U.S. Department of Energy

Office of Fossil Energy and Carbon Management (FECM)

Notice of Intent to Issue

Notice of Funding Opportunity No. DE-FOA-0003390 titled "Mine of the Future – Proving Ground Initiative"

This "Notice of Intent No. DE-FOA-0003603" is for informational purposes only. The Department is not seeking comments on the information in this Notice. All information contained in this Notice is subject to change.

Purpose:

The U.S. Department of Energy (DOE), National Energy Technology Laboratory (NETL) intends to issue a Notice of Funding Opportunity (NOFO) on behalf of the FECM. The NOFO is anticipated to be issued in the fourth quarter of calendar year 2025.

The goal of this work is to de-risk the adoption of new mining technologies for commercialization and widespread industry adoption. This will be achieved through:

- **Development of Mine Technology Proving Grounds:** Competitive awards will establish dedicated technology testing sites that support future R&D in mining technology, real-world testing, and optimization. These facilities will enable the development, demonstration, and maturation of advanced mining technologies at a large scale for deployment at domestic mine sites. Proving ground test beds are expected to be constructed during the first two years of the projects and ready for technology testing in subsequent years.
- **Accelerated R&D Projects:** Applicants will propose work for up to two signature mining technologies to be developed and proven at their proposed proving ground facility. These projects will focus on advancing technologies past bench scale, leading to field-scale testing and demonstration.
- **Collaborative Partnerships:** A key to successful execution will be the collaboration between government, industry/private sector, and academia, leveraging diverse expertise, infrastructure, and support for technology development and demonstration. This approach prioritizes government investment in areas where universities and the private sector may not traditionally prioritize.

Background:

The United States imports greater than 80% of its rare earth elements from non-domestic supplies. For example, domestic industrial and defense sectors are entirely reliant on China for more than 25% of our critical materials.[1] Recent accounting of critical mineral flows[2] indicates that the U.S. continues to lose market share to other countries.

President Donald Trump, recognizing the need to secure America's critical material supply chain, included "critical minerals" in the definition of Executive Order (EO) 14156, *Declaring a National Energy Emergency*[3], which highlighted the role critical materials play in all parts of the U.S. energy system, including hydrocarbon energy production, refining, and other industrial uses.[4] President Trump also released EO 14241, *Immediate Measures to Increase American Mineral Production*, which highlights the need to immediately increase domestic mineral production.[5]

Therefore, pursuant to sections 7001(a) and 7002(g) of the Energy Act of 2020,[6] section 41003(c) of the Infrastructure Investment and Jobs Act (IIJA),[7] and the aforementioned EOs, this Notice of Intent (NOI) announces the intent of DOE's Office of Fossil Energy and Carbon Management to issue a funding opportunity to establish *Mine of the Future – Proving Ground Initiative* and accelerate the development of innovative technologies for the U.S. mining sector. This initiative aims to re-establish U.S. leadership in mining by fostering technology development through real-world testing, optimization, and deployment of next-generation mining technologies, addressing a critical need for secure and resilient domestic critical minerals and materials (CMM) supply chains.

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[1] Critical material as defined in 30 U.S.C. § 1606(a)(2), meaning (A) any non-fuel mineral, element, substance, or material that the Secretary of Energy determines- (i) has a high risk of a supply chain disruption; and (ii) serves an essential function in 1 or more energy technologies, including technologies that produce, transmit, store, and conserve energy; or (B) a critical mineral. *See also* What Are Critical Materials and Critical Minerals? | Department of Energy.

[2] U.S. Geological Survey, 2025, Mineral commodity summaries 2025 (ver. 1.2, March 2025): U.S. Geological Survey, 212 p., https://doi.org/10.3133/mcs2025

[3] https://www.federalregister.gov/documents/2025/01/29/2025-02003/declaring-a-national-energy-emergency

[4] 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.

[5] 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.

[6] Energy Act of 2020, Pub. L. 116-260, div. Z, title VII, §§ 7001(a) and 7002(g), Dec. 27, 2020, as amended, https://www.govinfo.gov/content/pkg/PLAW-116publ260/pdf/PLAW-116publ260.pdf.

[7] Infrastructure Investment and Jobs Act, Pub. L. 117-58, div. D, title X, § 41003(b)-(c), Nov. 15, 2021, https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf.

This competitive funding opportunity, designated DE-FOA-0003390, will support competitive awards for infrastructure development and technologies that transform mining practices. The proving grounds will facilitate the maturation of advanced mining technologies from bench-scale (TRL 3)[8] to field-scale (TRL 6) and beyond, overcoming the "valley of death" where promising technologies often stall due to a lack of suitable testing environments. These sites will also serve as vital training grounds for a new generation of skilled American miners.

The purpose of this NOI is to provide potential applicants with information that may be useful in determining whether to apply to this NOFO, if it is issued.

Planned NOFO Technical Objectives and Scope

Projects will focus on developing a proving ground site capable of developing, testing, and demonstrating various mining technologies to produce critical minerals and developing an initial innovative mining technology that can undergo testing and demonstration at the proving ground to recover critical minerals (CM) from domestic ores. Initial technologies will be proposed at each proving ground, with each award having a requirement of at least 1 and a limit of no more than 2 projects at each proving ground. The overarching goal is to enhance efficiencies, reduce environmental impact, minimize waste, and improve recovery. Efforts will integrate automation, selective recovery, and modular mobile infrastructure to enable sustainable mining operations.

Potential areas of research for initial mining technology R&D projects include, but are not limited to:

- Physical, chemical, and electrochemical technologies to improve comminution efficiency and reduce grinding energy consumption.
- Physical and mechanical techniques to improve rock fracturing, pore connection, and permeability for enhanced in-situ extraction of critical minerals.
- Technologies to reduce manual mining tasks through drone use, robotics, hardware, sensors, and computational tools/software for automation in ore digging, hauling, extraction, and processing.
- Electrification of mining equipment to reduce energy consumption and pollution.
- Advanced drilling technologies with real-time sensing capabilities.
- Innovative technologies for real-time tracking and monitoring of mineralogy in feedstock/ore streams (solid, liquid, or slurry) and material streams at the mine or processing plant.
- In-situ leaching methods for mineral extraction that minimize surface disruption and waste.
- Artificial intelligence and machine learning algorithms to optimize equipment efficiency, resource extraction, and processing; autonomous vehicles and

[8] https://www.directives.doe.gov/directives-documents/400-series/0413.3-EGuide-04a-admchg1/@@images/file

machinery; and Internet of Things (IoT) applications for remote operations and monitoring.
- Advanced sensing methods or tools for detecting underground ore mineralization and low-grade mineral zones in tailings or refuse, including techniques for improved subsurface characterization of ore deposits for precision extraction and exploratory drilling.
- Data collection and utilization of big data, neural networks, machine learning, and artificial intelligence for subsurface and deep ground resource mapping and mineral exploration, including resource assessment and analysis of geophysical/geochemical/geological data.

Key Objectives:
- Assess mining technologies for efficiency, cost, and recovery.
- Develop methods to process low-grade ores, minimize waste rock, and reduce water use.
- Implement selective recovery and physical concentration techniques for economic ore and tailings.
- Create modular, reconfigurable units for flexible deployment and reduced site disturbance.
- Provide training grounds for new mining technics/technologies.

Technical Requirements:
Applicants will be required to provide:
- Detailed descriptions of feedstocks, processing circuits, and methods to improve ore production costs and waste reduction.
- Identification of target materials expected products (composition, purity), and integration into supply chains with examples of domestic consumers.
- Designs, flowsheets, and plans for a scalable field test facility capable of handling large quantities of materials at a pilot scale.
- A comprehensive research proposal, timeline, and preliminary techno-economic analysis (TEA). Justification of economic and technological advantages over conventional methods.
- Evaluation of expected waste (volume, toxicity, radioactivity, reusability, disposal).
- Letters of support for proposed materials/equipment or explanations for their absence.
- Photographs and descriptions of existing mining circuits and facilities with scale references.

Target Technology Readiness Levels (TRL):
Research should begin at TRL 3 and aim to achieve TRL 6 as work continues at the proving ground.

Broader Impact and Administration Priorities:

This initiative supports the Administration's priorities of Unleashing American Energy, Declaring a National Energy Emergency, and Securing America's Critical Supply Chains. The development of these proving grounds and advanced R&D projects will:

- **Accelerate Exploration-to-Production:** Reduce the timeline from mineral discovery to operational production.
- **Achieve "Mine of the Future" Vision:** Promote low to zero emission mining technologies, small-footprint mining, and increased recovery from mineral deposits.
- **Advance Tailings Management:** Develop a low-impact national strategy for tailings management, re-use, and extraction.
- **Ensure a Trained Workforce:** Provide hands-on training opportunities, fostering a pipeline of skilled workers and supporting government-industry-university partnerships.
- **Improve Sector Image:** Demonstrate clean technologies and positive public engagement.
- **Support Regulatory Agencies:** Facilitate regulatory adoption of innovation and tested new approaches.
- **Benefit Stakeholders:** Provide real-world sites for technology development, maturation, and deployment, benefiting the critical mineral supply chain sector through improved environmental practices, cost-effective technologies, and a highly skilled workforce.

This federal investment represents the first significant commitment in this area since the closure of the Bureau of Mines nearly 30 years ago, highlighting this funding opportunity's importance to U.S. leadership in the mining sector.

This NOI describes a preliminary plan that will evolve during the NOFO development process. The Office of Fossil Energy and Carbon Management, in addition to other offices within DOE, coordinates critical minerals and materials funding opportunities via the Critical Materials Collaborative (CMC), a DOE coordinating entity authorized by language in the Energy Act of 2020.[9]

[9] *See* Energy Act of 2020, Pub. L. 116-260, div. Z, title VII, § 7002(g)(8), Dec. 27, 2020, as amended, https://www.govinfo.gov/content/pkg/PLAW-116publ260/pdf/PLAW-116publ260.pdf.

Anticipated Awards and Funding Requirements

NOFO Topic Area	Mine of the Future – Proving Ground Initiative Field scale proving ground facility – design, construction, and operation at a domestic mine. The Recipient will complete maximum of 2 R&D projects in that will be tested at the developed proving ground beginning at TRL 3 and ending at TRL 6.	Total Government Funding: $80M Awards: Maximum 4 awards at maximum $20M each Cost share 20-50%

Submission and Registration Requirements

If the NOFO is released, it will be available in NETL eXCHANGE

There are several required one-time actions applicants must take before applying to a NOFO. Some of these actions may take several weeks, so it is vital applicants build in enough time to complete them. Failure to complete these actions could interfere with application or negotiation deadlines or the ability to receive an award if selected. If you are already registered, please make sure your registration is active and up to date. All registrations are free.

SAM.gov Registration

You must have an active account with SAM.gov, the System for Award Management (SAM). This includes having a Unique Entity Identifier (UEI).

- **What is it?** SAM is a federal procurement database. All entities that want to do business with the federal government MUST be registered in SAM.
- Existing SAM registrations must be updated annually.
- **Duration to complete:** can take several weeks.
- **Registration Link:** https://sam.gov/content/home
    - **NOTE:** Subrecipients are not required to obtain an active SAM registration but must obtain a Unique Entity Identifier.
- **HELP:** https://sam.gov/content/help Applicants must allow several weeks for the SAM process to complete. All registrations rely on completion of the SAM registration. (START Early)

Unique Entity Identifier (UEI)

- **What is it?** UEI is a non-proprietary identifier that has replaced the Federal Government use of Data Universal Numbering System (DUNS) number effective April 4, 2022.
- Applicants must obtain an UEI from the SAM to uniquely identify the entity. The UEI is available in the SAM entity registration record.
    - **Note:** Subawardees/subrecipients at all tiers must also obtain an UEI from the SAM and provide the UEI to the recipient before the subaward can be issued.
- **Duration to complete:** can take several weeks.
- **Registration Link:** https://sam.gov/content/entity-registration
- **HELP:** https://www.fsd.gov/gsafsd_sp

Grants.gov Registration

You must have an active Grants.gov registration in order to receive automatic updates when modifications to this NOFO are posted and to submit an application. Doing so requires a Login.gov registration as well.

- **What is it?** Website used to enable federal grant-making agencies to notify potential applicants of funding opportunities and to submit an application in response to a funding opportunity. Please note that letters of intent and concept papers will not be accepted through Grants.gov.
- Step-by step instructions for applicants at How to Apply for Grants website https://www.grants.gov/applicants/grant-applications/how-to-apply-for-grants
- **Duration to complete:** can take several days.
- **Registration Link:** https://grants.gov/applicants/applicant-registration
- **HELP:** https://apply07.grants.gov/help/html/help/index.htm#t=GetStarted%2FGetStarted.htm

Disclaimer

This NOI is issued so that interested parties are aware that DOE may issue a NOFO as described herein, may issue a NOFO that is significantly different than what is described herein, or may not issue a NOFO at all. Any information contained within this NOI is subject to change

No concept papers, letters of intent, or full applications are being requested nor accepted in response to this NOI. The Department is not seeking comments on the information in this notice and will not respond to questions concerning this Notice. Upon release of a NOFO, an avenue for potential applicants to submit questions will be provided.