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How Critical are Critical Minerals?

White Paper

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Critical minerals are naturally occurring elements essential to U.S. economic and national security because they are both strategically important to manufacturing and vulnerable to supply disruption. They are key inputs for high-performance magnets used in aircraft, missiles, and electric motors; thermal coatings for turbine engines in fighter jets; optical materials for night-vision devices; and lasers for ISR platforms.[1] They also support semiconductors, advanced munitions, high-performance alloys, quantum technologies, and many other defense systems.[1, 2] Reliable access to these materials is therefore critical to the U.S. defense industrial base (DIB).

Despite their importance to national security and nearly every U.S. defense system, the United States remains heavily dependent on imports for many critical minerals, often from non-allied or non-friendly countries.[3] This fact is the essence of significant critical minerals supply chain risks. In recent years, the Pentagon has worked to revive domestic mining to reduce this reliance, and these efforts have focused heavily on extraction rather than on refining.[4]

The DIB can align with the commercial sector in components such as batteries and electronics. This will support the DIB's access to resources by harmonizing demand across defense and commercial sectors.

Refining, the process of purifying and separating raw ore into high-grade materials suitable for manufacturing, is an essential step in producing critical minerals. China dominates this stage by a wide margin: According to the International Energy Agency, China mined 59% of rare earths and refined 91% in 2024.[5] Similar patterns hold across many minerals, meaning expanded U.S. or partner-country mining would still often depend on Chinese refining to produce manufacturing-ready materials.[3]

Beyond the refining bottleneck, the U.S. DIB's access to critical minerals is constrained by its small market footprint. Most U.S. demand comes from commercial sectors such as automotive, consumer electronics, batteries, and renewable energy.[6] A 2024 GAO report found that the Pentagon accounted for just 0.1% of global rare earth purchases, leaving the DIB with (1) little influence to shape markets and (2) highly exposed to supply disruptions.[7] The problem is compounded by the defense sector's need for higher-purity materials than what commercial users typically require, which further weakens its demand signal. At the same time, the People's Republic of China (PRC) has tightened export controls on critical minerals for U.S. defense and dual-use applications, giving it near-total leverage over global mineral flows.[5]

The U.S. government and key stakeholders must act across supply chains, policy, production, and contracting to ensure DIB access to critical minerals. Below are recommendations to provide immediate relief, and both short-term and longer-term solutions for the DIB.

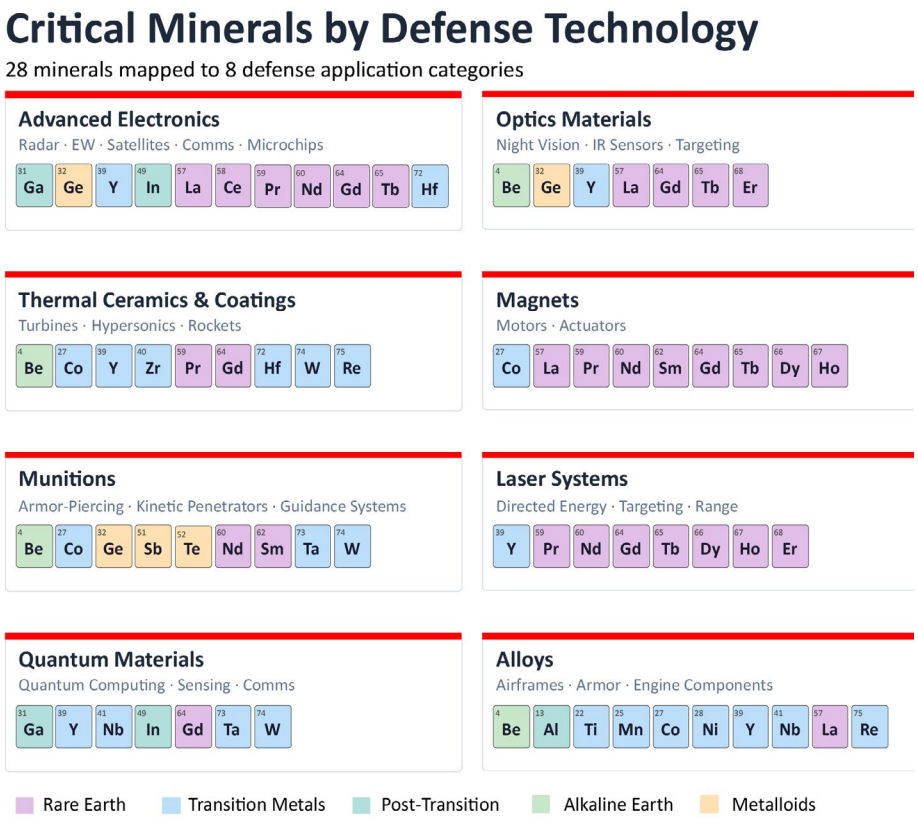
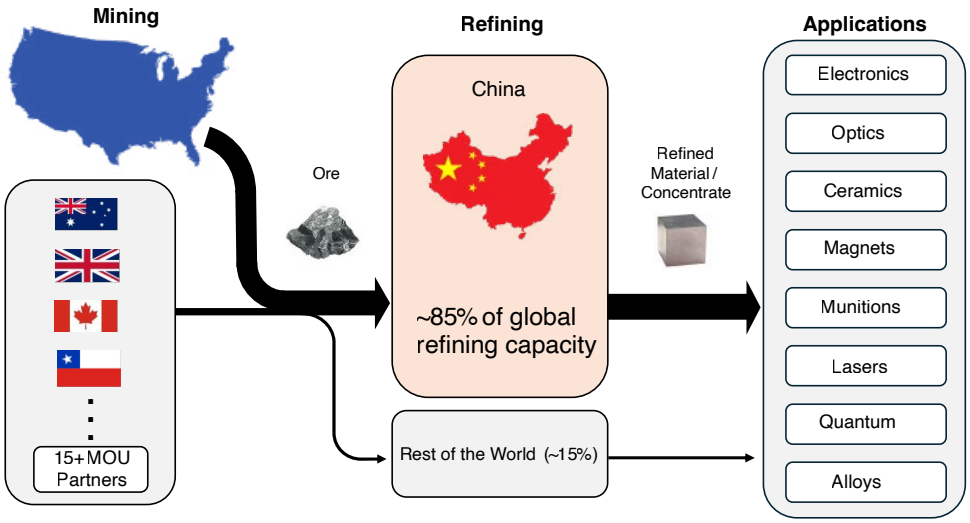


Figure 1. *Twenty-eight selected critical minerals categorized by use in defense technologies. These groupings represent tier-two and tier-three supply chain categories with countless end-uses in all sectors of the defense industry.*[1, 2, 3, 8, 10, 11, 12, 13, 14, 15]

Figure 2.
Critical mineral refining is predominantly conducted in China,[9] meaning that most materials, regardless of country of origin, will be processed in China and deemed a "Chinese product," rendering them non-compliant with U.S. regulations.



Recommendations: (Short-Term, Mid-Term, Long-Term)

1. **Continue to streamline waivers and nonavailability decisions until the Department can confirm availability of adequate capacity and quality of compliant material.** Build a faster, standardized process with clear timelines, common documentation, and material-based determinations, and help industry identify and secure compliant materials.

2. **Provide a mechanism to derisk offtake agreements made by defense companies with emerging and scaling suppliers.** Offtakes are a necessary step for suppliers to secure both private and public financing, and these agreements send clear demand signals. Offtakes, however, are risky for end users when they (1) are not typically buyers and sellers of raw material and (2) must be cost-conscious when bidding solutions to the customer.

3. **Use flexible, sector-wide financing and reserve tools.** Structure critical minerals support to fund capabilities across the sector rather than narrowly steering money to specific firms or uses, and pair that support with demand-driven reserve mechanisms to buffer price volatility.

4. **Support the DIB in re-qualification requirements, costs, and timeframes as component manufacturers and weapon systems producers work with domestic emerging and scaling REE magnet producers.** This gives DIB companies and aspiring magnet manufacturers a clear path toward a long-term supplier relationship as changing magnet block and magnet block products or suppliers trigger requalification at the component level (i.e., motor) and often at the system level (i.e., missile).

5. **Prioritize refining, separation, and metallization capacity in addition to mining.** Direct public investment and contracting tools toward the midstream stages where PRC dominance is greatest, especially for rare earth separation, metals, alloys, and magnet inputs.

6. **Cultivate international allies and partner agreements to make strategic, comprehensive, and coordinated investments to build long-term resiliency in global mineral supply chains.**

Recently Addressed Challenges

The Department has recently revised the clause prescription at DFARS 225.7018-5 to apply to contracts awarded after 1 January 2027 and clarify the compliance of material determined to be "non-available." These revisions clarify the effective date of restrictions, and enable the use of key stockpiles. Although the DNAD provides some relief, it creates a new compliance challenge in tracing of material imported after April 4, 2025, where there is no easy or existing way to trace origin to satisfy compliance requirements. Potentially leaving secured material useless even in a constrained market.

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