NATIONAL ASSOCIATION OF Manufacturers

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The Honorable Jeffrey Goettman
Deputy United States Trade Representative
Office of the U.S. Trade Representative
600 17th St. NW
Washington, DC 20503

Re: USTR-2026-03868: Request for Comments on the Design of a Plurilateral Agreement on Trade in Critical Minerals and Policy Actions to Strengthen the Resilience of Critical Minerals Supply Chains

Dear Ambassador Goettman:

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 drives American prosperity and innovation—the industry employs nearly 13 million people, contributes $2.95 trillion annually to the U.S. economy and accounts for nearly 52% of all private-sector research in the nation.[1]

The NAM appreciates this opportunity to inform the U.S. Trade Representative's approach to plurilateral negotiations on trade in critical minerals. Given the speed at which the agency seeks to proceed and the complexity of this topic, we welcome USTR's approach to ongoing engagement from interested stakeholders such as the NAM beyond this initial request for comment. The NAM's membership includes a full and diverse array of producers and users of critical minerals in advanced manufacturing whose experiences would contribute richly to future information exchanges. The NAM has also put forward recommendations for domestic policy approaches, from permitting reforms to strategic incentives to workforce development programs, that complement and work in tandem with the recommendations herein for engaging international partners on critical minerals.

The Strength and Success of Manufacturers in the U.S. Depend on Our Nation's Access to Critical Minerals

Access to raw and processed critical minerals is fundamental to both a thriving commercial manufacturing base in the U.S. and to the U.S. defense industrial manufacturing base. Manufacturers rely on critical minerals and their derivatives to produce and lead globally in technologically advanced industrial and consumer products made in America, including aircraft and defense systems, automotive parts and vehicles, electric grid components, robotics and industrial automation, personal electronics and much more.

[1] National Association of Manufacturers, "Facts About Manufacturing," 2026.

It is vital for U.S. national, economic and energy security to safeguard stable and diversified supply chains of critical minerals. While endowed with many natural resources, the U.S. has finite domestic supply of critical minerals and is a global leader in mining for just eight mineral commodities.[2] The U.S. also has limited midstream processing capabilities, an essential step that transforms minerals for specific end uses. Though a significant global producer of rare earth elements, insufficient domestic processing infrastructure leads to the U.S. exporting 93% of its unrefined rare earths for processing overseas.[3]

As a result, manufacturers in the U.S. rely heavily on imports of many critical minerals. The U.S. is 100% import reliant for 13 mineral commodities included on the 2025 U.S. Geological Survey List of Critical Minerals, and an additional 20 critical mineral commodities had an import reliance greater than 50% of apparent consumption.[4] China is a global powerhouse in mineral production and processing as a result of decades of industrial strategy. China's increasing weaponization of mineral dominance, including export restrictions on over a dozen critical minerals and rare earth elements in 2025, underscores the acute vulnerabilities in U.S. mineral supply chains.

As part of its comprehensive approach to bolstering domestic production of critical minerals and improving the overall resilience of U.S. critical minerals supply chains, the NAM recommended in its public comments in May 2025 that USTR negotiate an innovative sectoral trade agreement for the critical minerals sector with like-minded partners, thereby supporting U.S. investments, securing U.S. access to inputs and reducing exposure to nonmarket policies and practices.[5]

Creating a Critical Minerals Alliance Through a New Comprehensive Plurilateral Trade Agreement

Manufacturers in the U.S. are seizing the opportunities created by the Trump administration to reinvest in domestic critical minerals capacity. Permitting reforms and expanded access to strategic incentives like the 45X Advanced Manufacturing Production Credit and funding under the Defense Production Act would further bolster this activity. The NAM also recommends increased investments in critical minerals recycling and recovery technologies and efforts to reskill and scale our manufacturing workforce. However, expanded domestic mineral capabilities will take time to reach fruition. To ensure the continuity and long-term resilience of mineral supply chains, manufacturers in the U.S. remain fully engaged in global supply networks, particularly with allied suppliers.

Recognizing this imperative, the Trump administration has ramped up critical minerals diplomacy in an approach that has yielded over 20 critical minerals frameworks and action plans since August 2025, created new international coalitions like Pax Silica and the Forum on Resource Geostrategic Engagement and launched a critical minerals stockpile initiative in Project Vault.[6]

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[2] U.S. Geological Survey, "Global Maps of Critical Mineral Productions in 2023," August 2025. "Leading mining countries" is defined as countries mining 5% or more of a mineral commodity.
[3] Center for Strategic & International Studies, "Critical Minerals and the Future of the U.S. Economy," February 2025.
[4] U.S. Geological Survey, "Mineral Commodity Summaries 2026," March 2026.
[5] National Association of Manufacturers, "NAM Comments on Section 232 Critical Minerals Investigation," May 2025.
[6] U.S. Department of State, "2026 Critical Minerals Ministerial," Feb. 4, 2026.

A plurilateral agreement with allies and partners would both synthesize and complement these actions by leveraging the collective advantages of U.S. international partners and allies at each stage of the critical mineral lifecycle—from research, development and exploration, to mining, processing and recycling—to effectively rebalance the global critical minerals market.[7]

The NAM believes that an innovative plurilateral agreement would create opportunities to directly support the development of mineral extraction and processing projects domestically and in allied countries, sustain their success with legal and commercial protections, empower manufacturers with low-cost access to resources and critical inputs and dismantle longstanding systemic vulnerabilities. Such an approach also would enable partners to pool geological assets with collective technological and industrial know-how to more effectively deploy resources at scale and hedge against geopolitical risks for the benefit of all participants.

The following represents the NAM's recommendations on how to design a plurilateral agreement to impactfully enhance resilient critical minerals supply chains and downstream industries from project inception through end use.

Connect Mineral Discovery and Project Development to First Rights Investment and Offtake Opportunities

A plurilateral trade agreement offers an opportunity to make the **critical link between collaboration in the discovery and development phases of a project to "first rights" commitments** that incentivize and operationalize direct investments and downstream access to industrial inputs.

The agreement can support the conditions for enhanced international collaboration at the earliest phase of project development, where pooled expertise and technical assets can be deployed to identify locations within mineral-rich countries that are ripe for new or expanded mining. This approach is attractive to agreement partners because many countries with known mineral sources do not yet have a full picture of their untapped potential. For example, though already regarded as a leading source for many minerals such as copper and cobalt, only 20% of the Democratic Republic of the Congo has been mapped geologically for potential resources.[8]

The U.S. can support mineral-rich partners to map reserves and identify promising opportunities for new projects through the existing technical expertise of the U.S. Geological Survey. Partnering on project identification also provides an opportunity to test and deploy innovative mapping and research solutions, such as those underway by the Defense Advanced Research Projects Agency that leverage artificial intelligence and machine learning to complete resource assessments.[9] Collaboration could be modelled on the Critical Minerals Mapping Initiative, a joint mapping research effort between USGS, the Geological Survey of Canada and Geoscience Australia.[10]

[7] The White House, "Adjusting Imports of Processed Critical Minerals and Their Derivative Products into the United States," Jan. 14, 2026.
[8] Center for Strategic & International Studies, "Building Critical Minerals Cooperation Between the United States and the Democratic Republic of the Congo," March 25, 2025.
[9] Defense Advanced Research Projects Agency, "CriticalMAAS: Critical Mineral Assessments with AI Support."
[10] U.S. Geological Survey, "Critical Minerals Mapping Initiative," Sept. 2, 2025.

Government-backed exploration delivers a strong market signal for further investment, helping to ensure potential projects have the financial and technical resources to get off the ground and attract early-stage U.S. and allied investors. **These early investors should then be first in line for preferential access to extracted minerals, potentially through long-term offtake agreements or similar arrangements.**

To operationalize this linkage in a trade plurilateral, the administration could build from language in the U.S.–Thailand Critical Minerals Framework. **The parties would commit to exchange potential tenders and projects at the earliest practicable moment and provide U.S. investors the "first opportunity to invest in critical minerals assets" both for sales within partner countries and by companies headquartered or incorporated in partner countries.**[11]

Establish Favorable Investment Conditions for Mining, Refining and Processing Projects

As part of securing the long-term viability and capital return on critical minerals projects overseas, manufacturers in the U.S. seek greater transparency, fairness and basic protections for their investments. A plurilateral critical minerals trade agreement can secure strong legal commitments from partner governments to streamline and expedite prioritized projects in mining, refining and processing of critical minerals and ensure enforceable basic investor protections.

Establish Strong Protections for Investors: Efforts by the U.S. government to facilitate private-sector investments overseas should be bolstered by commitments that both enable market access and ensure these investments are respected by the host government. The administration should seek to eliminate limitations on participation in exploration and utilization of resources by parties to the agreement, protect assets owned and operated by the parties, and provide for neutral and robust enforcement mechanisms.

Key protections, based on well-developed U.S. standards, include national and minimum standard of treatment for foreign investment, protection from expropriation, freedom from performance requirements and localization mandates, facilitation of smooth, timely financial transfers and transparency and publication of investment laws and regulations.[12] Mineral-rich countries should also adopt transparent best practices in bidding processes, drawing on high-standard government procurement commitments such those in the U.S.–Mexico–Canada Agreement.[13]

Streamline Investment Approvals and Procedures: A plurilateral agreement could also simplify and streamline permitting and regulatory processes for minerals projects through the creation of dedicated "Single Windows" (single points of contact within the host government for applications and approvals) for investment projects prioritized by the parties to the agreement. At the outset of projects, requirements and incentives would be clarified and established for the lifecycle of the

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[11] The White House, "U.S.–Thailand MOU Concerning Cooperation to Diversify Global Critical Minerals Supply Chains and Promote Investments," Oct. 26, 2025.
[12] Office of the U.S. Trade Representative, "2012 U.S. Model Bilateral Investment Treaty."
[13] Office of the U.S. Trade Representative, "Agreement Between the United States of America, the United Mexican States and Canada: Chapter 13: Government Procurement," July 1, 2020.

project, expedited approval timelines established and a centralized portal for tender and application documentation created to ensure cross-government accountability for project success.

Incentives for Investments Under the Agreement: The parties should discuss successful investment incentive approaches, such as tax credits and other cost-recovery programs, that could be available to investors participating in priority projects identified through the agreement and should **grant extended operating licenses** for priority projects identified by parties of the agreement, akin to recent commitments by Malaysia for U.S. firms.[14] Parties may also consider pooling resources for underfunded mineral exploration projects that struggle to achieve market support.

Require All Companies to Operate Under Commercial Considerations: Under the plurilateral agreement, parties should be required to ensure "competitive neutrality," making sure that state-owned enterprises, whether domestic or those of nonmarket economies operating in the jurisdiction of a party, do not benefit from unfair advantages that distort investment flows or competitive bids for public tenders.

All parties to the agreement should adopt the recently updated "OECD Guidelines on Corporate Governance of State-Owned Enterprises," which includes commitments to high standards of transparency and disclosure on SOE cost and revenue, non-exemption of SOEs from laws and regulations and open and competitive public procurements.[15] The plurilateral itself should incorporate by reference language from Section III (state-owned enterprises in the marketplace) and Section V (disclosure, transparency and accountability) of the Organisation for Economic Co-operation and Development's guidelines.

Investment Screening: The plurilateral agreement should commit all parties to minimum standards and procedures for inbound investment reviews for national security risks, akin to provisions included in several U.S. Agreements on Reciprocal Trade.

Ensure Access to Critical Mining, Processing and Manufacturing Inputs on Zero-for-Zero Terms

Processing minerals is equally significant to extracting them. The concentration of mineral processing in a single country remains a massive threat to U.S. mineral security. China maintains a near monopoly on the processing of minerals, refining between 40% and 90% of the world's supply of rare earth elements, graphite, lithium, cobalt and copper. It is imperative that the U.S. counter this chokehold by ramping up downstream manufacturing capabilities, including processing, refining and magnet production.

Zero-for-Zero: To achieve this goal, manufacturers in the U.S. need a runway of streamlined, low-cost access to both critical minerals and industrial inputs like machinery for processing, refining and recycling to accelerate more investment and innovation across the full manufacturing base. A plurilateral agreement provides the optimal opportunity to secure preferential zero-for-zero tariff

[14] The White House, "Joint Statement on United States–Malaysia Agreement on Reciprocal Trade," Oct. 26, 2025.
[15] Organisation for Economic Co-operation and Development, "OECD Guidelines on Corporate Governance of State-Owned Enterprises 2024," Oct. 28, 2024.

terms with allied trading partners on minerals, machinery and industrial inputs for critical mineral extraction and production. This will also provide opportunities for increased U.S. exports of processed critical minerals and related products, including a wide array of globally competitive U.S. derivative products.

At a minimum, the administration should ensure that inputs critical to grow domestic capacity for extraction, processing, refining, recycling and manufacturing can be imported from participants to the agreement without the added cost of tariffs through a "speed pass," as proposed in the NAM's U.S. Manufacturing Investment Accelerator Program. The NAM encourages the administration to work with manufacturers to identify critical minerals, equipment and machinery unavailable or in limited supply in the U.S. but critical for the acceleration of domestic mineral production.[16]

Dismantle Systemic Vulnerabilities

To achieve diversification and global supply chain security, a critical minerals international partnership must work to overcome six core limitations, some of which can be addressed in a plurilateral trade agreement, while others must be addressed alongside the trade agreement. They include lack of transparent market data, regulatory disparities, the proliferation of export restrictions, insufficient project financing, fractured demand and fragmented expertise and capacity.

Inside the Plurilateral Trade Agreement

1. **A Price Transparency Mechanism to Stabilize Markets:** In the case of grains**,** to stabilize global markets and guard against the weaponization of trade in food, global data is collected and published by the Food and Agriculture Organization on production, utilization, stocks and trade to monitor market volatility but also render it politically difficult for any major producer to intentionally induce large price swings. Generating and publishing **better global data on critical minerals production, supply and trade flows would send market-based price signals to counter price manipulation in critical minerals markets.**

   For many critical minerals, China has de facto control over global prices, given its role as both a major producer and consumer of critical minerals and as the hub for a majority of minerals transactions.[17] This dynamic is magnified by China's significant processing capacity, enabling Chinese entities to overbid for raw materials from other countries and drive up the price of extracted and unrefined minerals while artificially depressing the price of processed minerals exported from China—effectively prohibiting the commercial viability of processing facilities outside of China.

   Extraction costs, yields, grades and applicable environmental and labor standards vary significantly by geography, presenting significant challenges to estimating production costs and forecasting supply accurately. Expectations for demand are complicated by rapid technological change in the private sector and the imperatives of defense procurement.

[16] The National Association of Manufacturers, "U.S. Manufacturing Investment Accelerator Program," 2025.
[17] SAFE, "Issue Brief: Critical Minerals Pricing Mechanisms," Dec. 9, 2025.

Improved market transparency is essential to build sustainable critical minerals supply chains for manufacturers in the U.S. Transparency not only promotes natural market-based prices but also enables better decision-making for government interventions like stockpiling, ensuring actions can be informed through accurate global data, realistic risk assessments and scenario-based stress tests of potential shocks.

If stockpiles serve as a shock absorber, a price transparency mechanism can serve as an ongoing market stabilizer. **The administration should work with trade agreement partners to create a minerals information clearinghouse** to serve as a counterbalance to predatory nonmarket practices. This repository of mineral data could become the basis for a market data-driven critical minerals price index.

An organization like the OECD could serve as an enabling partner to institutionalize and operationalize the information clearinghouse, leveraging information from a global critical mass of market economies and developing methodologies for estimating data from nonmarket economies until the clearinghouse can be widened out to include all major producers. Pressure to participate in global reporting would reduce China's ability to create both real and perceived mineral scarcity or to engage in predatory oversupply and price depression.

As a corollary to or extension of the information clearinghouse, the parties could also explore the viability of creating a mechanism for critical minerals that operates similar to the London Metal Exchange, which includes warehousing to facilitate mineral storage and logistics, mitigate risk and support reliable prices.

2. **Standards and Reporting Thresholds to Combat Regulatory Arbitrage:** A predictable regulatory environment across borders and credible verification are necessary for industry across the critical minerals supply chain—from miners to end-use manufacturers—to have confidence in investing further into global supply chains. Disjointed and unequal regulations and standards create perverse incentives that can be exploited by nonmarket actors seeking loopholes and undermining transparency and fairness. Manufacturers and private lenders also need confidence that critical minerals meet purity, durability and strength requirements, especially if pursuing long-term offtake agreements. Mutually recognized testing and certification is important for regulatory compliance and to provide accurate data to producers, investors and government stakeholders.

   Alignment among the parties will be vital to support price premiums for suppliers across the global critical minerals supply chain that adhere to high standards for transparency, traceability and sustainability. The G7 Critical Minerals Action Plan identified how international critical minerals cooperation should promote responsible mining practices, labor standards, anti-bribery and corruption measures and sustainability requirements, while encouraging multilateral development banks and private-sector lenders to invest in standards-based critical minerals projects.[18] The OECD has developed guidelines on due diligence for responsible mineral supply chains on mitigating human rights abuses, conflict financing and other financial crimes.[19]

[18] G7/G20 Documents Database, "G7 Critical Minerals Action Plan," June 17, 2025.
[19] Organisation for Economic Co-operation and Development, "OECD Due Diligence Guidance for Responsible Supply Chains of Minerals from Conflict-Affected and High-Risk Areas," April 6, 2016.

In pursuing a plurilateral agreement, the parties should promote industry-led standards development and certification, in alignment with principles in the WTO Agreement on Technical Barriers to Trade, to reflect supply chain and market realities accurately.[20] The U.S.-Mexico-Canada Agreement TBT chapter also provides best-in-class agreement language for enabling innovative, private-sector-led standards and accreditation of public and private conformity assessment bodies. Development of a durable investment and trading system for critical minerals will require transparency, compliance and verification with baseline standards. In this context, transparency is the first step in ensuring U.S. companies are not forced to participate in a race to the bottom that undermines mineral sources and privileges disreputable investors.

3. **Critical Minerals Export Restrictions:** Governments have expanded the use of export restrictions on industrial raw materials greatly, with a sharp escalation in 2023, creating a spiral of copycat restrictions, rising prices and reduced global supply.[21] Notably, between 2021 and 2023, over 20% of global exports of several critical minerals, including cobalt, tin, palladium, platinum, nickel, copper, manganese, silver and rare earth elements, faced at least one export restriction. The vast majority—over 94%—of new export restrictions in 2023 came from seven countries: Burundi, China, the Democratic Republic of the Congo, Laos, Russia, Vietnam and Zimbabwe. A plurilateral agreement should incorporate dialogue on approaches to ensure export restrictions do not create undue trade distortion among the parties and to understand the impact on domestic jobs and investments.

Observations About Price Floors: There are some lessons to be derived from historical commodity agreements that sought to establish and enforce price floors. Commodity agreements, such as the International Tin Agreement, included all major global producers, which appears to be an important criterion for success. Any similar pricing mechanisms for critical minerals would likely need to be carefully tailored to specific minerals, accounting for distinct and variable market dynamics, as well as industry-forecasted demand through regular consultations with miners, original equipment manufacturers and end users.

Coordinated price floors or other similar mechanisms have different impacts on segments of the mineral value chain—for example, an artificial price floor on a raw material that could enable a domestic extractor to achieve profitability would raise input costs for processors and end users simultaneously. Setting credible reference prices would require nuanced and data-intensive assessments of underlying cost structures, which may differ across primary, secondary and recycled supply. Lastly, the International Tin Agreement incorporated dynamic sunsets and regular reviews and renewals to consider evolving industry demand and market developments. Potential triggers for mechanism review include meaningful decreases in China's refining shares, substantial growth of U.S. domestic capacity and sustained increases in transparent futures trading levels.[22]

[20] World Trade Organization, "Principles for the Development of International Standards, Guides and Recommendations."
[21] Organisation of Economic Co-operation and Development, "OECD Inventory of Export Restrictions on Industrial Raw Materials 2025," May 2025.
[22] Hoover History Lab, "A Multilateral Commercial Stockpile for Critical Minerals," Aug. 11, 2025.

Alongside the Agreement

4. **Expanded Government Co-Financing:** U.S. critical minerals security cannot be achieved absent project financing. The U.S. government can play an essential role providing catalytic financing across the mining and critical minerals supply chain, including by supporting precompetitive extractive and processing technology R&D. U.S. agencies, including the U.S. Trade and Development Agency, the Export-Import Bank and the U.S. International Development Finance Corporation, should be leveraged to fill funding gaps when private-sector capital is insufficient. More expansive use of loans, loan guarantees and purchase commitments by agencies like the Department of War and the Department of Energy would also create more opportunities to de-risk and attract private capital for critical minerals.

   These agencies should engage in more co-financing initiatives with partner governments, generating market signals on project viability, particularly when paired with long-term offtake agreements and commitments to transparent, best practices in bidding processes. Agencies should be encouraged to fast-track projects with mineral equities, including investments to support mineral recycling, infrastructure, energy and logistics. The DFC's political risk insurance program should be utilized for U.S. processing and offtake deals.[23]

   The NAM is a proponent of Congress acting to expand these agencies' capabilities. This includes raising EXIM's default cap and enabling EXIM to shoulder increased risk in long-term projects. DFC should be granted greater flexibilities to work with high-income countries with significant reserves, by raising the 25% cap on total project investment and the 10% ceiling on agency aggregate exposure with high-income countries. DFC's equity scoring model, which discourages investments in capital-intensive processing projects, should be reformed to mirror risk-adjusted models utilized by other development finance institutions.

   Joint public–private financing across multiple governments could serve to close financing gaps for frontier mineral technologies, enabling them to advance more quickly from pilot initiatives to commercial scale. For example, innovations in mineral recycling technologies may have high strategic value but struggle to advance absent patient venture investment and clear demand signals.[24] Similarly, as noted in NAM comments to the U.S. Department of Commerce in May 2025, private capital is harder to attract in the lengthy and complex project preconstruction phase, which entails significant front-end risk to capital.[25]

5. **Facilitated Pooling of Industry Demand:** Some critical minerals and rare earth elements, like yttrium, scandium and gallium, are not widely used in high-volume quantities or require high purity from qualified processing and refining operations to meet strength and durability requirements. As a result, manufacturers purchase smaller quantities from fewer suppliers, leaving them acutely vulnerable to supply chain disruptions and price manipulations with limited bargaining power. The U.S. government could explore ways to facilitate the pooling of capital

[23] Foundation for Defense of Democracies, "Unplugging Beijing: A Playbook to Reclaim America's Advanced Battery Supply Chain," July 2025.
[24] Council on Foreign Relations, "Leapfrogging China's Critical Minerals Dominance," February 2026.
[25] National Association of Manufacturers, "NAM Comments on Section 232 Critical Minerals Investigation," May 16, 2025.

and demand among manufacturers in the U.S., establishing stronger market power for mineral procurements from overseas markets, including to fill the new U.S. Strategic Critical Minerals Reserve through Project Vault.

6. **Technical Capacity and Expertise:** U.S. R&D leadership in critical minerals technologies is critical to reducing dependence on China. For example, innovative approaches to critical mineral recycling and enhanced recovery, such as from existing waste streams or tailing piles, could accelerate the commercialization of viable substitutes, help insulate the U.S. from supply chain shocks and provide critical manufacturing input materials.[26] Operational experience to recover rare earth elements from decommissioned electronic equipment is positioning secondary recovery as a viable pathway for defense, automotive and advanced technology applications.

   Plurilateral partners should explore collaborative research to increase mineral reclaim yields, acquire used rare earth cores and magnets that can be utilized to recycle rare earth elements and utilize secondary recovery as another supply source alongside other mineral reclamation and recycling technologies. The parties should also combine efforts to accelerate development and deployment of technologies for separating and sorting scrap as a priority to reduce reliance on imports and increase U.S. domestic capacity.

   Scaling mineral technology often depends on a patchwork of public grants, private capital, tax credits and debt financing—but also benefits from global equity venture investments, often from venture arms of mining and automotive companies and other high-technology end users. Strategically matched foreign partners can be a crucial resource in developing and scaling mineral technologies. Early-stage technologies often require capital-intensive equipment and facilities for testing and refinement. Promoting shared-use infrastructure would help accelerate the scaling of new technologies.

   While the U.S. is making strides in leveraging artificial intelligence and machine learning in minerals technologies through federal initiatives, more can be done to increase public–private collaboration and promote access to global technologies. U.S. critical mineral MOUs should explore ways to partner with countries like Australia and Japan that have set similar goals to increase AI adoption in critical mineral production.

   The U.S. also requires a wide range of manufacturing skillsets to expand capacity in mining and processing. Only 14 universities in the U.S. have mining and mineral engineering programs,[27] while in 2023, China had over 38 mineral processing schools and upwards of 44 mining engineering programs.[28] U.S. critical mineral MOUs should also focus on educational and workforce training and exchanges to help upskill American workers to take on mining, processing and refining jobs needed to support domestic projects.

[26] Council on Foreign Relations, "Leapfrogging China's Critical Minerals Dominance," February 2026.
[27] National Mining Association, "Mining schools and universities."
[28] Center for Strategic & International Studies, "Digging Deeper: Building Our Critical Minerals Workforce," June 12, 2024.

Partners for Success: Who Should Join the Plurilateral?

By deepening strategic partnerships and coordinating investments across allies, the U.S. can compete more effectively with China and reduce vulnerability to geopolitical risks. U.S. allies and partners each offer a different mix of resources and capabilities at different stages of the critical mineral lifecycle. The nuances among partner countries should be reflected in U.S. policymaking and strategies, and plurilateral initiatives should be crafted to capitalize on distinct opportunities.

Mineral Suppliers: For many minerals, U.S. reserves comprise a small percentage of global reserves, but our partners have natural endowments that complement our own. Canada, Germany, Japan, Mexico, South Africa, Brazil, Indonesia, Australia, Chile, Peru and the Democratic Republic of the Congo already serve as major suppliers for important critical minerals, and these relationships should be reinforced to preserve this existing resource and bolstered with strong investor protections. The U.S. should also deepen relationships with other supplier countries, such as the Cook Islands, Guinea, Poland, Norway, Spain, Ukraine and Saudi Arabia, in cultivating additional markets and enabling supplier diversification.

Processing Capacity Countries: The U.S. should continue to develop its domestic processing, recycling and refining capabilities, both to enable greater manufacturing self-sufficiency and to serve as a counterweight to China. However, this buildup of domestic capacity will take time to achieve, and processing capacity in partner countries should be utilized to avoid continued reliance on China. The U.S. should partner with countries like Japan, Canada and South Korea, each of which processed at least 4% of the global total of 14 mineral commodities in 2023.[29] Argentina, Chile, Estonia, Finland, Indonesia, Malaysia, Netherlands and the United Kingdom are also leading alternatives to China in processing certain minerals.[30] The United States should work to identify ways to encourage further processing and value add at mineral extraction sites to ensure benefits are shared and resiliency is created for allied countries, an approach that would stand in contrast to investments by certain nonparties to the agreement.

Technology Hubs: Other countries are well positioned to contribute technologies and expertise to support increased manufacturing capacity in the U.S., from mining, to material sciences, to engineering. The U.S. could utilize a plurilateral agreement to develop research and innovation consortiums, facilitating exchanges of data, testing facilities and design tools along aligned research agendas with partners like Australia and G7 participants, particularly Japan, Canada and the European Union.[31] Clear intellectual property rules and coordinated procurements could enable the development of scaled, predictable markets for innovative technologies. Partnerships can also be leveraged to encourage long-term, high-risk research in pre-commercialized technologies, including mine waste and e-waste recycling and the development of mineral substitutes. Countries like Canada, Australia and Chile have programs with deep expertise in the mining sector that could be leveraged to upskill American workers.[32] Japan is a global leader in critical minerals stockpiling and

[29] U.S. Geological Survey, "Global Maps of Critical Mineral Productions in 2023," August 2025.
[30] Center for Strategic & International Studies, "Critical Minerals and the Future of the U.S. Economy," February 2025.
[31] Council on Foreign Relations, "Leapfrogging China's Critical Minerals Dominance," February 2026.
[32] Center for Strategic & International Studies, "Digging Deeper: Building Our Critical Minerals Workforce," June 12, 2024.

can share valuable lessons learned as the U.S. implements the U.S. Strategic Critical Minerals Reserve via Project Vault.

Investor and Buyer Markets: As countries across the globe seek to secure their minerals supply chains from predatory nonmarket practices, countries with similar values and priorities are ripe partners for joint financing of mining and refining projects overseas. However, these same partners will also increasingly be competitors over scarce resources. Coordination with other buyer markets like Japan, South Korea, the European Union and the United Kingdom is essential to mitigate this risk and successfully develop stable long-term access to minerals and processing capacity, including through open dialogues on respective mineral priorities and common government procurement commitments on fairness and transparency.

Recovery and Recycling: China dominates the critical mineral recovery and recycling market, generating disproportionate demand for minerals scrap. As other countries increase their investments in recovery and recycling technologies, the U.S. should bolster domestic recycling capacity and explore appropriate policies to capture and process scrap. Under the plurilateral, the parties can discuss potential co-investing strategies, best practices and alignment of interoperable standards to help promote closed-loop supply chains. Countries like France, Germany, Japan, South Korea and Brazil have made strides in this area. The parties should also utilize secondary and recycled critical mineral supply that meets industry defined quality standards as appropriate in offtake commitments and stockpiling programs.

The North American Continent: Both Canada and Mexico have abundant mineral reserves and are the lead U.S. sourcing partners for several critical minerals, including fluorspar, gallium, lead, nickel, potash, silver, tellurium, vanadium, yttrium and zinc.[33] The NAM provided comments on critical minerals to the USTR public consultation process for the USMCA joint review, including establishing a critical minerals initiative under the North American Competitiveness Committee.[34] A plurilateral agreement should complement such efforts and further develop integrated North American critical minerals supply chains.

Determining Minerals of Focus

The 58 minerals included on the 2025 USGS Critical Minerals List each face distinct and variable market dynamics, resource endowments, supply networks and global vulnerabilities. The administration should carefully consider import reliance, market vulnerabilities, industry-forecasted demand and likely private-sector investment in determining which minerals to prioritize in minerals partnership agreements.

Recognizing the challenge of addressing all systemic vulnerabilities across 58 minerals in a single effort, the administration should pilot efforts targeted at specific minerals to demonstrate proof of concept of distinct, tailored solutions. The process could identify a menu of solutions applicable to some but not all mineral resources. The NAM recommends incorporating the following criteria into this process:

[33] U.S. Geological Survey, "2026 USGS Mineral Commodity Summaries," February 2026.
[34] National Association of Manufacturers, "NAM Comments on USMCA Review," Nov. 3, 2025.

Import Dependence: Enhanced partnerships for minerals on which the U.S. is reliant entirely on imports could shore up alternative sources and mitigate against unreliable actors. As noted earlier, the U.S. is 100% net import dependent on 13 critical minerals. China is the top supplier of U.S. imports for six of these minerals (arsenic, cesium, graphite, rubidium, tantalum and yttrium) and is a prominent U.S. supplier for another four (fluorspar, gallium, indium and scandium).[35]

Global Market Concentration: A key consideration is when a significant share of a mineral's global production is controlled by a single country.[36] Strategic competitors present the greatest concern—for example, China controls at least 60% of worldwide production for bismuth, fluorspar, gallium, graphite, indium, magnesium, rare earths, silicon, tellurium, titanium (metal), tungsten and vanadium.[37] However, a major concentration of a mineral's supply in any country presents supply chain vulnerabilities that could be mitigated by developing and securing alternative sources of supply. Other minerals with at least 60% of global production in a single country include cobalt (Democratic Republic of the Congo), nickel (Indonesia), niobium (Brazil) and platinum (South Africa). Any analysis of market concentration should consider both the physical location of mineral resources and the ownership of invested mining and processing operations as key risk factors.

Global Market Structure: Some critical materials like copper and aluminum are high-volume, globally traded base metals with transparent price discovery mechanisms, robust financial markets and established recycling/scrap markets. Other minerals such as certain rare earth elements are produced in much smaller volumes and pose different attributes of smaller-scale markets. The administration should consider grouping based on global market structural dynamics in evaluating policy approaches.

National Security Concerns: Many critical minerals are necessary for manufacturing parts and components essential in U.S. defense systems and for supplying strategic allies with American-made defense products. The defense industrial base requires high-purity, aerospace-grade materials that meet stringent strength and durability requirements from qualified processing and refining operations. For example, low-grade titanium dioxide powder is used for sunscreen, paint, plastics, paper and food, while high-grade titanium alloys are essential in the manufacturing of aircraft frames and engines. Similarly, the defense industrial base relies on ultra-pure (99.9% grade) aluminum for the frames of military aircraft, naval vessels and combat vehicles, for which the U.S. does not have production capacity and relies on imports. Tungsten is another critical component for military-grade steel production, aerospace components, munitions and ground vehicle armor.[38]

Targets of Economic Coercion: Several minerals have already faced geopolitical supply chain disruptions intended to harm U.S. manufacturer capabilities. China imposes export controls on bismuth, indium, tellurium and tungsten, along with 12 rare earth elements (including yttrium).[39] Such measures can have major implications on price as well as availability of supply—one U.S.

[35] U.S. Geological Survey, "Mineral Commodity Summaries 2026," March 2026.
[36] Hoover History Lab, "A Multilateral Commercial Stockpile for Critical Minerals," Aug. 11, 2025.
[37] U.S. Geological Survey, "2026 USGS Mineral Commodity Summaries," February 2026.
[38] U.S. Department of War, "DOD Makes Investment to Strengthen Tungsten Supply Chain," Dec. 13, 2024.
[39] Clark Hill, "China Hits Pause on Rare-Earth Export Controls and What it Means for Supply Chains," Nov. 24, 2025.

automotive tool manufacturer reported steep price increases of tungsten carbide from $330 per metric ton unit in January 2025 to over $2,100 per metric ton unit in March 2026.

Strategic Commercial Significance: Several minerals carry outsized importance in ensuring U.S. priorities in the defense, energy and technology sectors. Aluminum, antimony, titanium and alloying elements (including magnesium, manganese, chromium, silicon, nickel and zinc) and rare earth elements (such as yttrium) are essential to the U.S. defense industrial base. Lithium, cobalt, graphite and copper are pivotal to America's energy dominance. Germanium is a vital input in optical fibers that underlie all U.S. telecommunications networks.[40] Gallium and tungsten are important inputs for advanced manufacturing, including for semiconductors. Minerals like bismuth are integral to a host of manufacturing sectors, from pharmaceutical ingredients to critical water infrastructure. Many rare earths (such as gadolinium, lanthanum, lutetium, samarium and ytterbium), as well as barite and lithium, are key ingredients in medicines and cancer radiation therapies. Evaluation of commercial significance should also assess critical end uses and derivative mineral products, including magnets and batteries. Expanded comments on the importance of each of these minerals is available in the NAM's comments on critical minerals to the U.S. Department of Commerce in May 2025.

Low Substitutability: Certain critical minerals have few to no substitutes given their significance in advanced applications, such as high-performance semiconductors. Low substitutability not only creates supply chain bottlenecks in meeting demand but also highlights vulnerability to geopolitical risks. For example, China's export restrictions on gallium, which has low substitutability, disrupted supply chains critical to gallium nitride transistors and gallium-based radar technology in defense systems. Other critical minerals with low substitutability include antimony, barite, chromium, copper, manganese, phosphate, potash, scandium, tantalum, tungsten, vanadium and rare earth elements.

Synergy with U.S. Strategic Critical Minerals Reserve: Through the announcement of a U.S. Strategic Critical Minerals Reserve, the administration has taken an untraditional approach to government stockpiles by having original equipment manufacturers identify which critical minerals, at certain grades and volumes, should be prioritized in government stockpiling. In return for supply chain stability and predictability through the stockpile, manufacturers have agreed to long-term financing commitments. This unprecedented private–public partnership underscores a shared commitment from industry and government to strengthen supply chains and collaborate in mitigating risks. The NAM encourages the U.S. to coordinate minerals of focus under this plurilateral with those prioritized under the U.S. Strategic Critical Minerals Reserve.

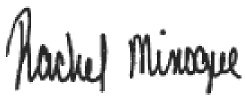
Conclusion

The NAM strongly supports the administration's goals to increase domestic capabilities and strengthen the resilience and reliability of global critical minerals supply chains. A plurilateral agreement presents a unique opportunity to rebalance the global critical minerals market based on fair market principles, transparency and technological and financial collaboration with trusted trading partners. Achieving these goals requires a sustained and holistic approach that simultaneously ensures manufacturers of all sizes and in all segments of the U.S. manufacturing economy have

[40] National Association of Manufacturers, "NAM Comments on Section 232 Critical Minerals Investigation," May 16, 2025.

access to the materials that enable the production of innovative, technologically advanced products for a wide variety of essential applications. Manufacturers look forward to working with the administration to achieve these ambitious outcomes.

Sincerely,



Rachel Minogue
Director, International Policy

Andrea Durkin
Vice President, International Policy

Annex: Sample Mineral Use Cases and Illustrative Approach to Joint Evaluation of Mineral Priorities and Partner Countries

In developing target minerals for focus under a plurilateral agreement, the administration will need to work closely with manufacturers in the U.S. to determine priority minerals, followed by an exchange of priorities with parties to the agreement. This annex provides illustrative examples of how the administration could utilize the criteria identified above to evaluate priorities for different manufacturing applications.[41]

Critical Minerals Pivotal to America's Energy Dominance: Lithium, Cobalt, Graphite and Copper

Maintaining access to lithium is critical to energy and national security in the U.S. Lithium is used in air treatment technologies, batteries, metallurgy and polymers. 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 supply of lithium.

Lithium is also a critical component of the energy systems that power artificial intelligence 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, and having lithium-ion battery storage in place can enable a backup power source in the event of disruption.

Lithium Evaluation	
Commercial Significance	**Batteries:** For use in EVs, laptops, smartphones and energy grid storage. **Industrial:** Used in dehumidification, thickening agents, greases and smelting. **Aerospace:** Used in alloys.
Current Market Conditions	**International:** The majority of world lithium production is in Argentina, Australia, Brazil, Canada, Chile, China, Mali and Zimbabwe. Global demand for lithium has increased by 20% in the past year, in part due to EV sales in China and Europe. **Domestic:** Two American companies produce downstream lithium products but produce less than 1% of global supply.
Vulnerabilities	**Imports:** U.S. net import reliance of 50%, with Chile and Argentina as leading sources. **Market Interventions:** Namibia and Zimbabwe have established export bans on lithium ore (both) and concentrates (Namibia).
Partner Opportunities	**Argentina:** Argentinian lithium mines have received increased funding for expansion, including an Inter-American Development Bank long-term loan of up to $50 million.[42] **Canada:** The Canadian government announced new partnerships in 2026 in developing a lithium processing facility and lithium conversion infrastructure in Ontario.[43]

[41] U.S. Geological Survey, "Mineral Commodity Summaries 2026," March 2026.
[42] IDB Invest, "IDB Invest Boosts Argentina's Lithium Production to Promote Green Energy Transition in Latin America and the Caribbean," Dec. 14, 2023.
[43] Government of Canada, "Canada Secures 30 New Critical Minerals Partnerships and Unlocks $12.1 Billion in Mining Project Capital," March 2026.

Cobalt is among what DOE has deemed the “electric 18” materials essential to ensuring American energy dominance. Cobalt is a key component of the lithium-ion batteries that power Americans’ personal electronics, including smartphones and laptops, as well as their vehicles, and is a required input for aircraft gas turbine engines, including military aircraft.

The NAM commends the EXIM Bank 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 the production of critical minerals in the U.S., more needs to be done to ensure a reliable supply of cobalt for our energy and national security needs.

Cobalt Evaluation	
Commercial Significance	**Batteries:** Key component of the lithium-ion batteries that power smartphones and laptops, as well as vehicles and aircraft gas turbine engines, including military aircraft.
Current Market Conditions	**International:** The Democratic Republic of the Congo controls 73% of worldwide production for cobalt. The DRC imposed export restrictions followed by quotas on cobalt in 2025. China remains the global leader in refined cobalt. **Domestic:** There is only one primary cobalt-bearing mine in the U.S., which exports primarily to Canada for processing. The U.S. has no commercial-scale cobalt refineries. In 2025, the U.S. published and later canceled a solicitation for cobalt for the National Defense Stockpile.
Vulnerabilities	**Imports:** U.S. net import reliance of 79%, with Norway, Finland, Canada and Japan as leading sources. **Market Interventions:** Namibia established an export ban on cobalt ores and concentrates in 2023, and the DRC imposed an export quota on cobalt in 2025.
Partner Opportunities	**Chile:** In 2024, through the China and Transformational Exports Program, the EXIM Bank issued a letter of interest to a U.S.-run mine for a loan of $317 million in return for long-term access and an offtake agreement.[44] **Norway:** Primary import origin source for metal, oxide and salts (26%) and has taken extensive measures to increase mapping of mineral deposits on the Norwegian continental shelf and seabed.[45]

Graphite, both natural and synthetic, is necessary for a variety of industrial applications. It is an important material for all battery types, 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 subsidization and overcapacity in both natural and synthetic graphite enable below-market priced graphite to compete unfairly in the U.S. market with domestic producers.

[44] Chilean Cobalt Corp., “Chilean Cobalt Corp Annual Update,” Feb. 27, 2025.
[45] Norwegian Offshore Directorate, “Seabed minerals,” Nov. 22, 2024.

Graphite Evaluation	
Commercial Significance	**Batteries:** Used in bipolar plates in fuel cells, heat sinks and conductive brushes for electric motors. **Automotive:** Critical in brake lining, clutch materials, gaskets and seals. **Aerospace:** Used in aircraft, missiles and rockets.
Current Market Conditions	**International:** China controls 78% of worldwide production for graphite. The U.S. is 100% net-import reliant on graphite, with most originating from China (46%). In 2025, the Commerce Department determined that graphite from China is being sold at less than fair market value in the U.S. **Domestic:** Natural graphite has not been produced domestically in the U.S. since 1989.
Vulnerabilities	**Imports:** U.S. net import reliance of 100%, with China, Canada, Mozambique and Mexico as leading sources. **Market Interventions:** In 2023, China established export licensing requirements on graphite, and Namibia imposed an export ban on graphite ores and concentrates.
Partner Opportunities	**Canada:** The only operational graphite mine is in Quebec and recently was awarded over $6 million in government investment to expand the mine and strengthen production capacity.[46] Canada is also streamlining approvals for a synthetic graphite project in Ontario.[47] The U.S. receives 13% of its graphite imports from Canada.

Copper is a critical material for manufacturing as a raw input to products and industrial machinery, but it is also critical to the manufacturing, generation and delivery of the energy that manufacturers rely on for their operations. 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." 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 and additional applications in advanced batteries.

A strong, affordable and reliable energy generation mix is a key to manufacturing success, especially as the administration works to greatly expand manufacturing in the U.S., including advanced manufacturing in semiconductors and AI data centers. A study of just one data center facility in Chicago showed that the facility used the equivalent of 27 tons of copper for every megawatt of applied power, meaning it required a total of 2,177 tons of copper for construction of a single facility. And one global mining company estimates that copper used in data centers globally will grow sixfold by 2050 from half a million tons in 2025 to approximately 2 million tons in 2050.

[46] Government of Canada, "Government of Canada Strengthens the Critical Minerals Sector by Investing in Northern Graphite Corporation through its Quebec subsidiary Graphite Nordique," Aug. 26, 2025.
[47] Government of Canada, "Canada Secures 30 New Critical Minerals Partnerships and Unlocks $12.1 Billion in Mining Project Capital," March 2026.

Copper Evaluation	
Commercial Significance	Vital across manufacturing sectors given its electrical and thermal conductivity, malleability and corrosion resistance. Widely used in **aerospace, industrial machinery, electrical and electronics, automotives** and **medical** uses.
Current Market Conditions	**International:** The U.S. relies heavily on trusted sources for copper content, including Canada (99% of imported ore and concentrate, 52% of imported copper matte and 16% of imported refined copper), Chile (68% of imported refined copper) and Finland (88% of imported copper blister). China leads in copper smelting capacity. **Domestic:** The U.S. has increased mining and smelting operations but is only capable of meeting 53% of the domestic demand for refined copper cathode. Substitutability for copper is low.
Vulnerabilities	**Imports:** U.S. net import reliance of 57%, with Chile, Canada, Peru and Mexico as leading sources. **Market Interventions:** Several countries have imposed export bans since 2023 on copper, both raw and concentrates, including Indonesia, Laos, Tanzania and Venezuela. Morocco imposed export licensing requirements on copper (refined and alloys) in 2025.
Partner Opportunities	**European Union:** Has multiple sites for copper smelting. In particular, Finland is the primary import origin source for copper blister but also has pioneered flash smelting method for copper concentrates and continues to invest in technological innovation for smelting and recycling.

Critical Minerals Underlie U.S. Telecommunications Networks and the U.S. Ability to Develop AI Capabilities: Germanium

Germanium is used to help make fiber optics, semiconductors and other electronic components. Specifically, germanium tetrachloride is a necessary component to produce the optical fiber that underlies all U.S. telecommunications networks. Optical fiber provides the bandwidth and performance to support the voice, data and video services that have become critical to our daily lives and U.S. military applications and that will propel U.S. AI capabilities.

Germanium Evaluation	
Commercial Significance	**Telecommunications:** Necessary component in optical fiber for all U.S. telecommunications networks. **Semiconductors:** Used in transistors, high-frequency electronics and diodes.
Current Market Conditions	**International:** China controls 60% of the world's supply of germanium and imposed export controls in August 2023. China's National Food and Strategic Reserves Administration is buying significant quantities of germanium for domestic use in semiconductors and satellite deployments. **Domestic:** Progress was made in 2025 for germanium recovery from zinc concentrates and from recycled material. U.S. imports of germanium metal decreased by 67% in 2025 due to Chinese export controls.
Vulnerabilities	**Imports:** U.S. net import reliance of 50%, with Belgium, China, Canada and Germany as leading sources. **Market Interventions:** China imposed export licensing requirements on germanium in 2023, followed by an export ban to the U.S. in 2024. China suspended the ban in November 2025.
Partner Opportunities	**European Union:** In addition to identifying germanium as a priority critical material in legislation, the European Commission has identified two Belgian business units to improve germanium refining and recycling.[41]

Critical Minerals Are Essential to the U.S. Defense Industrial Base: Antimony, Aluminum, Molybdenum, Titanium and Alloying, Magnets and Rare Earth Elements

Antimony has been a key material in defense production for years. Antimony is critical to produce tungsten steel and harden lead bullets. It is also used in modern warfare technologies from night vision goggles to infrared sensors and precision optics, as well as in manufacturing flame retardants as well as glass and rubber products.

Antimony Evaluation	
Commercial Significance	**Defense:** Necessary in tungsten steel and to harden lead bullets. **Batteries:** Improves durability and structural integrity for lead-acid batteries in automobiles and grid energy storage. **Semiconductors:** Essential in silicon wafers and diodes.
Current Market Conditions	**International:** China controls much of the global antimony market. Other global deposits include Australia, Bolivia, Burma, Mexico, Russia, South Africa and Tajikistan. **Domestic:** Current production does not meet domestic demand. U.S. Antimony Corp. began mining in Montana in 2025—making it the first domestic mining site for antimony. Primary metal and oxide production uses imported feedstock. In 2025, the Pentagon announced a $43.4 million grant through the Defense Production Act for a mine in Idaho. Substitutability for antimony is low.
Vulnerabilities	**Imports:** U.S. net import reliance of 91%, with China, Belgium, Thailand and India as leading sources. **Market Interventions:** China enacted an export ban on antimony to the U.S. in 2024, resulting in sharp price increases and reduced access to supplies. China suspended the ban in November 2025.
Partner Opportunities	**European Union:** The U.S. imports ore and concentrates from Belgium (16%) and France (5%); EU includes antimony in legislation to reduce dependency on China. **Mexico:** Primary import source for ore and concentrates (86%). U.S. Antimony Corp. restarted smelting operations in 2025 after announcing a stall due to financing. Sourcing identified in **Australia, Bolivia, Mexico and South Africa.**

Ultra-pure aluminum has a foundational role in the defense industrial base due to its unique combination of strength, light weight and corrosion resistance properties and manufacturability. Aluminum is indispensable in military aircraft fuselages, naval vessels, missile structures and armor systems. Ultra-pure grade is required to meet strength and durability requirements of the defense industrial base. Aluminum is also widely used in energy applications as an electrical conductor.

Ultra-Pure Aluminum Evaluation	
Commercial Significance	**Defense:** Widely used in structural airframe material for aircraft, military and combat vehicles. **Energy:** Used as an electrical conductor.
Current Market Conditions	**International:** Global market is experiencing rapid growth driven by surging demand for defense capabilities, electronics and semiconductor manufacturing. Asia-Pacific region holds the largest market share, primarily in China, Japan and Korea. **Domestic:** In June 2023, Defense Production Title III funding was granted to a domestic company for high-purity aluminum production. Currently, no domestic manufacturers have the ability to refine ultra-fine aluminum.
Vulnerabilities	**Imports:** U.S. net import reliance of 60%, with Canada, the United Arab Emirates, Bahrain and China as leading sources. The U.S. is 100% net-import reliant on ultra-pure aluminum from Germany and China. **Market Interventions:** Morocco imposed export licensing requirements on aluminum ingot in 2025.
Partner Opportunities	**Japan:** In the past decade, Japan has increasingly expanded its capacity for high-purity aluminum to meet global demand.

Molybdenum, though not included on the USGS 2025 Critical Minerals List, is a vital refractory metal relied on by the defense industrial base for its strength, toughness, corrosion resistance and high-temperature properties. Molybdenum is used frequently in steel alloys as well as in rocket nozzles, jet engines and structural materials. While estimated mine production of molybdenum in the U.S. increased in 2025, China still controls most of the supply chain and is the only other producer of molybdenum from primary mines and byproduct copper mines. Other import-origin countries rely on byproduct copper production.

Molybdenum Evaluation	
Commercial Significance	**Aerospace:** In rocket nozzles, jet engines and structural materials. **Electronics:** Used in conductive materials, including solar cells, due to its low thermal expansion.
Current Market Conditions	**International:** U.S. and China are the only producers of molybdenum from primary mines and byproduct copper mines, as other countries use byproduct copper production. China's mine production and reserves are over double those of the U.S. **Domestic:** U.S. production of molybdenum concentrate increased by 18% in 2025.
Vulnerabilities	**Imports:** Leading U.S. sources of imports are Peru, Mexico, Chile and Canada. **Market Interventions:** In February 2025, China imposed export restrictions on molybdenum powders.
Partner Opportunities	**European Union:** The European Union has developed a long-term deal (Malmbjerg molybdenum production) to increase molybdenum production and mining to supply 25% of their molybdenum demand for the next two decades.

Titanium is a key component of military and commercial aircraft frames, jet engines, helicopters, missiles, naval vessels, satellites, artillery, tanks and munitions. Titanium sponge is the raw material for titanium metals and alloys, a critical component of military fighter aircraft, submarines, satellites and many other defense technologies.

Titanium along with **magnesium, manganese, chromium, silicon, nickel and zinc** are essential alloying elements for domestic aluminum production. Aluminum production requires these critical alloying elements to make aluminum inputs for key domestic sectors, including automotive, defense, health care, infrastructure and construction. Domestic aluminum scrap also contains critical mineral alloying agents. Aluminum and critical minerals contained in scrap are themselves valuable domestic critical mineral resources and support the growth of scrap supplies for domestic remelting facilities.

Titanium Evaluation	
Commercial Significance	**Aerospace:** Crucial for engines, airframes, castings and fasteners. **Biotechnology:** Used in orthopedic implants, dental implants and surgical instruments.
Current Market Conditions	**International:** China is the leading producer and consumer of titanium mineral concentrates. **Domestic**: The U.S. did not produce titanium sponge metal in 2025, as the last domestic plant closed in 2024.
Vulnerabilities	**Imports:** U.S. net import reliance of 100% for titanium sponge, with Japan, Saudi Arabia and Kazakhstan as leading sources. Leading U.S. import sources for titanium mineral concentrates include South Africa, Canada, Madagascar and Mozambique. **Market Interventions:** No existing export controls.
Partner Opportunities	**Japan:** The Ministry of the Economy, Trade and Industry leads a Titanium Production Capacity Enhancement Plan to support domestic suppliers in boosting annual sponge production capacity and increase aerospace-grade titanium supply in the global market.[48]

Critical minerals found in permanent magnets, particularly **cerium, neodymium, praseodymium, samarium, scandium and yttrium,** are used to power various defense platforms and components, including power guidance systems, sensors and communication technologies. The minerals' magnetic strength, heat resistance and efficiency result in low substitutability, especially for next-generation defense capabilities. Rare earth elements, like **erbium, europium and lanthanum,** are also utilized for their specialized, high-conductivity properties. Secure, reliable access is critical in maintaining technological competitiveness and a deployable defense industrial base.

Yttrium Evaluation	
Commercial Significance	**Aerospace:** In commercial and military jet engines, turbine blades and thermal barrier coatings. **Biotechnology:** Used in orthopedic implants, dental implants and surgical instruments.
Current Market Conditions	**International:** China produces the majority of the world's supply of yttrium, and the U.S. sources 94% of rare earth metals and compounds from China. **Domestic:** No commercial facilities in the United States have the capacity to separate or refine yttrium. Substitutability for yttrium is low.
Vulnerabilities	**Imports:** U.S. net import reliance of 100%, with China, Germany and Austria as leading sources. **Market Interventions:** In April 2025, China imposed export restrictions on yttrium product forms (yttria). As of December 2025, China's imposed export restrictions remain in effect, with some general export licenses to selected exporters.
Partner Opportunities	**Australia:** Australia has identified itself as a top rare earth producer and deposit holder, including for yttrium as well as other critical minerals found in permanent magnets, and has identified a critical minerals strategy through 2030 to strengthen supply chains.[49]

[48] OSAKA Titanium Technologies Co. Ltd., "Notice of Funding through Two-Step Loans under the Economic Security Promotion Act," Dec. 26, 2025.
[49] Australian Government Department of Industry, Science and Resources, "Critical Minerals Strategy 2023-2030," June 20, 2023.

Critical Minerals Driving Advanced Semiconductor Manufacturing: Gallium and Tungsten

Approximately 95% of all gallium produced is used to make gallium arsenide (GaAs) and gallium nitride (GaN), two critical compounds for semiconductor production that outperform silicon in high-frequency, power and temperature applications. As the U.S. has increased its demand and production for advanced semiconductors, a secure supply of gallium is crucial.

Gallium Evaluation	
Commercial Significance	**Telecommunications:** Supports ultra-fast switching essential for 5G, wireless systems and satellite communication. **Aerospace:** Used in radars.
Current Market Conditions	**International:** China accounts for 99% of worldwide primary low-purity gallium production. **Domestic:** No domestic primary gallium has been recovered since 1987. One company has the ability to recover and refine high-purity gallium from imported low-purity gallium metal and new scrap. Substitutability for gallium is low.
Vulnerabilities	**Imports:** U.S. net import reliance of 100%, with Canada, Japan, China and Germany as leading sources. In 2025, gallium imports were estimated to be more than double those in 2024. **Market Interventions:** In 2023, China began heavily restricting exports of gallium and banned exports to the U.S. in December 2024. China suspended the ban in November 2025.
Partner Opportunities	**Canada:** In 2025, Canada committed several million toward a research and development project to extract primary gallium in Quebec.[50] New gallium production projects have been announced in **Australia, Canada, Greece, Kazakhstan and South Korea**.

Tungsten has an increasingly vital role in the semiconductor supply chain due to its thermal stability and ability to form reliable, conformal conductive layers in advanced chip architectures. As advanced semiconductor manufacturing increases, demand for tungsten is also expected to increase, as it can be used in higher power densities and for small, ultra-thin conductive layers within chips. Tungsten is also a critical component in high precision machining for a host of manufacturing applications.

[50] Government of Canada, "Canada secures 30 new critical minerals partnerships and unlocks $12.1 billion in mining project capital," March 2, 2026.

Tungsten Evaluation	
Commercial Significance	**Electronics:** Critical in semiconductor fabrication and electron tubes. **Machinery and Automotive:** Tungsten is sintered with a binder, like cobalt, to produce hard tools for machining, drilling and cutting. Also used in manufacturing transmissions, brake parts, and engines. **Aerospace:** Used in rocket nozzles and turbine blades as well as superalloys.
Current Market Conditions	**International:** The world's largest tungsten supply is in China, but there are deposits on every continent with the exception of Antarctica. China leads as the world's leading producer, importer and consumer of tungsten, with their demand continuously increasing. **Domestic:** Has not been mined commercially in the U.S. since 2015, though there are seven companies that have the ability to convert tungsten concentrates. Prices of tungsten have risen dramatically since 2025. Substitutability for tungsten is low.
Vulnerabilities	**Imports:** U.S. net import reliance of 50%, with China, Germany, Bolivia and Vietnam as leading sources. **Market Interventions:** In February 2025, China implemented export controls on tungsten.
Partner Opportunities	**Canada:** In 2024, Defense Production Act Title III funding was awarded to a manufacturing project in the Yukon for tungsten in an effort to reduce reliance on Chinese supply.[51] **Kazakhstan:** A joint venture between Kazakhstan and the United States to develop tungsten resources was announced in October 2025.

Critical Minerals Are Vital to "Derivative" Manufactured Products: Bismuth, Magnets and Critical Mineral-Derived Cancer Therapies

Bismuth, magnets and many other critical minerals used in medicines and medical treatments, particularly rare earths, are core examples of how mineral inputs feature in a wide variety of derivative products.

Bismuth is used in cosmetic, industrial, laboratory, pharmaceutical and water infrastructure applications. Bismuth is best known for providing the active ingredient in over-the-counter stomach remedies and other compounds used to treat burns, intestinal disorders and stomach ulcers. The Safe Drinking Water Act requires critical water infrastructure materials, including pipe fittings, water meters and fixtures, to be free of lead, with bismuth as the primary alternative.

Magnets are used in a variety of applications from robotics to autos. For example, both commercial and personal vehicles use magnets to enable a wide range of functions and systems, including engine control, safety systems, infotainment, navigation and autonomy. Semiconductor wafer fabrication equipment uses approximately 45 critical minerals in specialized processes to produce the nanoscale circuits on microchips. Rare earths are used to manufacture permanent magnets that are especially critical to these machines' performance.

A variety of critical minerals are key ingredients in the most advanced, highly targeted cancer radiation therapies. For example, radioactive isotopes of **lutetium and ytterbium** are deployed in radioligand therapies that destroy cancer cells with significantly reduced damage to healthy cells. Many other critical minerals are used in medicines, such as **lanthanum** for end stage kidney

[51] U.S. Department of War, "Department of Defense Makes Investment to Strengthen the Tungsten Supply Chain," Dec. 13, 2024.

disease, **samarium** for bone pain and **lithium** for bipolar disorder. Critical minerals such as **gadolinium** and **barite** are used as contrast agents to enhance the quality of MRI and X-Ray images. **Neodymium magnets** are used in MRI machines, and critical mineral-based lasers are used in surgery procedures.

Bismuth Evaluation	
Commercial Significance	**Cosmetics and Pharmaceuticals:** Active ingredient for over-the-counter stomach remedies and burn treatments. **Infrastructure:** Critical replacement for lead in water infrastructure systems.
Current Market Conditions	**International:** China controls 88% of worldwide production for bismuth. U.S. imports primarily from China (56%), and prices have risen with export controls imposed in response to U.S.-issued tariffs on Chinese goods. **Domestic:** U.S. ceased primary production of refined bismuth in 1997 and secondary production in 2013 following the closure of a lead smelter.
Vulnerabilities	**Imports:** U.S. net import reliance of 92%, with China, South Korea and Germany as leading sources. **Market Interventions:** China imposed export controls on bismuth in February 2025.
Partner Opportunities	**South Korea:** Secondary import origin source (22%) and increasing production through their sole producer to mitigate reliance on China. **European Union:** Germany is a secondary import origin source (13%), and production has increased throughout the region, following efforts to secure supply chains and reduce dependency on China.