# U.S. Department of Energy

# Office of Fossil Energy and Carbon Management

## Resource Sustainability Office

# NATIONAL LABORATORY CALL FOR PROPOSALS

# MINE OF THE FUTURE RESEARCH, DEVELOPMENT, AND DEMONSTRATION

# Amendment 0001

## National Lab Funding for Fiscal Year 2025

| PROPOSAL DEADLINE | |
|---|---|
| Lab Call Release Date: | September 26, 2025, 5:00 PM ET |
| Letter of Intent (LOI) Submission Deadline: | November 14, 2025, 5:00 PM ET |
| Concept Paper Deadline: | December 08, 2025, 5:00 PM ET |
| Full Application Deadline: | January 27, 2026, 5:00 PM ET |
| **DECISION DATES** | |
| Concept Paper Response Date: | December 19, 2025 |
| Expected Decision Date: | March 2, 2026 |
| **EXPECTED LAB CALL PROCESS** | |
| Expected Funding Allocation: | April 2026 |
| Expected Project Execution: | June 2026- June 2028 |

This lab call is being issued by the U.S. Department of Energy's (DOE) Office of Fossil Energy and Carbon Management (FECM) Resource Sustainability Office.

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# I. Lab Call Description

## A. Background and Context

### i. Overview and Purpose

The research, development, and demonstration (RD&D) activities to be funded under this lab call will support the Department of Energy's (DOE's) Mine of the Future (MotF) Initiative. They will help integrate, expand, and accelerate DOE's strategy to build resilient, diverse, sustainable, and secure domestic critical mineral supply chains that support the Administration's executive orders, including Executive Orders 14154 - *Unleashing American Energy*,[1] 14156 - *Declaring a National Energy Emergency*,[2] and 14241 - *Immediate Measures to Increase American Mineral Production*.[3]

The MotF Initiative represents a comprehensive rethinking of exploration, discovery, mining, and processing aimed at transforming the mining industry. The program envisions the creation of "mines of the future," which will employ cutting-edge technologies to conduct more precise, surgical, and efficient extraction of critical minerals and materials (CMM). This approach will significantly reduce the capital expenditure of conventional mining approaches, minimize the environmental impact on land and surface water, and lower water and energy consumption. The program will focus on several technological advancement areas including: geophysical approaches and directional drilling to target deeper and richer mineral deposits in the subsurface, innovations in robotics and autonomous mining, approaches to recover materials via *in-situ* and real-time extraction, and novel beneficiation, advanced processing, and tailings management methods.

By leveraging innovative technologies and sustainable practices, the MotF Initiative aims to meet the growing domestic demand for critical minerals and materials while advancing the U.S.'s position as a global leader in responsible resource development and aligning with broader energy and national security goals. The DOE wants this initiative to ***"Inspire miners to innovate, and innovators to mine"***.

Through this lab call, FECM aims to achieve the following goals:

- Accelerate the identification and development of new CMM deposits.

[1] Exec. Order No. 14154 of January 20, 2025, *Unleashing American Energy,* 90 Fed. Reg. 8353 (Jan. 29, 2025), https://www.federalregister.gov/documents/2025/01/29/2025-01956/unleashing-american-energy.

[2] Exec. Order No. 14156 of January 20, 2025, *Declaring a National Energy Emergency,* 90 Fed. Reg. 8433 (Jan. 29, 2025), https://www.federalregister.gov/documents/2025/01/29/2025-02003/declaring-a-national-energy-emergency.

[3] Exec. Order No. 14241 of March 20, 2025, *Immediate Measures to Increase American Mineral Production*, 90 Fed. Reg. 13673 (March 25, 2025), https://www.federalregister.gov/documents/2025/03/25/2025-05212/immediate-measures-to-increase-american-mineral-production.

- Increase CMM recovery while ensuring confidence of environmental performance.
- Reduce mine tailings and minimize hazardous waste production
- Maximize the full value of mined CMMs as saleable products
- Lower energy consumption, water use, and emissions from all stages of CMM development
- Minimize hydrological impacts and preserve aquifers at mining sites
- Expedite data development, utilization, and management
- Advance AI technologies related to CMM objectives, including remote and autonomous mining
- Grow the technically recoverable CMM reserve base of the US.

Through this lab call, it is estimated that the:

- Total DOE funding available is up to $15M
- Number of projects awarded is up to 8
- Project duration is approximately 2 years

Successful technologies developed under this lab call may have the potential to be demonstrated at DOE's METALLIC facility.

This lab call is soliciting proposals aligned with the following topic areas:

- Mining Innovation
- Beneficiation Technologies
- In-situ Extraction and Recovery

Applicants are required to submit a Letter of Intent (LOI) to express interest in this lab call. Each National lab should submit a separate LOI if they are interested, even if they plan on joining together with other labs for a full proposal. If labs are planning to collaborate on a full proposal, please feel free to note this in an LOI, but such plans will not impact the lab's ability to change those plans before proposals are submitted. FECM will not provide any response or feedback on the LOI but will use the LOI to identify reviewers and gauge interest. This Lab Call is to be kept separate from METALLIC efforts. The National Energy Technology Laboratory (NETL) is excluded from proposing towards this lab call.

The application process requires submittal of a concept paper and a full application. Each concept paper and full application must address a single topic area from the lab call.

- In the concept paper:
  - Applicants who are interested in this opportunity must identify what existing areas, facilities, and capabilities at the lab(s) will be leveraged, as well as any other equipment or expertise that will be required.
- In the full application, applicants will meet the following expectations:

- A lab or group of labs will develop full proposals with a domestic industry partner(s).
- Domestic industry partners are encouraged to explore Cooperative Research and Development Agreement (CRADA) options with their lab partners. A CRADA between each lab and its partners will be required to govern the work responsibilities for the project, intellectual property, and other applicable requirements for the project and the lab management and operating (M&O) contact.

## ii. Timeline and Process Logistics

*Timeline*

| PROPOSAL DEADLINE | |
|---|---|
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*Process Logistics*

All communication to FECM regarding this lab call must use LabCall-FECM-HQ@hq.doe.gov.

- **LETTER OF INTENT, CONCEPT PAPER, AND PROPOSAL SUBMISSIONS:** To apply to this lab call, lab personnel must submit all documents and application materials at LabCall-FECM-HQ@hq.doe.gov.

  Applicants are responsible for meeting the submission deadlines. FECM strongly encourages all applicants to submit the required information at least 24 hours in advance of the submission deadline. Applicants should not wait until the last minute—internet and data server traffic can be heavy in the last hours before the submission deadline, which may affect the applicants' ability to successfully submit the required information before the deadline.

- **NOTIFICATION OF SELECTION:** When selections are finalized, lab leads will

receive an email from LabCall-FECM-HQ@hq.doe.gov.

## B. Key Considerations and Topic Area(s)

### i. Key Considerations

- **AVAILABLE FUNDING:** There is approximately **$15 million in total federal funding** available to fund **all** projects solicited in this lab call pending appropriations and program direction considerations. The amount of federal funding given to fully awarded labs will be a maximum of $15M.
- **NON-LAB PARTNERS:** Labs partnering with industry, academia or other non-lab entities to perform work under this Lab call are encouraged to enter into CRADAs with those partners within time parameters set forth by the funding program.
- **EXISTING PROJECTS:** Labs with existing projects addressing any of the topic areas below may incorporate that work in proposals they submit in response to this lab call to demonstrate existing capability and leverage existing partnerships with industry and other partners. If the proposal is not selected for funding under this lab call, the work under the existing projects will not be negatively impacted. Proposed projects must not be duplicative to existing government initiatives (i.e., METALLIC, ARPA-E, etc.) or rely on completion of facilities associated with these initiatives before the proposed projects can be fully executed.
- **ELIGIBILITY:** All DOE National Laboratories, except the National Energy Technology Laboratory, are eligible for this lab call. Proposals that involve more than one laboratory are also allowed. All proposals are encouraged to include a domestic industry partner(s).

  **National Lab applicants must submit an eligible LOI to be qualified to submit (or contribute to submission of) a Final Application.**

  Applicants with currently active projects seeking additional funding to complete their original scope of work are excluded. Note, such applicants with existing projects may apply as long as a new scope of work is proposed that meets the intent of this lab call. The intention is that applicants cannot use this lab call to ask for additional funding on an existing project (see Sec. I.B.i.).

  *Applicants may submit Letters of Commitment from domestic industry partners but this is not a requirement of this lab call.*

  For a stronger proposal, DOE encourages the inclusion of letters of commitment from at least one domestic industry partner. The domestic

industry partner must be a for-profit entity; organized and chartered or incorporated (or otherwise formed) under the laws of a state or territory of the United States; have majority domestic ownership and control; and/or have a physical location for business operations in the United States.

In addition to the requirements of this lab call, each applicant must comply with all relevant laws, DOE directives, and contractual obligations, including the DOE Policy on Foreign Engagements.

## ii. Topic Area Descriptions

### Topic Area 1: Mining Innovation

This Topic Area (TA) will focus on developing technologies capable of innovating and modernizing the CMM mining industry. The goal will be to develop better, novel mining techniques for the mining of conventional ores that contain CMMs. Proposed technologies should have a low technology readiness level (TRL), e.g., TRL 2-4, and fit into the following categories:

- **Operational Efficiency and Safety:** Leveraging AI and automation to enhance operational efficiency, minimize waste, and enhance worker safety.
- **Precision Mining/Drilling:** Developing techniques that improve ore recovery while reducing environmental impact. This involves using sensor-based systems for real-time monitoring and improved geological steering, as well as AI-driven process control and vision systems to optimize mineral separation.
- **Artificial Intelligence (AI) for Mining Autonomy:** Focusing AI research on achieving autonomy in mining operations, specifically including applications in mineral discovery, metallurgical processing, addressing societal license challenges, water management, environmental impact mitigation, and decarbonization efforts.
- **Subsurface Characterization:** Developing computational tools, including machine learning and AI, to improve the characterization of ore deposits for precise CMM extraction, incorporating technologies like sensing while drilling.
- **Resource Mapping and Exploration:** Utilizing big data, neural networks, machine learning, and AI for subsurface and deep ground resource mapping and mineral exploration.
- **Tailings and Waste Management Innovation:** Focusing on innovative approaches for tailings management, slurry processing, and the reduction of waste piles. This includes developing methods to recover co-products from existing tailings and waste, thereby transforming large dilute sources into valuable resources and maximizing the utility of all extracted ore.

### Topic Area 2: Beneficiation Technologies

This TA will focus on developing novel beneficiation technologies that can preconcentrate at the mine site along with novel separation techniques. The goal will be to enhance efficiency, reduce

environmental impact, and improve resource recovery. Proposed technologies should be low TRLs (2-4) and fit into the following categories:

- **Geometallurgy and Ore Sorting:** Implementing these techniques to minimize transportation needs, reduce the processing load on mills, decrease energy consumption, and improve recovery rates.
- **Advanced Pre-treatment and Grinding:** Utilizing methods such as dense medium separation, pre-weakening with microwave or electric pulse treatments, and dynamic grinding tailored to different ore types to prevent over-grinding.
- **Reagent-Free Beneficiation:** Exploring and developing environmentally benign separation methods like electrostatic and magnetic separation, and bio-beneficiation, which do not rely on chemical reagents.
- **Novel Mineral Separation Processes:** Developing alternatives to conventional flotation, specifically targeting processes that require significantly less water. This emphasizes the need for "nearly benign" mineral processing techniques, especially in contexts where smelter availability is limited, necessitating more refined and environmentally conscious processing at earlier stages.

### Topic Area 3: *In-situ* Extraction and Recovery

This TA will focus on *in-situ* extraction and recovery of CMMs. Technologies developed under this TA should emphasize advanced technological integration with a strong commitment to environmental and social responsibility. Proposed technologies should be low TRLs (2-4) and fit into the following categories:

- **Geochemical Optimization:** Customizing lixiviant chemistry (e.g., bioleaching, low-pH solutions) to the specific mineralogy of the ore body and precisely controlling redox conditions to boost the solubility of target metals. Real-time monitoring of solution parameters (like pH and eH) for maintaining optimal chemical conditions.
- **Advanced Subsurface Mapping and Modeling:** Utilizing sophisticated tools such as 3D reactive transport modeling to simulate fluid flow, reaction kinetics, and metal recovery. High-resolution geophysical surveys are also key for real-time tracking of fluid movement and identifying ore contact. Machine learning models, trained on historical data, can be used to refine injection strategies for various geological formations and ore types.
- **Refined Fluid Management and Recovery Enhancement:** Designing intelligent wellfields, including horizontal and multi-lateral wells, and optimizing injection systems (e.g., pulsing vs. cyclic) to enhance lixiviant diffusion, minimize channeling, and improve contact efficiency between the lixiviant and the ore.
- **Selective Extraction and Processing:** Employing in-line technologies like ion exchange or membrane systems for targeted metal capture from pregnant leach solutions. This also involves on-site modular solvent extraction and advanced nanofiltration for efficient lixiviant recycling and metal concentration.
- **Integrated Environmental and Community Focus:** Employing foundational principles for new mining technologies by identifying, measuring, and mitigating negative environmental impacts. Maximizing potential benefits for communities affected along the entire CMM supply chain.

Applicants should also consider how they may best:

- Support process design, including how to bring together advances in fundamental research to advance applied R&D
- Address research on concepts for both existing and new, innovative approaches. (e.g., improvements to commercial processes; enabling deployment of processes not completely novel, but not yet commercially deployed for a particular material; next-generation/transformational processes; or existing processes applied to novel feedstocks).
- Enable the diversification of supply through extraction/separation to manufacturing, thus enabling the extraction of CMMs from a variety of sources/feedstocks, e.g. hardrock ore, mining waste and by-products, legacy waste, etc.
- Apply machine learning, rational design, and modeling.

Applicants must clearly identify proposed targets and performer responsibilities for the project and justify how they were assigned. The proposed targets and the expected progress of the project towards meeting targets must be substantiated. The proposed targets need to include TRL or Manufacturing Readiness Level (MRL), as well as technical performance metrics, manufacturing capability metrics, and manufacturing cost metrics (see Appendix C for definitions of TRLs and MRLs). The TRL and MRL should be defined for the start of the project and a proposed target defined for the end of the project. The metrics should be specific to the proposed technology and must define the appropriate baseline (the start of the project), the final target (the end of the project), and the state-of-the-art, with appropriate references. Through this lab call, FECM will fund and establish new technologies capable of revolutionizing the mining industry and revitalize the domestic mining landscape

**Critical Materials Collaborative (CMC)**

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

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

The Recipient's Principal investigators (PIs) or a member of their research team are expected to participate in coordination efforts including, but not limited to, an in-person

annual symposium, virtual coordination meetings, and periodical presentations on research progress. There are no fees associated with this participation in the CMC.

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

**Critical Materials & Materials Matchmaker (CM3)**
Applicants and partnering organizations are also encouraged to add their critical mineral activities to the DOE's Critical Materials and Materials Matchmaker (CM3)[4]. The CM3 is an online information resource created to help connect users across the critical minerals and materials supply chains. CM3 includes a survey designed for organizations to self-identify their critical minerals and materials-aligned activities and interests to better understand the critical minerals and materials supply chains that exist domestically and in allying countries.

# II. Application Submission and Review Information

## A. Application and Submission Details

### i. Application Process

To apply to this lab call applicants must email all required documentation to LabCall-FECM-HQ@hq.doe.gov. All submissions must conform to the guidelines for format and length, and be submitted at, or prior to, the deadline listed in section I.A.ii.

#### *Letters of Intent*

Applicants are required to submit an LOI to demonstrate interest in this lab call. FECM will not provide any response or feedback on the LOI but will use the LOI to identify reviewers and engage industry interest. **Applicants must submit LOIs to LabCall-FECM-HQ@hq.doe.gov.**

#### *Concept Paper*

The application process requires submittal of a concept paper and a full application.

- In the concept paper:
  - Applicants who are interested in this opportunity must identify what existing areas, facilities, and capabilities at the lab(s) will be leveraged, as well as any other equipment or expertise that will be required.

[4] Critical Minerals & Materials Matchmaker (CM3) | Department of Energy

- Each concept paper should address a single Topic Area from the lab call.

### *Final Application*

In the full application, applicants will meet the following expectations:

- A lab or group of labs will develop full proposals with a domestic industry partner(s).
- Labs are encouraged to develop CRADAs with their domestic industry partners. A CRADA between each lab and its partners will be required to govern the work responsibilities for the project, intellectual property, and other applicable requirements for the project and the lab M&O contact.
- Each application should address a single Topic Area from the lab call.

Applicants will be required to include project information that will be used to develop and accelerate negotiations of FWPs if selected. Appendix A provides a worksheet to guide applicants through this process. Any information the applicant considers to be of significance for the review process must be included in the proposal, as reviewers will not have access to the AOP development information.

## ii. General Proposal Requirements

Proposals must be formatted for 8.5 x 11 paper, single spaced, and have 1-inch margins on each side. Typeface size should be 12-point font, except tables and figures, which may be in 10-point font, see Full Application section for page limits.

## iii. Proposal Content

Proposal content aligns with content required in the FECM FWP project forms, with additional information to assist reviewers in evaluating technical details. The narrative should build on the information provided.

**Applicants must include all content they wish to have reviewed in the proposal (proposal reviewers will not review any information provided for FWP development).**

### *Letters of Intent (LOIs)*

All LOIs must be no longer than 1-page and must conform to the following content requirements:

- Lead laboratory and point of contact;
- Names of participating lab or labs if it is a collaboration;
- The specific topic area the applicant is responding to;
- Major relevant research focus;
- Specific facilities and capabilities including hardware; and
- Potential partners for the project

## *Concept Papers*

The Concept Paper must conform to the following content requirements:

| SECTION | PAGE LIMIT | DESCRIPTION |
|---|---|---|
| Cover Page Section | 1 | The cover page should include the project title, the specific announcement Topic Area being addressed, both the technical and business points of contact, names of all team member organizations, and any statements regarding confidentiality. |
| Technology Description | 5 | Applicants are required to describe succinctly how the technology will:<br>• Aid in the development of a domestic supply chain for CMMs identified in the 2023 DOE Critical Materials Assessment<br>• Accelerate deployment of novel mining technology<br>• Designing new materials to support extraction from low concentrations sources<br>• Minimize waste generation through process design (reduction of waste and chemical use/inputs), valorization of byproducts<br>• De-risk industry adoption of new technology by demonstrating success on various scales<br>• Perform independent techno-economic analysis and life cycle analysis to understand the impact of proposed technologies<br>• Support the establishment of domestic CMM supply chains<br>• Rapidly advance technology from the bench to deployment for commercialization<br>• Expand the capabilities of the participating research institutions<br>• Developing technology that can be used to revolutionize the mining industrial and serve as a base for domestic CMM supply chains<br>• The potential impact that the proposed project would have on the relevant field and application;<br>• The lead lab and partnering entities existing infrastructure with respect to existing mining capabilities;<br>• Proposed mining capabilities by the end of the project;<br>• The key technical risks/issues associated with the proposed technology development plan; and<br>• The impact that FECM funding would have on the proposed project. |
| Addendum | 2 | Applicants are required to describe succinctly the qualifications, experience, and capabilities of the proposed Project Team, including:<br>• Whether the Principal Investigator (PI) and Project Team have the skill and expertise needed to successfully execute the project plan; and |

| | | |
|---|---|---|
| | | • Whether the applicant has prior experience which demonstrates an ability to perform tasks of similar risk and complexity. |

If multiple national labs are submitting a join proposal, the lead lab will submit a single concept paper clearly identifying all parties involved.

*Full Applications*

- An eligible LOI must have been submitted prior to the Full Application.
- FECM will not review or consider ineligible Full Applications.
- Each Full Application shall be limited to a single concept or technology. Unrelated concepts and technologies shall not be consolidated in a single Full Application.

Full Applications must conform to the following requirements:

| SECTION | FILE FORMAT | PAGE LIMIT | FILE NAME |
|---|---|---|---|
| Technical Volume | PDF | 25 | ControlNumber_LeadOrganization_TechnicalVolume |
| Resumes | PDF | 1 per person | ControlNumber_LeadOrganization_Resumes |
| Letters of Commitment | PDF | 1 per letter | ControlNumber_LeadOrganization_LOCs |
| Summary/Abstract for Public Release | PDF | 1 | ControlNumber_LeadOrganization_Summary |
| Summary Slide | MS PowerPoint | 1 | ControlNumber_LeadOrganization_Slide |
| DOE Work Proposal for FFRDC, if applicable (see DOE O 412.1A, Attachment 3) | PDF | N/A | ControlNumber_LeadOrganization_WP |
| Authorization from cognizant Contracting Officer for FFRDC | PDF | N/A | ControlNumber_LeadOrganization_FFRDCAuth |
| SF-LLL Disclosure of Lobbying Activities | PDF | N/A | ControlNumber_LeadOrganization_SF-LLL |

| | | | |
|---|---|---|---|
| Waiver Requests: Foreign Entities and Foreign Work (if applicable) | PDF | N/A | ControlNumber_LeadOrganization_Waiver |
| Data Management Plan | MS Word | 1 | ControlNumber_LeadOrganization_DMP |

Technical Volume

The Technical Volume must be submitted in PDF format. The Technical Volume must conform to the following content and form requirements, including maximum page lengths. If applicants exceed the maximum page lengths indicated below, FECM will review only the authorized number of pages and disregard any additional pages. Save the Technical Volume in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_TechnicalVolume".

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

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

The Technical Volume must conform to the following content requirements:

| SECTION / PAGE LIMIT | DESCRIPTION |
|---|---|
| **Title/Cover Page** (1 page) | This should include the proposal title, Topic Area(s) being applied for, requested funding and proposed cost-share, PI(s) and business POCs, names of all team member organizations, any statements regarding confidentiality, a nonproprietary project summary, and a 200-or-less-word summary of the project suitable for public release if the project is funded.<br>• Include name, address, phone number, and email address of the lead applicant (organization) for contract issues and project issues. |
| **Project Overview** (Approximately 10% of the Technical Volume) | The Project Overview component of the technical volume should contain the following information, succinctly described: |

| SECTION / PAGE LIMIT | DESCRIPTION |
|---|---|
| | • **Background:** The applicant should briefly discuss the background of their organization, including the history, successes, and current research and development status (i.e., the technical baseline) relevant to the technical topic being addressed in the Full Application.<br>• **Project Goal:** The applicant should explicitly identify the targeted improvements to the baseline technology and the critical success factors in achieving that goal.<br>• **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:<br>• **Relevance and Outcomes:** The applicant should provide a detailed description of the technology, perform early to mid-stage research, advance technology for commercialization, and solve known challenges 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 lab call, including the potential to meet the proposed targets or other relevant performance targets. The applicant should clearly specify the expected outcomes of the project.<br>• **Feasibility:** The applicant should demonstrate the technical feasibility of the proposed technology on de-risking, scaling, and accelerating deployment of novel technologies and capability of achieving the anticipated performance targets, including a description of previous work done and prior results.<br>• **Innovation and Impacts:** The applicant should describe the current state-of-the-art in the applicable field, the specific innovation of the proposed technology, the advantages of proposed technology over current and emerging technologies, and the overall impact on advancing the state-of-the-art/technical baseline if the project is successful. |

| SECTION / PAGE LIMIT | DESCRIPTION |
|---|---|
| **Workplan and Market Transformation Plan** (Approximately 40% of the Technical Volume) | The Workplan should include a summary of the Project Objectives, Technical Scope, Work Breakdown Structure (WBS), Milestones, Go/No-Go Decision Points, and Project Schedule. A detailed SOPO is separately requested. The Workplan should contain the following information:<br>• **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.<br>• **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. |

| SECTION / PAGE LIMIT | DESCRIPTION |
|---|---|
| | • **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 lab call. The summary provided should be consistent with the SOPO. The SOPO will contain a more detailed description of the WBS and tasks.<br>• **Milestone Summary:** The applicant should provide a summary of appropriate milestones throughout the project to demonstrate success. A milestone may be either a progress measure (which can be activity based) or a SMART technical milestone. SMART milestones should be Specific, Measurable, Achievable, Relevant, and Timely, and must demonstrate a technical achievement rather than simply completing a task. Unless otherwise specified in the lab call, 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.<br>• **Go/No-Go Decision Points:** The applicant should provide a summary of project-wide Go/No-Go decision points at appropriate points in the Workplan. A Go/No-Go decision point is a risk management tool and a project management best practice to ensure that, for the current phase or period of performance, technical success is definitively achieved and potential for success in future phases or periods of performance is evaluated, prior to actually beginning the execution of future phases. At a minimum, each project must have at least one project-wide Go/No-Go decision point for each budget period (12 to 18-month period) of the project. 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. |

| SECTION / PAGE LIMIT | DESCRIPTION |
|---|---|
| | • **End of Project Goal:** The applicant should provide a summary of the end of project goal(s). At a minimum, each project must have one SMART end of project goal. The summary provided should be consistent with the SOPO.<br>• **Project Schedule (Gantt Chart or similar):** The applicant should provide a schedule for the entire project, including task and subtask durations, milestones, and Go/No-Go decision points.<br>• **Project Management:** The applicant should discuss the team's proposed management plan, including the following:<br>  ○ The overall approach to and organization for managing the work<br>  ○ The roles of each project team member<br>  ○ Any critical handoffs/interdependencies among project team members<br>  ○ The technical and management aspects of the management plan, including systems and practices, such as financial and project management practices<br>  ○ The approach to project risk management<br>  ○ A description of how project changes will be handled<br>  ○ If applicable, the approach to Quality Assurance/Control<br>  ○ How communications will be maintained among project team members<br>• **Market Transformation Plan:** The applicant should provide a market transformation plan, including the following:<br>  ○ Identification of target market, competitors, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including a mitigation plan<br>  ○ 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. |
| **Technical Qualifications and Resources**<br>(Approximately 20% of the Technical Volume) | The Technical Qualifications and Resources should contain the following information:<br>• Describe the project team's unique qualifications and expertise, including those of key subrecipients.<br>• Describe the project team's existing equipment and facilities that will facilitate the successful completion of the proposed project; include a justification of any new equipment or facilities requested as part of the project.<br>• This section should also include relevant, previous work efforts, demonstrated innovations, and how these enable the applicant to achieve the project objectives.<br>• Describe the time commitment of the key team members to support the project.<br>• Describe the technical services to be provided by DOE/NNSA FFRDCs, if applicable. |

| SECTION / PAGE LIMIT | DESCRIPTION |
|---|---|
| | • For multi-organizational or multi-investigator projects, describe succinctly:<br>  ○ The roles and the work to be performed by each PI and Key Participant;<br>  ○ Business agreements between the applicant and each PI and Key Participant;<br>  ○ How the various efforts will be integrated and managed;<br>  ○ Process for making decisions on scientific/technical direction;<br>  ○ Publication arrangements;<br>  ○ Intellectual Property issues; and<br>  ○ Communication plans |

Resumes

Applicants are required to submit one-page resumes for key participating team members. Resumes will not be counted against the page limit in the technical volume. Multi-page resumes are not allowed. Save the resumes in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_Resumes".

Letters of Commitment

Submit letters of commitment from at least one domestic industry partner and any other partner or third-party cost share provider. The letter must indicate the willingness of the domestic industry partner to provide any voluntary cost share (one-page maximum per letter). Resumes will not be counted against the page limit in the technical volume. Save the letters of commitment in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_LOCs".

Summary/Abstract for Public Release

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

Summary Slide

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

The Summary Slide template requires the following information:

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

Save the Summary Slide in a single page MS PowerPoint file using the following convention for the title "ControlNumber_LeadOrganization_Slide".

Budget for DOE/NNSA FFRDC contractor (if applicable)

If a DOE/NNSA FFRDC contractor is to perform a portion of the work, the applicant must provide a DOE WP in accordance with the requirements in DOE Order 412.1A, Work Authorization System, Attachment 3, available at https://www.directives.doe.gov/directives-documents/400-series/0412.1-BOrder-a-chg1-AdmChg Save the WP in a single PDF file using the following convention for the title "ControlNumber_LeadOrganization_WP".

SF-LLL: Disclosure of Lobbying Activities

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

Prime recipients and subrecipients are required to complete and submit SF-LLL, "Disclosure of Lobbying Activities" (https://www.grants.gov/web/grants/forms/sf-424-individual-family.html) to ensure that non-federal funds have not been paid and will not be paid to any person for influencing or attempting to influence any of the following in connection with the application:

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

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

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

1. *Foreign Entity Participation:*
   All non-lab partners for this lab call must be incorporated (or otherwise formed) under the laws of a State or territory of the United States. To request a waiver of this requirement for a lab partner, the applicant must submit an explicit waiver request in the Full Application. Appendix B lists the necessary information that must be included in a request to waive this requirement.

2. *Performance of Work in the United States (Foreign Work Waiver)*
   All work funded by FECM must be performed in the United States. This requirement does not apply to the purchase of supplies and equipment, so a waiver is not required for foreign purchases of these items. However, the prime recipient should make every effort to purchase supplies and equipment within the United States. Appendix B lists the necessary information that must be included in a foreign work waiver request.

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

Data Management Plan

Each proposal under this lab call must have a data management plan (DMP). A DMP explains how, when appropriate, data generated in the course of the proposed work will be shared and preserved in order to validate the results of the work or how the results could be validated if the data is not shared or preserved. The DMP must provide a plan for making all research data displayed in publications resulting from the proposed work digitally accessible at the time of publications.

A lab may have a previously DOE approved DMP, such as a lab-wide DMP, and to the extent that the DMP applies to the proposal submitted under this lab call, the lab may rely on that DMP to satisfy the DMP requirement of this lab call. If there is no existing DMP that can apply and the applicant fails to submit a DMP as part of the proposal, then the default DMP for the proposal is the following:

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

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

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

## *Treatment of Application Information*

Proprietary Information

In general, DOE will use data and other information contained in proposals only for evaluation purposes, unless such information is generally available to the public or is already the property of the government.

Proposals should not include trade secrets or commercial or financial information that is privileged or confidential unless such information is necessary to convey an understanding of the proposed project or to comply with a requirement in the lab call.

Proposals containing confidential, proprietary, or privileged information must be conspicuously marked as described below. Failure to comply with these marking requirements may result in the disclosure of the unmarked information under the Freedom of Information Act or otherwise. The U.S. Federal Government is not liable for the disclosure or use of unmarked information and may use or disclose such information for any purpose.

If a proposal contains confidential, proprietary, or privileged information, it must include a cover sheet marked as follows identifying the specific pages containing confidential, proprietary, or privileged information:

*1. Notice of Restriction on Disclosure and Use of Data:*

Pages of this proposal may contain confidential, proprietary, or privileged information that is exempt from public disclosure. Such information shall be used or disclosed only for the purposes described in this lab call. The government may use or disclose any information that is not appropriately marked or otherwise restricted, regardless of source. In addition,

(1) the header and footer of every page that contains confidential, proprietary, or privileged information must be marked as follows: "Contains Confidential, Proprietary, or Privileged Information Exempt from Public Disclosure" and
(2) every line and paragraph containing proprietary, privileged, or trade secret information must be clearly marked with double brackets or highlighting.

## B. Application Review Details

### i. Merit Review and Selection Process

Upon receipt and review for initial compliance with requirements, all proposals received at LabCall-FECM-HQ@hq.doe.gov by the deadline will undergo a thorough technical review. FECM will use expert reviewers familiar with the FECM portfolio, goals, and objectives. FECM will collect and collate review scores and comments for use in making final project selections. The FECM Selection Official will consider the merit review results to make the final project selections. For transparency, FECM will provide summaries of the review results to assist labs in understanding how their submission reviewed and aid in improving future work.

### ii. Technical Review Criteria

#### *Letters of Intent (LOIs)*

FECM has not established separate criteria to evaluate LOIs. LOIs are reviewed to check to ensure that they are responsive. FECM will not provide any response or feedback on the LOI, but will use the LOI to identify reviewers and gauge interest.

#### *Concept Papers*

Concept Papers are evaluated based on consideration of the following factors:
**Criterion Concept Paper Criterion: Overall FOA Responsiveness and Viability of the Project (Weight: 100%)**
This criterion involves consideration of the following factors:

- The applicant clearly describes the proposed technology and how it builds on capabilities needed to establish a domestic supply chain; perform early to mid-stage research; advance technology for commercialization; and solve known challenges with a focus on de-risking, scaling, and accelerating deployment of novel technologies;
- The applicant has identified risks and challenges, including possible mitigation strategies, and has shown the impact that FECM funding and the proposed project would have on the relevant field and application;
- The applicant has the qualifications, experience, capabilities and other resources necessary to complete the proposed project; and
- The proposed work, if successfully accomplished, would clearly meet the objectives as stated in the Lab Call.

#### *Full Applications*

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

**Criterion 1: Technical Merit, Innovation, and Impact (50%)**
This criterion involves consideration of the following factors:

Technical Merit and Innovation

- Extent to which the success of the proposed project relies on the completion of existing government initiatives and/or facilities (i.e. METALLIC, ARPA-E, etc.);
- Extent to which the proposed technology or process is innovative, with respect to the development innovative mining technologies;
- Degree to which the current state of the technology and the proposed advancement are clearly described;
- Extent to which the application builds on existing infrastructure and expertise from the project team;
- Extent to which the application specifically and convincingly demonstrates how the proposed technology will move the state-of-the-art to the proposed advancement; and
- Sufficiency of technical detail in the application to assess whether the proposed work is scientifically meritorious and revolutionary, including relevant data, calculations, and discussion of prior work in the literature with analyses that support the viability of the proposed work.

Impact of Technology on Domestic CM Production

- Extent to which the proposed project will advance domestic production of critical minerals and materials (CMM);
- Extent to which the proposed project supports key needs and/or gaps in current domestic RD&D for CMM; and
- The potential impact of the project on advancing the state-of-the-art.

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

This criterion involves consideration of the following factors:

Research Approach, Workplan and SOPO

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

Identification of Technical Risks

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

Baseline, Metrics, and Deliverables

- The level of clarity in the definition of the baseline, metrics, and milestones; and
- Relative to a clearly defined experimental baseline, the strength of the quantifiable metrics, milestones, and a mid-point deliverables defined in

the application, such that meaningful interim progress will be made.

Market Transformation Plan

- Identification of how successful execution of the research will impact current markets for CMMs and how will the technology be marketed to ensure it has the greatest impact;
- Identification of target market, potential collaborators, and distribution channels for proposed technology along with known or perceived barriers to market penetration, including mitigation plan; and

**Criterion 3: Team and Resources (20%)**

This criterion involves consideration of the following factors:

- The capability of the principal investigator(s) and the proposed team to address all aspects of the proposed work with a high probability of success. The qualifications, relevant expertise, and time commitment of the individuals on the team;
- The sufficiency of the facilities to support the work;
- The degree to which the proposed consortia/team demonstrates the ability to facilitate and expedite further development and commercial deployment of the proposed technology;
- The level of cohesion between the principal investigator(s) and team members, as demonstrated by the Workplan's proposed schedule and structure that ensure effective communication and active participation from all members;
- Degree to which industrial/commercial involvement is highlighted from current producers/experts within the existing CMM supply chain;
- The level of participation by project participants as evidenced by letter(s) of commitment and how well they are integrated into the Workplan; and
- The reasonableness of the budget and spend plan for the proposed project and objectives.

## iii. Selection for Award Negotiation

FECM carefully considers all of the information obtained through the proposal process and makes an independent assessment of each compliant and responsive proposal based on the criteria set forth in this lab call. FECM may select or not select a proposal for negotiations. FECM may also postpone a final selection determination on one or more proposals until a later date, subject to availability of funds and other factors. FECM will notify applicants if they are, or are not, selected for award negotiation.

### iv. Selection Notification

FECM anticipates completing the project selection process and notifying labs of selections during the month of March 2026 **(subject to change)**.

FECM will notify lab leads of selection results from LabCall-FECM-HQ@hq.doe.gov and will provide lab leads with summaries of anonymized review comments for each proposal submitted.

### v. Questions and Agency Contacts

Specific questions about this lab call should be submitted via e-mail to LabCall-FECM-HQ@hq.doe.gov. To ensure fairness across all labs, individual FECM staff cannot answer questions while the lab call remains open.

# Appendix A: Lab Call Full Application Worksheet

## Lab Call Full Application Worksheet

**IMPORTANT:** This document is provided as a courtesy to allow Lab Call applicants to collaborate offline to develop Full Applications for Lab Calls. All information must be submitted to LabCall-FECM-HQ@hq.doe.gov and cannot be submitted with this document.

Please contact LabCall-FECM-HQ@hq.doe.gov with any questions.

Project General Information

Control Number:

Applicant (Name and Email):

Organization Name:

Project Title:

Topic:

Project Start Date:

Project End Date:

Partner Laboratories:

| Partner Laboratory | Email | First Name | Last Name |
|---|---|---|---|
| _ | _ | _ | _ |

Is this a continuation of an existing project?

WBS Number:

Fiscal Year Existing Project:

Project Overview (Multi-year):

Project Objectives (Multi-year):

### Contact Information

Lab Lead Point of Contact and Business Contact Information

Name:

Email:

Title:

Address:

Phone:

Fax:

## Financials

Please add a separate table for each partner laboratory.

Lead Laboratory Name:

| Year | Planned Project Costs |
|---|---|
| **2023** | _ |
| **2024** | _ |
| **2025** | _ |
| **Subtotal** | _ |

Partner Laboratory (If Applicable) Name:

| Year | Planned Project Costs |
|---|---|
| **2023** | _ |
| **2024** | _ |
| **2025** | _ |
| **Subtotal** | _ |

Total Planned Project Costs:

## Performers

Please add a separate table for each partner laboratory.

Lead Laboratory Name:

| Subcontractor Name | Sub Type | Start Date | End Date | 2023 Planned Costs | 2024 Planned Costs | 2025 Planned Costs | Total Funding |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| **Subcontractor Subtotal** | | | | | | | |

Partner Laboratory (If Applicable) Name:

| Subcontractor Name | Sub Type | Start Date | End Date | 2023 Planned Costs | 2024 Planned Costs | 2025 Planned Costs | Total Funding |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| **Subcontractor Subtotal** | | | | | | | |

Total Planned Project Costs:

## Project Plan

Project Tasks:

| Task Number | Title | Description | Team Members | Planned Costs | Start Date | End Date |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Project Milestones:

| Item Number | Type | Title | Description | End Date | Team Members | Criteria |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

## Risks

Project Tasks:

| Risk Name | Description | Response Plan | Severity | Probability | Response | Source | Classification | Team Members | Target Completion Date |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

## Modalities/Technology Readiness Level (TRL)

Modalities:

| Modality Number | Modality | FY23 Weight (%) | FY23 Planned Costs ($) |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |
| **Total:** | | | |

Current TRL of the proposed technology (1-9):

Estimated TRL the technology will reach at project end (2-9):

Project Impacts

**Deliverable/Product or "Output" Description:**

**Audience/Customer:**

**Audience/Customer Use:**

**Communications/Outreach Strategy:**

Does this project involve significant industry engagement?

Description of Engagement:

Associated CRADAs?

| CRADA Text |
| --- |
| |

# Appendix B: Waiver Requests and Approval Processes:
# 1. Foreign Entity Participation as Lab Partners; and
# 2. Performance of Work in the United States (Foreign Work Waiver)

## 1. Waiver for Foreign Entity Participation as Lab Partners

Many of the technology areas DOE funds fall in the category of critical and emerging technologies (CETs). CETs are a subset of advanced technologies that are potentially significant to United States national and economic security.[31] Lab partners (industry and/or organization partners that are **not** DOE/National Nuclear Security Agency (NNSA), Federally Funded Research and Development Centers (FFRDCs) and all National Laboratories) providing cost share as part of a Lab-led team must be organized and chartered or incorporated (or otherwise formed) under the laws of a state or territory of the United States; have majority domestic ownership and control; and have a physical location for business operations in the United States. To request a waiver of this requirement, an applicant must submit an explicit waiver request in the Full Application.

*Waiver Criteria*

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

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

*Content for Waiver Request*

A foreign entity waiver request must include the following:

a. Information about the entity: name, point of contact, and proposed type of involvement in the project;
b. Country of incorporation, the extent of the ownership/level control by foreign entities, whether the entity is state owned or controlled, a summary of the ownership breakdown of the foreign entity, and the percentage of ownership/control by foreign entities, foreign shareholders, foreign state, or foreign individuals;
c. The rationale for proposing a foreign entity participate (must address criteria above);
d. A description of the project's anticipated contributions to the U.S. economy;
    - How the project will benefit the U.S., including manufacturing, contributions to employment in the U.S. and growth in new markets and jobs in the U.S.;
    - How the project will promote manufacturing of products and/or services in the U.S.;
    - A description of how the foreign entity's participation is essential to the project;
e. A description of the likelihood of Intellectual Property (IP) being created from the work and the treatment of any such IP; and
f. Countries where the work will be performed. (Note: If any work is proposed to be conducted outside the U.S., the applicant must also complete a separate request foreign work waiver.).

DOE may also require:

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

DOE may require additional information before considering the waiver request. DOE's decision concerning a waiver request is not appealable.

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

All work funded under this lab call must be performed in the United States. To seek a waiver of the Performance of Work in the United States requirement, the lab partner must submit an explicit waiver request in the Full Application. A separate waiver request must be submitted for each entity proposing performance of work outside of the United States.

Overall, a waiver request must demonstrate to the satisfaction of DOE that it would further the purposes of this lab call and is otherwise in the economic interests of the United States to perform work outside of the United States. A request for a foreign work waiver must include the following:

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

DOE may require additional information before considering the waiver request. DOE's decision concerning a waiver request is not appealable.

# Appendix C: Definition of Technology and Manufacturing Readiness Levels

| Level | Technology Readiness Level (TRL) | Manufacturing Readiness Level (MRL)[19] |
|---|---|---|
| 1 | Basic principles observed and reported | Basic manufacturing implications identified |
| 2 | Technology concept and/or application formulated | Manufacturing concepts identified |
| 3 | Analytical and experimental critical function and/or characteristic proof of concept | Manufacturing proof-of-concept developed |
| 4 | Component and/or breadboard validation in a laboratory environment | Capability to produce the technology in a laboratory environment |
| 5 | Component and/or breadboard validation in a relevant environment | Capability to produce prototype components in a production relevant environment |
| 6 | System/subsystem model or prototype demonstration in a relevant environment | Capability to produce a prototype system or subsystem in a production relevant environment |
| 7 | System prototype demonstration in an operational environment | Capability to produce systems, subsystems, or components in a production representative environment |
| 8 | Actual system completed and qualified through test and demonstrated | Pilot line capability demonstrated; ready to begin low-rate, initial production |
| 9 | Actual system proven through successful mission operations | Low-rate production demonstrated; capability in place to begin full-rate production |
| 10 | — | Full-rate production demonstrated and lean production practices in place |

[19] Manufacturing Readiness Level (MRL) Deskbook, Version 2.0, the OSD Manufacturing Technology Program May 2011.