Christopher Phalen

Vice President,
Domestic Policy

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Mr. Lou Hrkman
Principal Deputy Assistant Secretary
Office of Energy Efficiency and Renewable Energy
U.S. Department of Energy
1000 Independence Ave. SW
Washington, DC 20024

Re: Notice of Request for Information on 2026 Energy Critical Materials Assessment, DE-FOA-0003568

Dear Principal Deputy Assistant Secretary Hrkman,

The National Association of Manufacturers is the largest manufacturing association in the United States, representing manufacturers of all sizes, in every industrial sector and in all 50 states. Manufacturing employs nearly 13 million people, contributes $2.90 trillion annually to the U.S. economy and accounts for nearly 53% of all private-sector research.

The NAM believes it is vital for global economic leadership and for U.S. energy security to safeguard stable and diversified supply chains of critical materials and minerals. Manufacturers in America utilize critical materials and minerals extensively, deploying them in a wide array of manufactured products throughout the U.S. economy—in aircraft and defense systems, automotive parts and vehicles, electric grid components and other energy technologies, robotics and industrial automation, personal electronics and much more.

In addition to highlighting materials that should remain on or be added to the 2026 Energy Critical Materials Assessment, the NAM also urges the Department of Energy to work across agencies and with Congress to remove barriers and streamline permitting processes to ensure greater domestic access to these materials—as well as work with the Department of the Interior to align the DOE's critical materials list with the DOI's critical minerals list.

Addressing access to critical materials must be a top priority for the DOE if the United States is going to increase manufacturing productivity, lower energy costs, spur greater domestic refining, drive new product development and strengthen our global competitiveness.

I. Maintaining Critical Materials Designations

Manufacturers rely on a sustainable and reliable supply chain of the critical materials that are currently listed within the DOE's Energy Critical Materials Assessment. The examples listed in this section are materials that are essential to energy technologies, national security and the manufacture of key products.

Aluminum will play a vital role for the U.S. to meet its surging demand to generate and transmit energy—driven in part by data center growth and increased electrification. Aluminum is a key input in energy storage technologies, transmission, transformers and commercial and residential wiring, all of which will be critical to the DOE's strategy to power American energy dominance.

Aluminum alloys are used in components of gas turbines because of their high thermal conductivity and corrosion resistance. They are widely used in radiators, heat sinks, heat exchangers, and cooling pipes at electricity generation facilities due to their excellent heat dissipation capabilities, helping regulate equipment temperatures in power plants such as combined-cycle gas turbine power stations. In nuclear power generation, aluminum is often used as cladding material for nuclear fuel elements in research reactors and heavy water reactors.

The majority—about 70%—of U.S. aluminum production originates from recycled inputs, mostly from aluminum scrap. Estimated U.S. primary production decreased 11% from 2023 and estimated secondary production from new and old scrap increased 5% from 2023. In terms of quantity, the U.S. produced around 3.9 million metric tons of aluminum in 2024, with about 2.7 million metric tons coming from secondary production.

Due to high energy costs, U.S. primary aluminum production has reduced from 3.8 million metric tons in 1999 to 0.78 million metric tons in 2023. This is in large part because of the multibillion-dollar investments required, and the fact that permitting and construction timelines average seven to eight years for U.S. smelting infrastructure. These barriers are prohibitive to scale at the speed and volumes necessary for U.S. energy needs. Therefore, to meet the objectives of energy, economic and defense supply chain security, it is important for the DOE to maintain aluminum as a designated critical material—and the agency should also be inclusive of secondary sources, like recycled aluminum. Domestic production from recycled aluminum meets high quality and durability standards while using 5% of the energy required for primary production.

The NAM supports maintaining aluminum on the Critical Materials List while also extending the designation's scope to include recycled aluminum. The DOE must prioritize research and development—and support activities that increase and commercially scale up new materials technologies. This approach will enable a whole-of-government approach to secure supply chains for energy, defense and economic needs.

Cobalt is key to ensuring American energy dominance. It is a critical component of the lithium-ion batteries that power Americans' personal electronics, including smart phones and laptops, as well as their vehicles. Further, cobalt is a required input for aircraft gas turbine engines, including military aircraft.

Today, there is only one primary cobalt mine in operation in the U.S. The U.S. has no commercial-scale cobalt refineries. The global market for cobalt is dependent on mines in the Democratic Republic of the Congo for 75% of mineral extraction and relies on China for at least 70% of global cobalt refining.[1] While exploration is underway for additional sources of cobalt, establishing new mining, refining and processing operations for cobalt at a scale that meets U.S. domestic demand will take years.

The NAM commends the Export-Import Bank of the United States for providing a letter of interest for a loan of up to $200 million to support construction and operation of a planned cobalt processing plant in Yuma, Arizona. While this is one example of the federal government utilizing available financial tools to help boost critical materials and minerals production in the U.S., more needs to be done to ensure a reliable supply of cobalt for our energy and national security needs. As such, the NAM urges the DOE to maintain cobalt on the critical materials list.

Copper is a critical material for manufacturing—not only as a raw material input for products and industrial machinery, but also to generate and deliver the energy manufacturers need to operate. Copper is especially vital as the U.S. continues to work to outcompete China to achieve energy dominance.

In a typical electric transformer, for instance, approximately 20% of the components by weight are copper. S&P Global research shows that "copper use in power transmission and distribution application represents close to 20% of current copper demand."[2] Additionally, copper is a critical input in many forms of energy production and distribution, including copper pipes for home gas distribution and potable water distribution, as well as copper-nickel alloys in gas and nuclear power generation[3] and additional applications in advanced batteries.[4]

A strong, affordable and reliable energy generation mix is a key to manufacturing success, especially as the administration works to expand manufacturing in the U.S., including advanced manufacturing in semiconductors and artificial intelligence data centers. A study of just one data center facility in Chicago showed that the facility used the equivalent of 27 tonnes of copper for every megawatt of applied power, meaning it required a total of 2,177 tonnes of copper for construction of just this one facility. One

[1] International Energy Agency, Clean Energy Supply Chain Vulnerabilities (2023), https://www.iea.org/reports/energy-technology-perspectives-2023/clean-energy-supply-chains-vulnerabilities.
[2] S&P Global, "The Future of Copper: Will the looming supply gap short-circuit the energy transition," July 2022, https://tinyurl.com/yc486mnp.
[3] Copper Development Association Inc., "Power Generation," Accessed March 26, 2025, https://tinyurl.com/uf3a3jmv.
[4] ElectraMet, "Unlocking Copper Recovery: How Much Copper Is in Lithium-Ion Batteries?" Accessed March 26, 2025, https://tinyurl.com/58knvxwb.

NAM member in the global mining industry estimates that copper used in data centers globally will grow sixfold, from half a million tonnes in 2025 to approximately 2 million tonnes in 2050.

Without a robust copper supply chain in the short and medium terms, manufacturing in America will not be able to reach its potential. According to a study commissioned by the Copper Development Association, the U.S. copper industry's vertical supply chain is only capable of meeting 53% of domestic demand for refined copper cathode.[5] As such, manufacturers in the U.S. rely heavily on copper imports.

Manufacturers support the administration's goal of expanding domestic copper production and refining capacity, as well as ensuring a reliable, secure and resilient domestic supply chain. This will, however, require time, access to capital and investment in the industry. Providing easy, reliable and cost-effective access for manufacturers investing in the U.S. would mitigate unnecessary scarcity and shortages as manufacturers in the U.S. take steps to ramp up domestic production and refineries.

We urge the DOE to maintain copper on the critical materials list and share data with the Department of the Interior that highlights its importance to American energy dominance.

Electrical steel is essential to automotive manufacturing, renewable electricity production, electric transmission and other industrial and commercial uses. It is necessary for grid construction and expansion. Grain-oriented electrical steel is used mainly as a core material for transformers.[6] Nongrain-oriented electrical steel is essential to produce electric motors used in electric vehicles, plug-in hybrids and a broad range of other technologies and applications.

The NAM urges the administration to maintain electrical steel on the critical materials list because this will allow for continued support of the onshoring of these materials, which are critical for electricity production and distribution.

Lithium is critical to energy and national security in the U.S. In 2018, the U.S. relied on imports for 50% of apparent consumption of lithium.[7] While the U.S. has sought to expand and incentivize domestic production of lithium, the U.S. continues to lag other international trading partners. The commodity is imported mainly from Chile and Argentina to meet consumer demand.

[5] S&P Global, Copper in the US: Opportunities and Challenges, Copper Mining, Recycling and Trade in the US (August 2024). https://view.highspot.com/viewer/f15367148e71dbfd68def7b8338645d2#1.
[6] Yasuyuki Hayakawa, "Electrical Steels," *Encyclopedia of Materials: Metals and Alloys*, vol. 2 (Elsevier, 2022), see https://www.congress.gov/crs_external_products/R/PDF/R48149/R48149.4.pdf.
[7] U.S. Geological Survey, Lithium Deposits in the United States (June 1, 2020), https://www.usgs.gov/data/lithium-deposits-united-states.

Lithium is used in air treatment technologies, batteries, metallurgy and polymers.[8] It is a key material in the global supply chain for battery metals used in vehicles, smartphones, storage and other applications essential to electrification. For the U.S. to achieve full energy dominance and modernize the electric grid, it will need an uninterrupted lithium supply.

Lithium is also a critical component of the energy systems that power AI data centers. AI has become integral to modern manufacturing as it increasingly transforms and supports a multitude of aspects of manufacturing, from product design to shop floor operations to supply chain management. These facilities require uninterrupted access to energy, which can come under threat from power outages or fluctuations. By having lithium-ion battery storage in place, operators can engage this backup power source in the event of a disruption. Tariffs, and global suppliers' reactions to them, could impact access to this key input.

Graphite is necessary for a variety of industrial energy applications. It is an important material for all battery types, such as alkaline, lead-acid and especially lithium-ion batteries in which graphite is essentially the entire anode side of the battery. Graphite is also critical in certain types of fuel cells and in stationary power storage. China's manipulation of the market and its stranglehold on supply have created unfair competition with domestic producers. In addition to maintaining natural graphite in the Critical Materials Assessment, the DOE could help address supply chain issues by expanding the list to include synthetic graphite as well.

II. Expanding the Critical Materials List to Meet New Challenges and Drive American Energy Dominance

There are also materials that the DOE should consider adding to the critical materials assessment, given new challenges facing the energy and manufacturing sectors. These materials are important to reducing our reliance on China and to generating baseload power to meet growing energy demand.

Iron nitride permanent magnets complement existing DOE investments by relieving pressure on rare-earth supply chains and enabling energy deployment at scale. Manufactured 100% in the United States, it is the only rare-earth-free permanent magnet technology in the world with demonstrated readiness and customer demand.

Today, China controls more than 90% of neodymium-iron-boron magnet production and 85% of rare-earth separation. This extreme concentration, paired with China's history of

[8] Bradley, Dwight C.; Stillings, Lisa L.; Jaskula, Brian W.; Munk, LeeAnn; and McCauley, Andrew D., "U.S. Geological Survey, Critical Mineral Resources of the United States—Economic and Environmental Geology and Prospects for Future Supply," U.S. Geological Survey Professional Paper 1802, p. K1–K21, https://doi.org/10.3133/pp1802K.

export restrictions and sanctions, poses a persistent threat to U.S. energy and national security.

Iron nitride offers a fundamentally different path. It is manufactured with domestic supply chains, free from geopolitical risks and scalable with conventional factory buildout. We strongly encourage the DOE to recognize iron nitride as a viable substitute to rare-earth materials in the 2026 Critical Materials Assessment.

Zirconium is key to fueling America's nuclear energy resurgence. The DOE's 2023 Critical Materials Assessment screening of materials and technologies assessed zirconium for the nuclear industry as a lower risk material.[9] We believe that developments since 2023 warrant an updated designation of zirconium as a critical material in the upcoming 2026 assessment. The following are key reasons that the U.S. government should consider zirconium to be a critical material as defined by the DOE:

The domestic nuclear industry for commercial and defense applications is dependent highly on Chinese-sourced zirconium oxychloride, or "ZOC," as the basic feedstock material for nuclear fuel products. At present, the global supply of the ZOC feedstock material (~95% or more) is available only from China. Considering recent geopolitical and trade tensions, this presents a potential vulnerability to the U.S. nuclear industry.

There is no feasible alternate material available to the U.S. nuclear industry as a substitute for ZOC. Moreover, the zirconium metal alloys produced in the U.S. from Chinese-sourced ZOC comprise the best base product for the manufacturing of nuclear fuel rods/assemblies, providing about 20% of the U.S.'s electricity generation.[10]

Recent positive market trends since the 2023 assessment highlight nuclear energy's increased importance in achieving the objectives of recent executive orders, such as "Unleashing American Energy" (14154) and "Reinvigorating the Nuclear Industrial Base" (14302), which call for 10 new nuclear power plants to be under construction by 2030 and a quadrupling of nuclear capacity by 2050. The United States' ability to realize these ambitious objectives is dependent on the availability of engineered zirconium alloy products for our rapidly growing demands. Thus, manufacturers urge the DOE to include zirconium on the 2026 Critical Materials Assessment.

III. Permitting Laws: A Barrier to Increased Domestic Capacity for Critical Materials

Outdated permitting laws and procedures are restricting the United States from being able to mine, process and access domestic resources, modernize infrastructure and shore up supply chains.

[9] U.S. Department of Energy, Critical Materials Assessment (July 2023), https://www.energy.gov/sites/default/files/2023-07/doe-critical-material-assessment_07312023.pdf.
[10] U.S. Energy Information Administration, Nuclear Power Comes from Nuclear Fission" (2023), https://www.eia.gov/energyexplained/nuclear/nuclear-power-plants.php.

To expand mine development and production in the U.S., manufacturers respectfully ask the DOE—through its leadership role on the National Energy Dominance Council—to encourage the administration to pursue the following non-exhaustive policy remedies:

- Address unreasonably long time frames for the consideration of land and water use permits under the Mining Law of 1872, the Federal Land Policy and Management Act and the Clean Water Act, among others.

- Ensure that permitting deadlines, the designation of a lead federal agency, page counts and the use of categorical exclusions as required by the Fiscal Responsibility Act of 2023 are followed across agencies.

- Work with Congress to address and enact critically needed reforms to judicial review under the National Environmental Policy Act.

Current permitting timelines and regulatory requirements have created significant challenges for establishing new smelting and refining operations in the U.S. While some progress has been made in restarting existing facilities, addressing regulatory and financial barriers remains essential to developing domestic processing capacity in a time frame that meets supply chain needs. The administration should take additional steps to drive down costs associated with long, uncertain permitting timelines in the U.S. so that manufacturers in America can compete more efficiently with Chinese smelters. America doesn't need to choose between competing on cost and maintaining environmental standards for the communities we operate in—we can do both.

IV. Financial Tools to Help De-Risk Technological Investments

Strengthening domestic production of critical materials presents a strategic opportunity to drive economic development, reshore manufacturing and establish a robust and resilient domestic battery industry. However, the capital intensity, long development timelines and technology risk associated with first-of-a-kind projects present significant barriers to scaling domestic critical materials and minerals production.

To bridge this commercialization gap and accelerate deployment, targeted fiscal incentives, such as investment tax credits, production tax credits, grants, contracts-for-difference, offtake agreements, accelerated R&D depreciation, loans and loan guarantees, are essential tools that can help de-risk private capital, catalyze innovation and ensure the U.S. industry remains globally competitive.

V. Aligning the DOE Critical Materials and DOI Critical Minerals Lists

Under the Energy Act of 2020, Congress directed the DOI to identify and maintain a list of critical minerals to be updated routinely by the U.S. Geological Survey. Unfortunately,

the items that USGS designated as critical minerals did not align with the DOE critical materials list that was established under the same law. This discrepancy is causing confusion among producers because eligibility for certain grant programs, tax credits, loan guarantees or improved permitting processes is only granted to items on the DOI list.

It is a priority for manufacturers to align these two lists by adding copper, electrical steel, synthetic graphite, silicone and silicon carbide to the national critical minerals list maintained by the USGS to shore up supply chains of key minerals and materials. Furthermore, fluorine should be added to the USGS's critical minerals list as fluorine is not synonymous with fluorspar. These materials are irreplaceable in crucial energy, technology and national security applications—from electrical equipment and batteries to grid transformers and semiconductors. American manufacturing relies too often on foreign sources of raw and refined inputs of these materials—when we can and must be doing more to produce them domestically.

The NAM encourages the DOE to work through the interagency process to coordinate with the DOI as they undertake a review of their critical minerals list and share data that would be helpful to minimize confusion between the two lists. The DOE should also work with Congress and issue a Statement of Administration Policy in support of the Critical Mineral Consistency Act, which would eliminate the disparities between the two lists.

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To do what manufacturers in the U.S. do best—put more Americans to work, more factories into motion, more innovation into the marketplace and more investments into our communities while strengthening the hand of the United States on the world stage—manufacturers welcome public policies that will boost domestic supply chains for critical materials and reduce the United States' reliance on countries like China for its energy inputs.

It is vital that the DOE works closely with other federal agencies to ensure manufacturers of all sizes and in all segments of the industry have access to the materials necessary for modern, innovative manufactured products.

Sincerely,

Christopher Phalen
Vice President, Domestic Policy