U.S. DEPARTMENT OF ENERGY | Office of ENERGY EFFICIENCY & RENEWABLE ENERGY

Energy Critical Materials Assessment
DE-FOA-0003568

DATE: June 25, 2025
SUBJECT: Request for Information (RFI)

Description

This is a Request for Information (RFI) issued by the U.S. Department of Energy (DOE). The RFI seeks public input to inform the next Energy Critical Materials Assessment. Specifically, this RFI seeks input on:

- Energy technologies of interest
- Materials of interest
- Supply chain information
- Market dynamics
- Challenges to domestic industry
- Methodology
- DOE critical materials and U.S. Department of the Interior (DOI) critical minerals lists
- Other stakeholder issues related to the Energy Critical Materials Assessment

Background

On January 20, 2025, the President issued Executive Order 14154 *Unleashing American Energy*[1], which in part sets a policy to establish the United States as a leading producer and processor of non-fuel minerals, including rare earth minerals, and directs the Secretary of Energy to ensure critical mineral projects, including the processing of critical minerals, receive consideration for Federal support, contingent on the availability of appropriated funds[2]. To inform implementation of DOE critical minerals projects through the Department's Critical Minerals and Materials Program, DOE conducts an Energy Critical Materials Assessment to establish which materials are critical for energy.

In 2010, DOE established a methodology to assess material criticality based on the potential for supply risk and importance to energy technologies, resulting in DOE's 2010 Critical Materials Strategy[3]. The assessment methodology includes consideration of high and low future technology deployment scenarios, primarily from the International Energy Agency's World

[1] https://www.federalregister.gov/documents/2025/01/29/2025-01956/unleashing-american-energy
[2] There have been additional relevant Executive Orders, including: EO14220 (Addressing the Threat to National Security from Imports of Copper), EO14241 (Immediate Measures to Increase American Mineral Production), EO14261 (Reinvigorating America's Beautiful Clean Coal Industry and Amending Executive Order 14241), EO14272 (Ensuring National Security and Economic Resilience Through Section 232 Actions on Processed Critical Minerals and Derivative Products), and EO14285 (Unleashing America's Offshore Critical Minerals and Resources)
[3] https://www.energy.gov/sites/prod/files/2019/06/f63/2010%20Critical%20Materials%20Strategy%20Report.pdf

Energy Outlook. The methodology also incorporates material intensity of energy technologies (i.e., quantity of material per component, product, or system), both those currently widely deployed and innovative technologies that may reduce material requirements. Other factors in the methodology include substitutability; competing technology demand; political, regulatory, and social factors; codependence on other markets; and producer diversity.

2023 DOE Critical Materials Assessment

In 2023, DOE used its methodology to assess material criticality for energy over the short and medium terms based on national and global priorities, technology advancement, and technology adoption trends. DOE evaluated the criticality of materials based on their importance to the energy sector and supply risk. The analysis identified seven materials, namely dysprosium, neodymium, gallium, graphite, cobalt, terbium, and iridium, as critical in the short term (2020-2025). These materials are used in various applications such as magnets, batteries, LEDs, hydrogen electrolyzers, fuel cells, and power electronics. Additionally, lithium, uranium[4], electrical steel, nickel, magnesium, silicon carbide, fluorine, praseodymium, and platinum are classified as near critical in the short term. Over the medium term (2025–2035), the importance and supply risk scores for certain materials shift. Specifically, nickel, platinum, magnesium, silicon carbide, and praseodymium become critical, primarily due to their roles in batteries, magnets, power electronics, electrolyzers, and vehicle lightweighting. Aluminum, copper, and silicon become near critical in the medium term due to increased demand in solar energy technologies, global electrification, and vehicle lightweighting. More details on the assessment can be found in the 2023 DOE Critical Materials Assessment.

[4] Section 7002(a) of the Energy Act of 2020 restricts the listing of critical materials to "any non-fuel mineral, element, substance, or material." Based on the plain meaning of fuel, uranium used in commercial nuclear reactors is a fuel material. As the 2023 DOE Critical Materials Assessment includes only use of uranium as a fuel, DOE did not designate uranium as a critical material in the Final 2023 Critical Materials List.

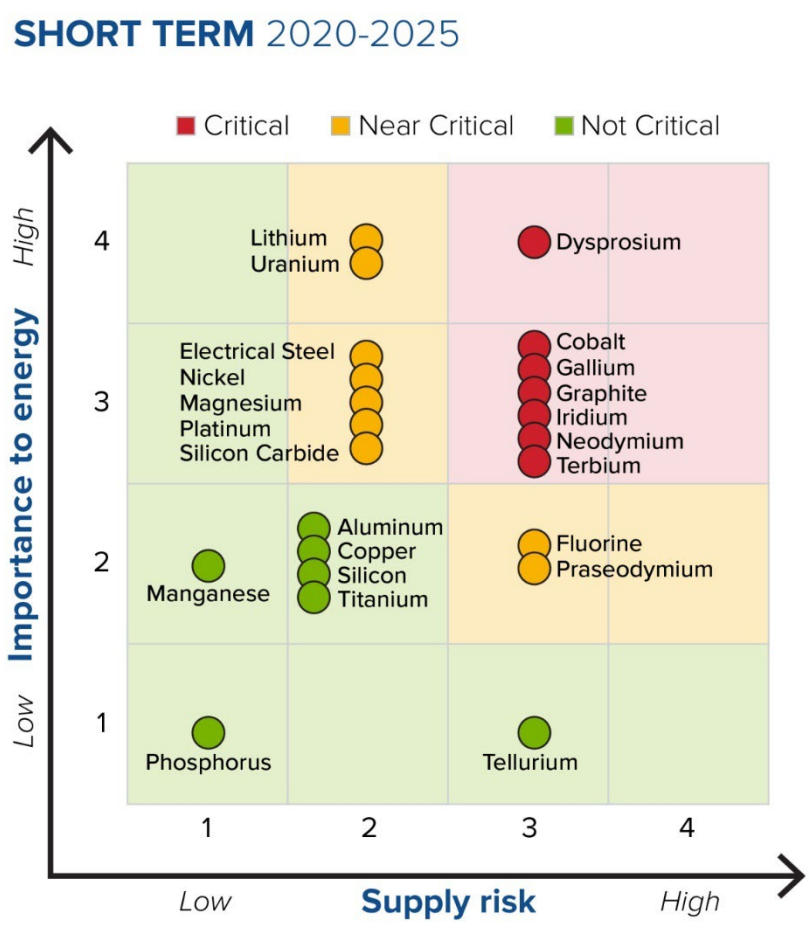

Figure 1: Short-term (2020 – 2025) criticality matrix

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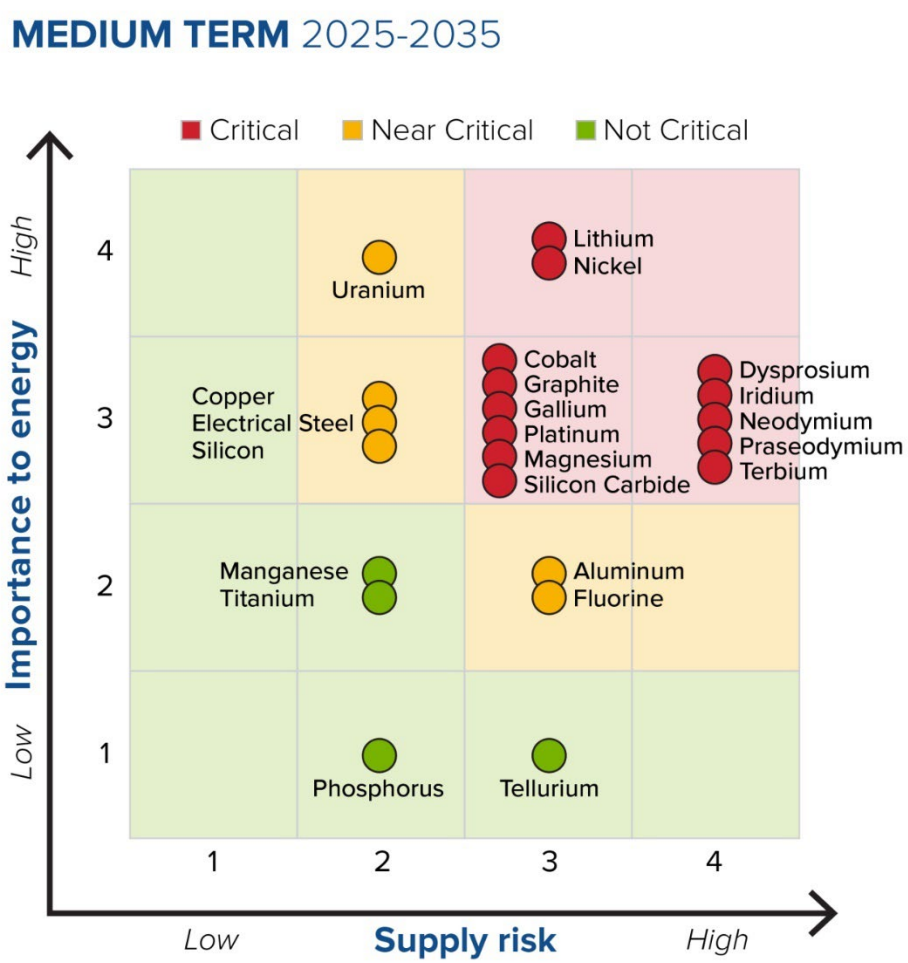

Figure 2: Medium term (2025 – 2035) criticality matrix

The dynamic nature of criticality necessitates ongoing updates to the assessment. For example, in 2010 and 2011, cadmium telluride (CdTe) and copper indium gallium selenide (CIGS) held a significant share of the global solar photovoltaic (PV) market, and market trends were unclear. This led indium and tellurium to be assessed as near critical by DOE in the short term in 2011. However, by 2023, crystalline silicon absolutely dominated the PV market and neither indium nor tellurium were assessed as critical. DOE anticipates updating the assessment every three years to reflect the most current data.

Energy Critical Materials List
Section 7002(a)(2) of the Energy Act of 2020 (codified at 30 U.S.C. § 1606(a)(2))

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authorizes the Secretary of Energy[5] to determine critical materials according to the following statutory definition[6] of a "critical material":

- Any non-fuel mineral, element, substance, or material that the Secretary of Energy determines:
  - (i) has a high risk of a supply chain disruption; and
  - (ii) serves an essential function in one or more energy technologies, including technologies that produce, transmit, store, and conserve energy; or
- A critical mineral [as designated by the Secretary of the Interior[7]].

In 2023, pursuant to the authority under Section 7002(a) of the Energy Act of 2020, the Secretary of Energy, acting through the Undersecretary for Science and Innovation, determined the Final 2023 Critical Materials List[8]. This list is based on the 2023 DOE Critical Materials Assessment, described above[9]. The Final 2023 DOE Critical Materials List includes the following:

- **Critical materials for energy:** aluminum, cobalt, copper*, dysprosium, electrical steel* (grain-oriented electrical steel, non-grain-oriented electrical steel, and amorphous steel), fluorine, gallium, iridium, lithium, magnesium, natural graphite, neodymium, nickel, platinum, praseodymium, terbium, silicon*, and silicon carbide*.
- **Critical minerals:** The Secretary of the Interior, acting through the Director of the U.S. Geological Survey (USGS), published a 2022 final list of critical minerals that includes the following 50 minerals: "Aluminum, antimony, arsenic, barite, beryllium, bismuth, cerium, cesium, chromium, cobalt, dysprosium, erbium, europium, fluorspar, gadolinium, gallium, germanium, graphite, hafnium, holmium, indium, iridium, lanthanum, lithium, lutetium, magnesium, manganese, neodymium, nickel, niobium, palladium, platinum, praseodymium, rhodium, rubidium, ruthenium, samarium, scandium, tantalum, tellurium, terbium, thulium, tin, titanium, tungsten, vanadium, ytterbium, yttrium, zinc, and zirconium."

* Indicates materials not designated as critical minerals by the Secretary of the Interior.

[5] Note that the Department of Energy has initiated a short-term supplemental analysis for metallurgical coal for steel production in response to Executive Order 14261 (Reinvigorating America's Beautiful Clean Coal Industry and Amending Executive Order 14241) to support a criticality determination for metallurgical in 2025.
[6] Consolidated Appropriations Act, 2021, Public Law 116-260 (Dec. 27, 2020), Div. Z, Title VII, section 7002(a)(2) [hereinafter Energy Act of 2020].
[7] https://www.federalregister.gov/documents/2022/02/24/2022-04027/2022-final-list-of-critical-minerals
[8] https://www.federalregister.gov/documents/2023/08/04/2023-16611/notice-of-final-determination-on-2023-doe-critical-materials-list
[9] https://www.energy.gov/sites/default/files/2023-07/doe-critical-material-assessment_07312023.pdf

Proposed 2026 Energy Critical Materials Assessment Scope

DOE is in the process of developing its 2026 Energy Critical Materials Assessment. The 2026 Assessment will consider energy technologies essential to global energy deployment scenarios in four broad groups, including (1) production and generation, (2) transmission, (3) storage, and (4) end-use. Because the U.S. relies on a global supply chain driven by various demand sectors, it is important to consider global trends and market dynamics that could impact material availability and the manufacturing sector for the United States. Within production and generation technologies, the assessment will consider nuclear, natural gas, oil, and coal with related conversion technologies, biofuel, geothermal, hydropower, wind, and solar technologies. Within transmission technologies, the assessment will consider advanced conductors, transformers, and power electronics as part of the grid. Within energy storage, the assessment will consider both chemical and electrochemical energy storage technologies. As far as end-use technologies that contribute to energy conservation, the assessment will consider vehicles and technologies that are used in buildings, industry (including steelmaking), computing (including quantum and artificial intelligence), and data centers, such as lighting, microelectronics, semiconductors, and relevant consumer electronics.

The assessment will consider the evaluation of engineered materials where manufacturing of specific engineered materials causes potential supply chain risks in downstream manufacturing of the intended applications. Given the broad formulation and use of engineered materials, priority is given to those used in technologies with high market share.

The assessment will also consider the evaluation of "indirect raw materials," materials used in the manufacturing process but that do not contribute to the composition of the components or final products. For example, helium is used in the cooling, cleaning, and etching processes of semiconductor manufacturing with no viable alternatives. While the focus of the assessment will remain on materials that are physically contained in final products, a limited set of materials like helium may be evaluated in the assessment.

The final set of materials and energy technologies will be determined by the application of the screening metrics, described in the 2023 DOE Critical Materials Assessment[10].

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

DOE Energy Critical Materials and DOI Critical Minerals

The table below differentiates between DOE's energy critical materials and DOI's critical minerals.

	Department of Energy Energy Critical Materials	Department of the Interior Critical Minerals
Authorized by:	Energy Act of 2020: section 7002	Energy Act of 2020: section 7002
Definition:	any non-fuel mineral, element, substance, or material the Secretary of Energy determines: (i) has a high risk of supply chain disruption; and (ii) serves an essential function in one or more energy technologies, including technologies that produce, transmit, store, and conserve energy; or a Critical Mineral as defined by the Secretary of the Interior (see right column)	any mineral, element, substance, or material the Secretary of the Interior determines (i) are essential to economic or national security of the United States; (ii) the supply chain of which is vulnerable to disruption; and (iii) serve an essential function in the manufacturing of a product, the absence of which would have significant consequences for economic or national security of the United States
Scope:	Two key dimensions: 1. Importance to energy 2. Supply risk	Three key dimensions: 1. Potential of a supply disruption (foreign or as a single point of failure), 2. Dependency of the U.S. manufacturing sector on foreign supplies, 3. Vulnerability of the U.S. manufacturing sector to a supply disruption
Timeframe:	Assesses multiple demand scenarios in the Short (5 years) and Medium term (15 years).	Uses historical / retrospective data.
Regionality:	Global supply chains	Domestic supply chains
Most recent List:	2023: 18 critical materials for energy + DOI list	2022: 50 critical minerals

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RFI Purpose

The purpose of this RFI is to solicit feedback from industry, academia, research laboratories, government agencies, Tribes, and other stakeholders on issues related to critical materials assessment. EERE is specifically interested in information on energy technologies of interest, materials of interest, supply chain information, market dynamics, challenges to domestic industry, methodology, DOE critical materials and DOI critical minerals lists, and other stakeholder issues related to the Energy Critical Materials Assessment. This is solely a request for information and not a Notice of Funding Opportunity (NOFO). EERE is not accepting applications.

Disclaimer and Important Notes

This RFI is not a Notice of Funding Opportunity (NOFO); therefore, EERE is not accepting applications at this time. EERE may issue a NOFO in the future based on or related to the content and responses to this RFI; however, EERE may also elect not to issue a NOFO. There is no guarantee that a NOFO will be issued as a result of this RFI. Responding to this RFI does not provide any advantage or disadvantage to potential applicants if EERE chooses to issue a NOFO regarding the subject matter. Final details, including the anticipated award size, quantity, and timing of EERE funded awards, will be subject to Congressional appropriations and direction.

Any information obtained as a result of this RFI is intended to be used by the Government on a non-attribution basis for planning and strategy development; this RFI does not constitute a formal solicitation for proposals or abstracts. Your response to this notice will be treated as information only. EERE will review and consider all responses in its formulation of program strategies for the identified materials of interest that are the subject of this request. EERE will not provide reimbursement for costs incurred in responding to this RFI. Respondents are advised that EERE is under no obligation to acknowledge receipt of the information received or provide feedback to respondents with respect to any information submitted under this RFI. Responses to this RFI do not bind EERE to any further actions related to this topic.

Confidential Business Information

Pursuant to 10 CFR 1004.11, any person submitting information that he or she believes to be confidential and exempt by law from public disclosure should submit via email, postal mail, or hand delivery two well-marked copies: one copy of the document marked “confidential” including all the information believed to be confidential, and one copy of the document marked “non-confidential” with the information believed to be confidential deleted. Submit these documents via email, if feasible. DOE will make its own determination about the confidential status of the information and treat it according to its determination.

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Evaluation and Administration by Federal and Non-Federal Personnel

Federal employees are subject to the non-disclosure requirements of a criminal statute, the Trade Secrets Act, 18 USC 1905. The Government may seek the advice of qualified non-Federal personnel. The Government may also use non-Federal personnel to conduct routine, nondiscretionary administrative activities. The respondents, by submitting their response, consent to EERE providing their response to non-Federal parties. Non-Federal parties given access to responses must be subject to an appropriate obligation of confidentiality prior to being given the access. Submissions may be reviewed by support contractors and private consultants.

Request for Information Categories and Questions

Responses are not required for all categories or questions; please answer those for which relevant information can be provided. If applicable, please duplicate and /or supplement information that you have already provided to the Department of Commerce under its 232 Investigation on Imports of Processed Critical Minerals and Derivative Products.[11]

Category 1: Energy technologies of interest

1.1 What energy technologies should be considered as in-scope for the 2026 Energy Critical Materials Assessment?

- What specific energy production and generation technologies should be considered? For example, what specific nuclear technologies should be included? What specific technologies should not be considered?
- What specific energy transmission technologies should be considered? For example, what specific grid technologies should be included? What specific technologies should not be considered?
- What specific energy storage technologies should be considered? For example, what specific battery or hydrogen technologies should be included? What specific technologies should not be considered?

1.2 What specific end use technologies should be considered? For example, what specific transportation technologies should be included? What specific technologies should not be considered?

[11] https://www.bis.gov/press-release/commerce-launches-section-232-investigation-imports-processed-critical-minerals-derivative-products

1.3 What additional energy technologies should be considered in the 2026 assessment that were not included in the 2023 assessment? For example, market growth, technological breakthroughs, or increased importance may warrant inclusion of additional energy technologies.

1.4 What substitutes or alternatives exist for the identified technologies at the component, technology, or system levels?

1.5 What data sources should be used for estimating deployment trajectories for these technologies?

Category 2: Materials of interest

2.1 Given the technologies suggested in the previous section, what materials should be evaluated in the 2026 Energy Critical Materials Assessment? DOE is particularly interested in:

- How are these materials used in specific energy technologies? In what forms or at what purity level?
- What is the material intensity of each material for the specified components or systems, or the total material quantity needed to produce the component or final good?
- What are the material processing recovery rates or manufacturing losses at different processing stages?
- Can the manufacturing process utilize recycled materials?
- What emerging technologies and innovations do you anticipate will increase or decrease the material intensity for the components and by how much?

2.2 For engineered materials, how are these materials manufactured? What are the main supply chain risks or bottlenecks associated with the material?

2.3 For indirect raw materials, how are these materials used in the manufacturing processes and equipment of specified components? How can these indirect raw materials cause supply chain risks or bottlenecks to their specified components?

2.4 Are there existing or potential direct material substitutes for any of the specified materials listed in 2.1 through 2.3 in their specific end-use applications? Are there existing or potential substitutes at the component or system levels that could reduce the reliance on a specific material? What are they? What is the technology readiness level associated with these potential substitutes?

2.5 How easy or difficult is it to substitute these materials, components, or systems with the options specified in the previous question? What are the tradeoffs in cost and performance at each level? If costs are not readily available, do the substitutes require

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changes in existing equipment, labor setup, or final system (product) configurations? If these substitute materials, components, and systems are not currently in use or readily available, why not?

2.6 What end-uses other than energy technologies also use these materials? Is the use of the specified materials in these end-uses expected to pose competition for their use in energy technologies?

Category 3: Supply chain information by material

3.1 Who are the major global players at each supply chain stage, including extraction, refining, and recycling? Please provide any information on production level and or capacity.

3.2 What are the main barriers to production in the United States and globally?

3.3 Is supply a concern for the next 5 to 15 years? If so, why? If not, why not?

3.4 How could global trade policies impact the material supply chain in the short and long term?

3.5 DOE seeks comment/information on U. S. capabilities to produce the specified materials at the various production stages (extraction, smelting, refining, and down-stream processing).

3.6 Please identify any current extraction, smelting, or refining operations that are currently under construction (in the United States or abroad) for the specified materials. What is the current level of end-of-life recycling for materials of interest? How much potential is there for additional recycling?

3.7 Please identify any current extraction, smelting, or refining operations that are currently under construction (in the United States or abroad) for the specified materials. Can the material also be sourced from unconventional sources, such as legacy mine tailings or brines? If so, at what production level?

3.8 What new processes have been demonstrated but not yet scaled to the commercial market at the extraction, smelting, and refining stages? How do these processes compare to the current market standard?

Category 4: Market dynamics by material

4.1 How responsive are supply and demand to price signals?

4.2 Other than price, what factors drive increases or reductions in supply or demand for the material (e.g., changes in technology, policy, consumer preferences, or other factors)?

4.3 For operations that produce (or could potentially produce) co-products, in general, how flexible are mining, smelting, separation, or refining stages in responding to market

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conditions? Can output of each material be adjusted based on market conditions? Are there any notable exceptions or examples?

4.4 For projects that produce co-products, what materials drive the economics of the process? Under what circumstances could minor material or by-product drive production decisions?

4.5 To what extent is surplus material produced and in what form is it stored?

Category 5: Challenges to domestic industry

5.1 What are the largest risks facing businesses related to critical materials?

5.2 Please describe the regulatory and business environment and the largest hurdles (if any) to doing business in the critical materials space. Are there regional differences that impact the ability to do business?

5.3 Please describe any other challenges, including technical barriers and workforce.

Category 6: Methodology

As stated above, an important underlying analysis for the CMA methodology is the development of future scenarios that include technology global deployment trajectories and technology material intensity. The technology deployment trajectories are drawn primarily from scenarios developed by the International Energy Agency. The high and low material intensity values are derived from DOE and industry experts. Taking the scenarios into account, energy material criticality is determined by a material's importance to energy and supply risk, which are each measured by a weighted set of factors described in Chapter 5 of DOE's 2023 Critical Materials Assessment[12]. Importance to energy is measured by energy demand (70%) and substitutability limitations (30%). Supply risk is measured by basic availability (40%); competing technology demand (10%); political, regulatory, and social factors (20%); co-dependence on other markets (10%); and producer diversity (20%).

6.1 What additional reputable data sources should be leveraged in the analysis?

6.2 Should more than four demand scenarios be developed per material? If so, what is the recommended configuration of scenarios?

6.3 How could the analysis of substitutability be improved?

6.4 How could processing and refining be better included in the analysis?

6.5 Should recycling be more explicitly improved in the analysis? If so, how?

6.6 Should multiple supply scenarios also be incorporated? If so, how?

6.7 Please provide any other specific suggestions related to the core methodology.

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

Category 7: DOE critical materials and DOI critical minerals lists

7.1 Please provide any recommendations on how best to streamline the critical materials and minerals lists offered by DOE and DOI.

7.2 Please offer any recommendations on how to effectively communicate on the scope and intent of each list.

Category 8: Other

8.1 Please provide feedback on any other aspect of the Energy Critical Materials Assessment.

Request for Information Response Guidelines

Responses to this RFI must be submitted electronically to *EnergyCriticalMaterialsRFI@ee.doe.gov* no later than 5:00pm (ET) on **July 25, 2025**. Responses must be provided as attachments to an email. It is recommended that attachments with file sizes exceeding 25MB be compressed (i.e., zipped) to ensure message delivery. Responses must be provided as a Microsoft Word (.docx) or Portable Document Format (.pdf) attachment to the email, and no more than 10 pages in length, 12 point font, 1 inch margins. Only electronic responses will be accepted.

Please identify your answers by responding to a specific question or topic if applicable. Respondents may answer as many or as few questions as they wish.

EERE will not respond to individual submissions or publish publicly a compendium of responses. A response to this RFI will not be viewed as a binding commitment to develop or pursue the project or ideas discussed.

Respondents are requested to provide the following information at the start of their response to this RFI:

- Company / institution name;
- Company / institution contact;
- Contact's address, phone number, and e-mail address.

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