment of the proposed technologies;
5. Level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan; and
6. Reasonableness of the budget and spend plan for the proposed project and objectives.

D. Other Selection Factors

In addition to the above criteria, the Selection Official may consider the following program policy factors to determine which applications to select for award negotiations:

1. The degree to which the proposed project exhibits technological diversity when compared to the existing DOE project portfolio and other projects selected from the subject NOFO;
2. The degree to which the proposed project team includes a variety of applicants.
3. The degree to which the proposed project, including proposed cost share, optimizes the use of available DOE funding to achieve programmatic objectives;
4. The level of industry involvement and demonstrated ability to accelerate demonstration and commercialization and overcome key market barriers;
5. The degree to which the proposed project is likely to lead to increased high-quality employment and manufacturing in the U.S. ;
6. The degree to which the proposed project will accelerate transformational technological advances in areas that industry by itself is not likely to undertake because of technical and financial uncertainty;
7. The degree to which the proposed project demonstrably advances the President's policy priorities;
8. All else being equal, preference will be given to institutions with lower indirect cost rates; and
9. The degree to which the applicant contributes to a broad range of recipients likely to produce immediately demonstrable results and recipients with the potential for potentially longer-term, breakthrough results, consistent with the objectives of the NOFO.
10. The degree to which the proposed project avoids duplication/overlap with other publicly or privately funded work.
11. The degree to which the proposed project supports complementary efforts or projects, which, when taken together, will best achieve the research goals and objectives.
12. The degree to which the proposed project enables new and expanding market segments.
13. The degree to which the project's solution or strategy will maximize deployment or replication.
14. The degree to which the project promotes increased coordination with nongovernmental entities for demonstration of technologies and research applications to facilitate technology transfer.

VII. Selection and Award Notices

The NOFO Part 2, *Selection and Award Notices*, provides information on notifications for applications, award negotiations, and post-selection information requests.

VIII. Award Administration Information

A. Post-Award Requirements and Administration

DOE requires all award recipients to follow and accept requirements governed by laws and policies—both Federal and DOE. These post-award requirements include:

- National and administrative policy requirements
- National Assurance Policies

- Financial assistance general certifications and representations
- Build America, Buy America requirements
- Davis-Bacon Act requirements
- Infrastructure Investment and Jobs Act-specific requirements
- Fraud, waste, and abuse requirements
- Safety, security, and regulatory requirements
- Environmental review with the National Environmental Policy Act requirements

Please review the Standard Award Terms and Conditions, the sample Federal Assistance Reporting Checklist, and standard Intellectual Property (IP) Provisions to better understand post-award requirements and administration.

Post-award requirements and administration that apply to awards funded under this NOFO are identified below. Detailed descriptions of standard requirements are provided in NOFO Part 2, *Post-Award Requirements and Administration*. Detailed descriptions of NOFO-specific requirements are provided below the table.

Post Award Requirements and Administration		
Government Rights in Data	NOFO Part 1	Applies to awards made under this NOFO
Real Property and Equipment Continued Use	NOFO Part 2	Applies to awards made under this NOFO
Program Down-Select	NOFO Part 2	Applies to awards made under this NOFO
Go/No-Go Review	NOFO Part 2	Applies to awards made under this NOFO
Energy Data eXchange	NOFO Part 2	Does not apply to awards made under this NOFO
Invoice Review and Approval	NOFO Part 2	Applies to awards made under this NOFO
Cost-Share Payment	NOFO Part 2	Applies to awards made under this NOFO
U.S. Manufacturing Commitments	NOFO Part 2	Applies to awards made under this NOFO
Subject Invention Utilization Reporting	NOFO Part 2	Applies to awards made under this NOFO
Data Management and Sharing Plan (DMSP)	NOFO Part 2	Does not apply to awards made under this NOFO

1. Government Rights in Data

You can find the U.S. government rights to application information in the Use and Disclosure of Application Information section. The U.S. Government rights to data produced

under an award or used in the performance of the award varies according to the following classifications..

Limited Rights Data:

Limited-Rights Data are data (other than computer software) developed at private expense that embody trade secrets or are commercial or financial and confidential or privileged. For limited-rights data used in the performance of an award, the U.S. Government may inspect such data to verify the limited-rights data and restricted rights assertion or to evaluate work performance. However, award recipients are not normally required to deliver such data. For awards that require an award recipient to deliver limited-rights data and to ensure the protection of such data, you must properly mark these data as described in the award's intellectual property terms and conditions.

Unlimited Rights:

Unlimited-Rights Data are data first produced under an award or are unmarked data delivered to the U.S. Government as part of an award. *Unlimited rights* mean the U.S. Government has the right to (in any manner and for any purpose whatsoever and to have or permit others to) take the following actions with these data:

- Use
- Disclose
- Reproduce
- Prepare derivative works
- Distribute copies to the public
- Perform publicly and display publicly.

Patentable Information:

In addition to any other protection allowed under the award, invention disclosures and other patentable information may be protectable from public disclosure for a reasonable time to allow you to file a patent application.

Protected Data:

Despite the unlimited rights the U.S. Government normally obtains in data first produced under an award, under special statutory authority and with DOE concurrence, certain categories of data first produced under awards resulting from this NOFO may be marked as *protected data*. Protected data are technical data or commercial or financial data first produced under the award that, if obtained from and first produced by a nonfederal party, would be privileged or confidential. These data are protected from public disclosure for up to 5 years after the data were first produced. To qualify as protected data, we must agree with the classification, and you must properly mark the data as set forth in the award's intellectual property terms and conditions.

IX. Other Information

Please see NOFO Part 2, *Other Information*, for additional information, acronyms, and requirements that apply to all DOE NOFOs.