RARE EARTHS AND INDUSTRY: WHY DEPENDENCE ON CHINA ENDURES

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China's grip on rare earths, especially heavy rare earths like *dysprosium* and *terbium*, has gained global attention as the country has weaponized these elements in its trade war with the United States. Yet, China's dominance results from decades of deliberate state strategy, not simply geology.

Heavy rare earth elements in particular are indispensable for high-temperature permanent magnets used in electric vehicles, offshore wind turbines, and, most critically, advanced defence systems. With nearly all commercial deposits of heavy rare earths concentrated in southern China and Myanmar, Beijing commands near-total control of the entire supply chain from upstream extraction through to downstream processing.

Financial statement analysis of Chinese and Western rare earth companies highlights how the industry's volatility is shaped less by geology or market forces than by Chinese policy decisions. This has led to well publicized efforts by the U.S. and Japan/Australia to diversify rare earths, but these efforts are entirely concentrated in *light* rare earths, which are much more geographically diverse. The nuance here between light and heavy rare earths is vital. The findings in this report conclude that China's near-monopoly chokehold will persist. Deng Xiaoping's famous line that "The Middle East has oil, China has rare earths" probably understates Beijing's leverage in what is increasingly one of the world's most strategic assets, demand for which is only set to soar as a critical component in key areas of future growth, such as robotics, automation and semiconductors.

(Click on the link to read the above in Chinese, French and Spanish)

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***Chinese*:**
稀土与工业：为何对中国的依赖持续存在

中国对稀土，尤其是镝和铽等重稀土元素的控制，引起了全球关注，因为中国在与美国的贸易战中将这些元素作为武器。然而，中国的主导地位源于数十年来深思熟虑的国家战略，而不仅仅是地质因素。

重稀土元素对于电动汽车、海上风力涡轮机以及至关重要的先进国防系统中使用的高温永磁体尤其不可或缺。几乎所有重稀土商业矿藏都集中在中国南方和缅甸，北京几乎完全控制着从上游开采到下游加工的整个供应链。

对中国和西方稀土公司财务报表的分析凸显出，该行业的波动性更多地受到中国的政策决策而非地质因素或市场力量的影响。这促使美国、日本和澳大利亚大力宣传实现稀土供应多元化，但这些努力完全集中在轻稀土领域，而轻稀土的地域分布更为分散。轻稀土和重稀土之间的细微差别至关重要。本报告的研究结果表明，中国近乎垄断的局面将持续下去。邓小平的名言“中东有石油，中国有稀土”可能低估了北京在稀土领域的影响力，稀土正日益成为全球最具战略意义的资产之一，而作为机器人、自动化和半导体等未来关键增长领域的关键组成部分，稀土的需求必将飙升。

***French*:**
TERRES RARES ET INDUSTRIE: POURQUOI LA DEPENDANCE A L'EGARD DE LA CHINE PERDURE

La mainmise de la Chine sur les terres rares, en particulier les terres rares lourdes comme le dysprosium et le terbium, a attiré l'attention au niveau mondial depuis que le pays a instrumentalisé ces éléments dans sa guerre commerciale avec les États-Unis. La domination de la Chine dans ce secteur résulte toutefois de décennies d'une stratégie étatique délibérée, et non simplement de facteurs géologiques.

Les terres rares lourdes sont particulièrement indispensables pour les aimants permanents à haute température utilisés dans les véhicules électriques, les éoliennes offshores et, surtout, les systèmes de défense avancés. Etant donné que la quasi-totalité des gisements commerciaux de terres rares lourdes sont concentrés dans le sud de la Chine et au Myanmar, Pékin exerce un contrôle quasi total sur l'ensemble de la chaîne d'approvisionnement, de l'extraction en amont jusqu'au traitement en aval.

L'analyse des bilans financiers des entreprises chinoises et occidentales de terres rares montre que la volatilité du secteur tient moins à la géologie ou aux forces du marché qu'aux décisions politiques chinoises. Cela a ainsi conduit les États-Unis et le Japon/l'Australie à

entreprendre des efforts largement médiatisés pour diversifier l'approvisionnement en terres rares, mais ceux-ci se concentrent entièrement sur les terres rares légères, beaucoup plus éparpillées géographiquement. La nuance entre terres rares légères et lourdes est ici essentielle. Les conclusions de cette publication suggèrent que l'emprise quasi monopolistique de la Chine perdurera. La célèbre formule de Deng Xiaoping selon laquelle « Le Moyen-Orient a le pétrole, la Chine a les terres rares » sous-estime probablement l'influence de Pékin sur ce qui devient l'un des actifs les plus stratégiques au monde. La demande est par ailleurs appelée à s'envoler en tant que composant crucial dans des secteurs d'avenir, tels que la robotique, l'automatisation et les semi-conducteurs.

***Spanish*:**

TIERRAS RARAS E INDUSTRIA: POR QUÉ PERSISTE LA DEPENDENCIA DE CHINA

El control de China sobre las tierras raras, especialmente las tierras raras pesadas como el disprosio y el terbio, ha atraído la atención mundial, ya que el país ha utilizado estos elementos como arma en su guerra comercial con Estados Unidos. Sin embargo, el dominio de China es el resultado de décadas de una estrategia estatal deliberada, no simplemente de la geología.

Los elementos de tierras raras pesadas, en particular, son indispensables para los imanes permanentes de alta temperatura utilizados en vehículos eléctricos, turbinas eólicas marinas y, fundamentalmente, en sistemas de defensa avanzados. Dado que casi todos los yacimientos comerciales de tierras raras pesadas se concentran en el sur de China y Myanmar, Pekín controla casi por completo toda la cadena de suministro, desde la extracción inicial hasta el procesamiento final.

El análisis de los estados financieros de las empresas chinas y occidentales de tierras raras destaca cómo la volatilidad de la industria se ve influenciada menos por la geología o las fuerzas del mercado que por las decisiones políticas chinas. Esto ha dado lugar a esfuerzos ampliamente publicitados por parte de EE. UU., Japón y Australia para diversificar las tierras raras, pero estos esfuerzos se concentran por completo en las tierras raras ligeras, que presentan una mayor diversidad geográfica. La diferenciación entre tierras raras ligeras y pesadas es crucial. Los hallazgos de este informe concluyen que el dominio casi monopolístico de China persistirá. La famosa frase de Deng Xiaoping: «Oriente Medio tiene petróleo, China tiene tierras raras» probablemente subestima la influencia de Pekín en lo que se ha convertido en uno de los activos más estratégicos del mundo, cuya demanda se prevé que se dispare como un componente crucial en áreas clave para el crecimiento futuro, como la robótica, la automatización y los semiconductores.

Executive Summary

1. China's dominance over rare earths, particularly heavy rare earth elements (HREEs) such as dysprosium and terbium, remains near-absolute, accounting for over 90% and an even greater share of processing. These HREEs are geologically scarce, concentrated almost entirely in southern China and northern Myanmar, and are critical inputs for many industries of the future such as robotics, automation, advanced defense, electric vehicles, and green energy technologies.

2. The consolidation of China's rare earths sector in response to a 2014 World Trade Organization (WTO) ruling against its rare earth policies ended up further entrenching state control. Today only two opaque, state-owned groups—China Rare Earth Group and China Northern Rare Earth Group—dominate the entire supply chain, down from over 100 companies. And with quotas, licensing, and environmental enforcement, Beijing manages prices and supply with minimal transparency.

3. Outside China, only MP Materials (United States [US]) and Lynas (Australia) have material rare earth operations, but both are focused on the less strategically important light rare earth elements (LREEs). While recent US public–private partnerships with MP Materials will establish domestic LREE magnet production, they do not address the strategic bottleneck in HREEs, as these require feedstock still sourced almost entirely from Chinese-controlled deposits.

4. Potential alternative HREE sources exist in Madagascar and Vietnam, but development is constrained by environmental opposition, project delays, and limited confirmed reserves. Without Myanmar breaking from Beijing's orbit, meaningful diversification of global HREE supply remains unlikely.

5. Rare earth leverage played a role in the July 2025 US decision to reverse semiconductor export restrictions to China, with officials linking the policy shift to rare earth magnet trade negotiations. This underscores rare earths' outsized geopolitical influence despite the sector's small market size.

RARE EARTHS AND INDUSTRY: WHY DEPENDENCE ON CHINA ENDURES

Jason BEDFORD*

China's rare earths dominance was by design

1. China's dominance in rare earths wasn't simply a gift of geology (although that has a lot do with it). While China has the largest and highest quality known rare earths deposits on the planet (Figure 1), the common refrain with rare earths is that despite the name they are not rare. And there is some basis for that statement. Rare earth reserve numbers are dependent on exploration intensity, classification methodology, and economic viability thresholds, not just on the actual abundance of the minerals underground. In other words, low official reserves in many countries often reflects under-exploration or the absence of a national push to locate, quantify, and commercialize deposits. The reasoning behind that is the combination of China's low price point for rare earths and the environmental consequences of rare earth processing and extraction, the combination of which often outweighs other considerations.

2. Let's start with a bit of history. In the 1950s, China discovered the Bayan Obo deposit in Inner Mongolia, which was identified as holding vast rare earth resources. By the 1960s, the Chinese government had established the Baotou Rare Earth Research Institute to develop domestic expertise in separation chemistry and materials science, laying the technical foundations for an integrated industry. However, the pursuit of dominance in rare earths had its roots in a statement by Deng Xiaoping in 1992 when he famously remarked, "The Middle East has oil; China has rare earths." This helped frame these elements as a strategic asset that could underpin industrial leverage.

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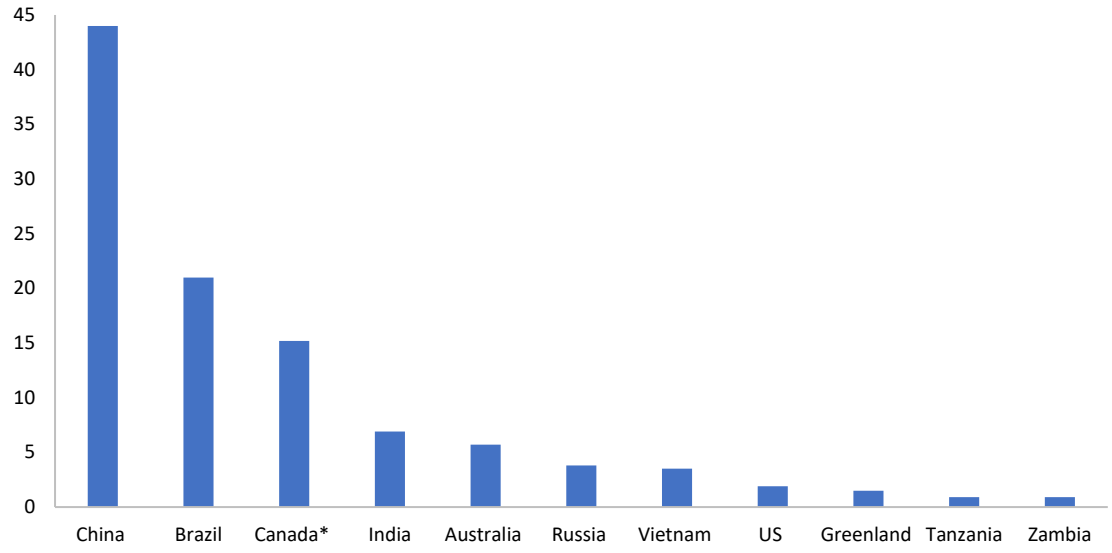
FIGURE 1 KNOWN RARE EARTHS DEPOSITS (metric tonnes)



*Canada's reserves are estimated, not proven.
Source: Statista.

3. Throughout the 1990s and 2000s, Beijing deployed a combination of export quotas, licensing regimes, and taxes to discourage the export of unprocessed ore, while offering preferential tax treatment, cheap energy, and credit to domestic processors. Rare earths were prioritized in national high-tech programs, ensuring sustained R&D funding, while permissive environmental regulation gave Chinese producers a cost advantage over foreign competitors. By the 2000s, these measures had cemented China's dominance in the industry, with the majority of the entire global rare earth chain (upstream mining, midstream separation, and downstream manufacturing) being done there.

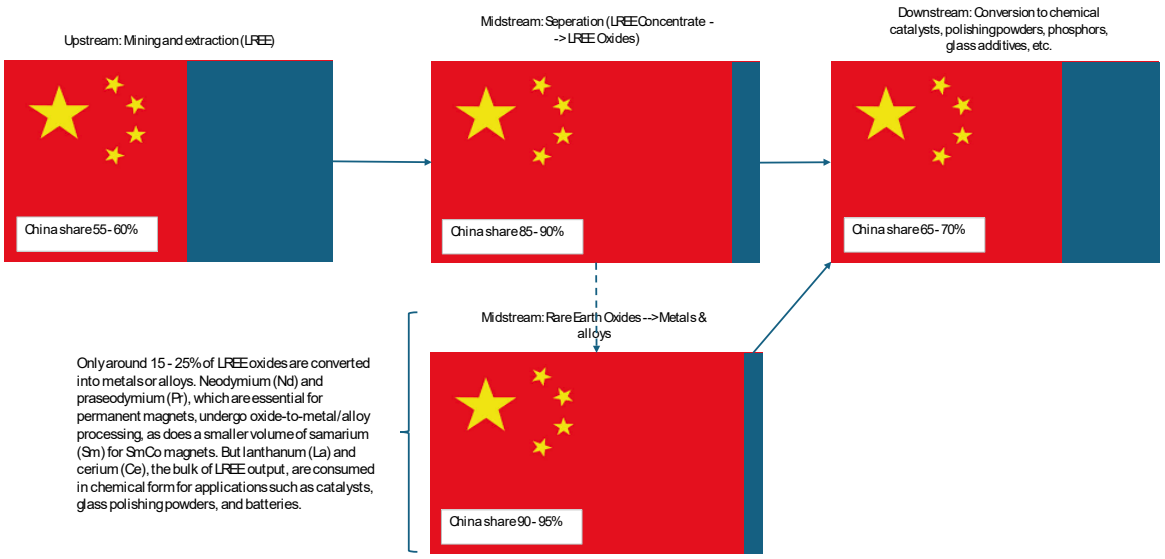
But the rare earths that matter are actually rare

4. Much of the market discussion on rare earths focuses on aggregate production, where China's share has fallen from near-total dominance to around 60–70% of global mine output in recent years. But this framing obscures an uncomfortable truth: 1) extraction is secondary, 2) processing is paramount, and 3) not all rare earths are created equal. This last point is absolutely key. It is the heavy rare earth elements (HREEs), such as dysprosium and terbium, which are critical and contain the most strategic value. These are the rare earths used for high-temperature permanent magnets in advanced defense systems, electric vehicles, and offshore wind turbines and are key to many of the world's key economic drivers: green energy, robotics,

automation, etc. UBS, for example, estimates demand of 86 million humanoid robot units by 2050, which equates to an additional USD7 bn of rare earth demand (around 2x the sector sales in 2024),[1] nearly all of which would be HREEs.

5. HREEs, however, are much more geologically scarce and occur almost exclusively in ion-adsorption clays, which are overwhelmingly concentrated in southern China and parts of northern Myanmar. Outside of these areas, most known HREE deposits are small, lower grade, more radioactive, or in environmentally prohibitive regions. This stands in contrast to LREEs such as cerium, lanthanum, and neodymium, which are far more geologically abundant and widely distributed across multiple continents, including Brazil, Australia, the United States, and parts of Africa (much of which is reflected in Figure 1). While light rare earths are still important for applications like catalysts, glass polishing, and certain magnets, they are generally easier to source and less strategically constrained. As a result, China's roughly 60–65% share of the light rare earths mine output is meaningful but not irreplaceable. This is not at all the case with HREEs though, which represent a far more genuine supply choke point for key technologies of the future. The below visual shows the gaps in China's participation between the two types of rare earths (Figure 2 and Figure 3).

FIGURE 2 LREE SUPPLY CHAIN CYCLE AND CHINA RELIANCE LEVELS

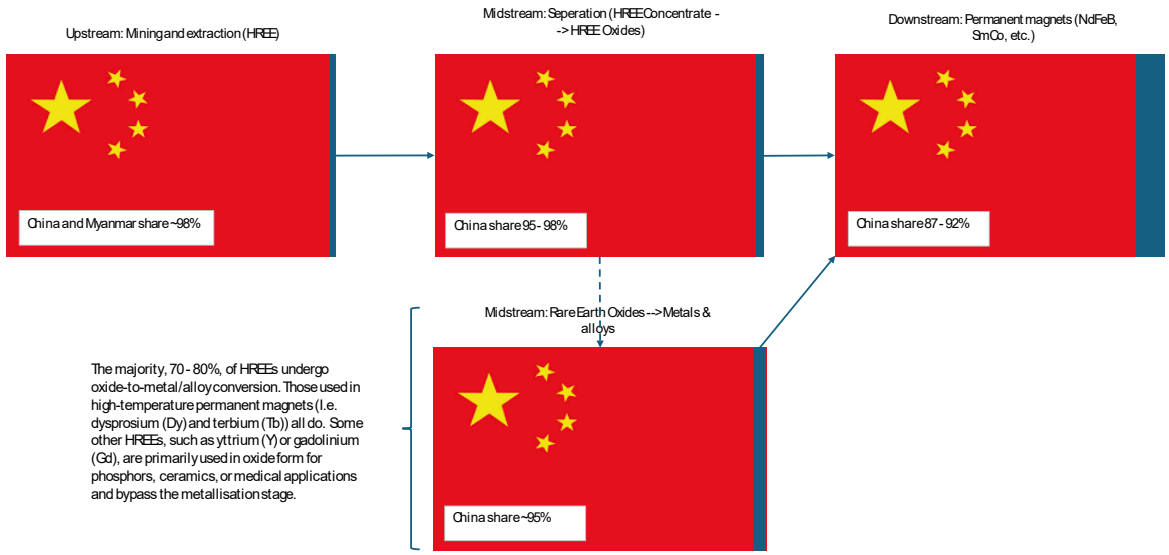


Sources: Adamas Intelligence, IEA Critical Minerals Market Review.

[1] Is the world ready for 1bn robots? UBS Securities Research, 17 June 2025.

6. Once the focus shifts from all rare earths to just the HREEs, China's position morphs from temporarily dominant to near-absolute monopoly, accounting for more than 98% of global extraction if Myanmar is included and a near equivalent share of separation capacity. This is not a market distortion that can be easily fixed by building more processing plants in the West. Without viable deposits, investment in processing is somewhat irrelevant. In this sense, Deng Xiaoping's remarks understate the level of control and dominance that China has over the rare earths that matter. The only other known material sources of HREEs sits in regions bordering China in Myanmar, which holds 10-15% of known global HREE reserves (and all of their output is processed in China). There is no clear historical precedent for this scale of control over a strategic asset. A few examples that come to mind are De Beer's control of the diamond trade in the 20th century or Sudan's control over Gum Arabic, a key input for soft drinks—but neither commodity has anything approaching the same strategic or geopolitical value.

FIGURE 3 HREE SUPPLY CHAIN CYCLE AND CHINA RELIANCE LEVELS



Sources: Adamas Intelligence, IEA Critical Minerals Market Review.

7. However, it is also worth noting how minuscule the rare earths industry is compared to any bulk metal. When compared to copper, either in market capitalization or sales value, it is not even close. Aggregating the market caps of the largest listed rare earths miners and processors (i.e., MP Materials, Lynas, NERG, CERG, etc.) only results in a combined market cap of around USD30–40 bn (i.e., less than a single mid-tier copper producer like Freeport-McMoRan). Global rare earth oxide

consumption is worth just USD7–8 bn annually, reflecting small production volumes of 300–350 kilotons/year despite high per-kilogram prices for certain HREEs. By contrast, total copper sales in 2024 were ~USD236 bn. Rare earths therefore attract disproportionate geopolitical attention not because of their market size, but because they represent niche strategic chokepoints in critical technologies.

8. The extremely strategic nature of rare earths however only became truly clear to the world in 2010 during a diplomatic dispute with Japan,[2] when China sharply slowed rare earth exports to Japan, exposing the vulnerability of global supply chains. The United States, European Union (EU), and Japan subsequently brought the case to the WTO in 2012 which ruled in 2014 that China's measures on rare earths violated its trade commitments under its WTO accession agreement. However, after that ruling the de facto situation didn't really change; indeed it ultimately entrenched deeper state involvement in the supply chain.

China consolidated its rare earths sector in response to the WTO ruling

9. The WTO ruling did have a big effect and probably not the one the US, EU, or Japan intended. China complied by removing formal quotas and export taxes in 2015, but it shifted to other forms of control such as tighter environmental enforcement and higher licensing hurdles, which had the effect of constraining supply and increasing the government's influence over prices and availability. However, the big change was a sweeping consolidation of the sector and removal of private sector players. Previously, hundreds of small mines and processors, many operating in an unlicensed capacity, played an important role in the industry. Many of these illegal producers were eventually shut down or absorbed while the more legitimate operations were merged into six powerful, state-controlled rare earths groups, each granted regional monopolies with vertical integration from mining to processing. The consolidation into these big six names was done by 2016.[3]

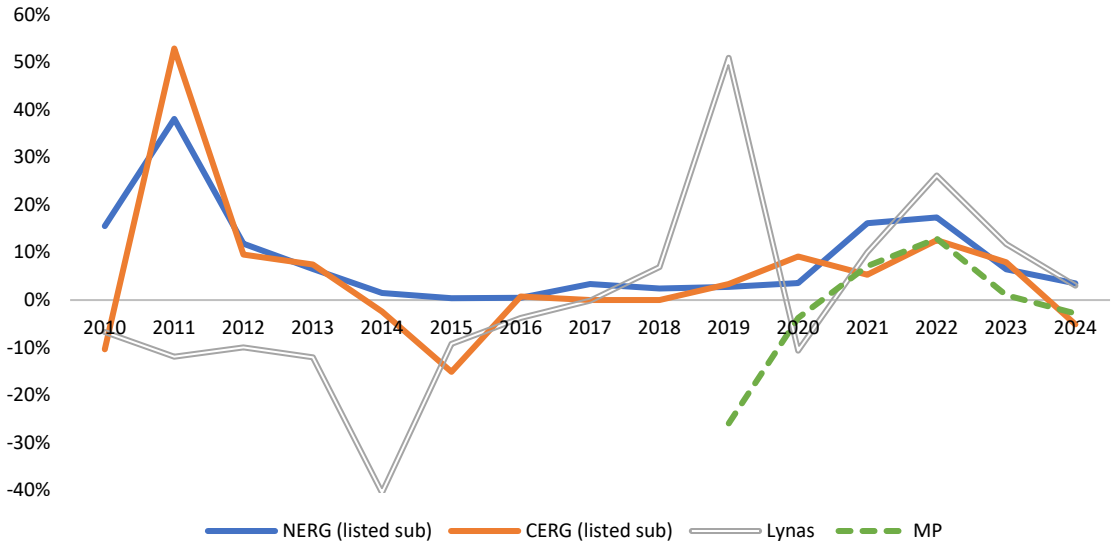
[2] In September 2010, a Chinese fishing trawler collided with Japanese Coast Guard vessels near the disputed Senkaku/Diaoyu Islands. Japan detained the captain, prompting Beijing to severely slow rare earth exports to Japan, which was then the world's largest importer, for roughly two months. Although China denied it was an embargo, customs data showed shipments plunged.

[3] China Northern Rare Earth Group, Xiamen Tungsten, Guangdong Rare Earth Industry Group, Chinalco's rare-earth division, China Minmetals Rare Earth, and Ganzhou Rare Earth Group.

10. Annual production quotas were allocated to these six entities, enabling Beijing to manage supply more effectively than under the old quota system. As a result, China not only maintained but entrenched its dominance, keeping its share of global production above 80% well into the late 2010s despite rising overseas output. However, this consolidation was furthered in 2021 when three of the six (Chinalco's division, Minmetals Rare Earth, and China Southern Rare Earth (formerly Ganzhou) were merged into the China Rare Earth Group. The group also absorbed Guangdong Rare Earth in 2024. So today, the sector is effectively consolidated into two players, China Rate Earth Group (CERG) and China Northern Rare Earth Group (NERG).

11. While the return on assets of mining companies is inherently volatile due to cyclical commodity prices and high operating leverage, rare earths producers experience a far more extreme version of this pattern, as can be seen in Figure 4. This volatility is also correlated to the fact that the rare earths market is small, highly concentrated, and disproportionately shaped by Chinese policy decisions, which can lead to extreme price swings to the tune of 5 to 10 times in a short period. Export restrictions, production quota changes, and environmental crackdowns in China are often the key swing factor in these price movements.

FIGURE 4 LISTED RARE EARTH COMPANIES (return on assets)



CERG = China Rare Earth Group, NERG = Northern Rare Earth Group.
Source: Company financial statements.

12. The situation was well summed up by Lynas[4] in their 2024 financial statements:

Supply side factors are a significant influence on price volatility for Rare Earth materials. Supply of Rare Earth materials is dominated by Chinese producers. The China Central Government regulates production via quotas and environmental standards. Over the past few years, there has been significant restructuring of the Chinese market in line with China Central government policy. However, periods of restricted supply, over supply or speculative trading of Rare Earths can lead to significant fluctuations in Rare Earth pricing.

13. China Rare Earth Group's listed subsidiary is also fairly direct in describing the importance of rare earths to China and stated in its 2024 annual report*, "Rare earths are a strategic resource in my country. The Central Committee of the Communist Party of China and the State Council attach great importance to the high-quality development of the rare earth industry, coordinating the exploration, development, utilization, and standardized management of rare earth resources."*[5]

Consolidation of the sector resulted in sharply reduced transparency

14. After this duopoly was formed, the transparency in China's rare earths sector mostly disappeared. Unlike many other entities that sit under the State-owned Assets Supervision and Administration Commission[6] (SASAC) controlled enterprises, both China Rare Earth Group and Northern Rare Earth Group operate with extremely limited transparency. Other major SASAC firms in sensitive sectors such as energy, transport, and finance publish at least basic group-level accounts, either to meet bond disclosure requirements or to support overseas operations. In contrast, these two state-owned rare earth producers only make public the financials of their listed subsidiaries, leaving the parent entities entirely opaque. This is surprisingly rare—there are only a few instances of equivalent lack of transparency (for example, China Unionpay and China Securities Finance Corporation). This reflects both the

[4] Lynas is the world's largest non-Chinese rare earth producer, with mining and concentration at the Mt Weld deposit in Western Australia and downstream separation in Malaysia. Mt Weld is a bastnäsite ore body overwhelmingly rich in light rare earth elements (La, Ce, Nd, Pr).

[5] Original wording: 稀土是我国战略优势资源。党中央、国务院高度重视稀土行业高质量发展有关工作，统筹稀土资源勘探、开发利用与规范管理。

[6] SASAC is a special commission that sits under the State Council of the People's Republic of China. It was founded in 2003 through the consolidation of various other industry-specific ministries and is responsible for managing state-owned enterprises.

strategic nature of the rare earths sector and its tight integration with government industrial policy.

15. For CERG, the listed arm only represents a very small part of the group's integrated operations. CERG's unlisted core conversely controls a far broader portfolio of upstream mines, midstream processing plants, and downstream separation capacity, much of which is not in the listed subsidiary's accounts. For NERG, the listed entity, China Northern Rare Earth (Group) High-Tech Co., Ltd. (中国北方稀土 (集团) 高科技股份有限公司), is actually a far better operational proxy because it appears to consolidate most of the group's commercial rare earth operations, including mining at Bayan Obo and separation facilities. However, even here, some assets and cash flows sit in unlisted affiliates under Baogang Group (包钢集团), so the parent group's financial situation is not entirely clear. But this entity can be used as a proxy.

16. Unfortunately, Northern Rare Earth Group is far more exposed to light rare earth elements than HREEs—hence Northern Rare Earth Group occupies a dominant but less strategically critical segment of the market. Nonetheless, their financials, of the other two global players, offer insight into the industry. This limits clarity from a financial perspective.

The current global response will do little to change the status quo

17. Globally, only two major rare earths producers and processors exist outside of China: MP Materials in the United States and Lynas in Australia.[7] The EU has no real player in this space although its Critical Raw Materials Act[8] entered into force in May 2024, which is aimed at reducing the bloc's dependency on external sources (especially China) of critical raw materials, particularly rare earths. Nonetheless, the EU lacks any real operating rare earths mining or refining facilities. Early projects

[7] There are also a number of early stage start-ups, such as Vital Metals (Canada), Iluka Resources (Australia, building a refinery), and Arafura Rare Earths (Australia) but they are not close to producing in scale.

[8] European Commission. European Critical Raw Materials Act. https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/green-deal-industrial-plan/european-critical-raw-materials-act_en?utm, accessed 18 August 2025.

like Pensana Saltend[9] in the UK are aiming to source and process light rare earth elements in Europe, but there is nothing yet that is approaching scale.

18. The urgency facing the EU has likely accelerated though. China's recent rare earth export controls, implemented in response to US export controls and tariffs, arguably impacted the EU even more than the US, as it lacked any domestic refining or substitution capacity. This stems from how these controls were implemented in April 2025, under which China required pre-export licensing under Announcement No. 18 from the Ministry of Commerce. This requirement imposed tight restrictions on the export of seven medium to heavy rare-earth elements (dysprosium, terbium, samarium, gadolinium, lutetium, scandium, and yttrium). This measure dramatically reduced supply flows, with exports plummeting over 70% for magnets and other processed forms, leading to real industrial disruptions in the automotive and defense sectors globally.

19. While aimed at the US in response to the trade ware, a Reuters report[10] detailed that the delays in rare earth export approvals for non-US importers was mostly down to bureaucratic bottlenecks, with a small Ministry of Commerce team (expanded only recently from 30 to 60 staff) struggling to process the hundreds of license applications.

20. The US has already strongly responded to China's export controls and is openly pursuing rare earths self-sufficiency. Specifically, MP Materials announced[11] on 25 July 2025 that it had entered into a multibillion-dollar public–private partnership with the U.S. Department of Defense to accelerate domestic rare earth magnet production and reduce reliance on foreign sources. The agreement includes construction of a "10X Facility" for magnet manufacturing, expected to commission in 2028, lifting US capacity to ~10,000 metric tons annually. MP will also expand heavy rare earth separation capabilities at its Mountain Pass, California site. Most

[9] Pensana PLC. https://pensana.co.uk/saltend-receives-first-phase-backing-from-the-1-billion-automotive-transformation-fund/, accessed 18 August 2025.

[10] Reuters. The world's auto supply chain is in the hands of a few Chinese bureaucrats.

[11] MP Materials Announces Transformational Public-Private Partnership with the Department of Defense to Accelerate U.S. Rare Earth Magnet Independence, accessed 12 August 2025.

importantly, the package includes a USD110/kg NdPr[12] price floor for 10 years (removing the financial risk of price swings), a decade-long full offtake commitment for 10X Facility magnets, USD150 mn in Department of Defense loans, USD400 mn in convertible preferred equity, and warrants giving the department a potential 15% equity stake. Financing commitments of $1bn from JPMorgan and Goldman Sachs will support the build.

21. Lynas also detailed in its 2024 annual report that it signed a USD258 mn deal in August 2024 with the United States Department of Defense for the construction of a U.S. Heavy Rare Earths processing facility. While these deals are framed as a decisive move toward US rare earth self-sufficiency, they really are not.

22. Both companies' flagship deposits (Mountain Pass for MP and Mount Weld for Lynas) are for light rare earth extraction only, with no meaningful concentrations of dysprosium, terbium, or any other HREEs. While both miners are establishing HREE separation and refining capacity, this does not equate to HREE self-sufficiency, because any such capacity will still require imported feedstock, which today is almost exclusively sourced from the ion-adsorption clay deposits in southern China and Myanmar. In other words, both companies remain reliant on Chinese-controlled supply. And they aren't particularly vague in explaining as much:

    a. Lynas 2024 Annual Report: "*The Company continues to investigate opportunities to secure alternative sources of Heavy Rare Earth feedstock. However, global availability is limited, with most supply originating from ionic clay deposits in China and Myanmar*."

    b. MP Materials 2024 Annual Report: "*While the Mountain Pass facility produces separated Light Rare Earth products such as NdPr, our planned Heavy Rare Earth separation capabilities will still depend on feedstock imports. Current non-Chinese supply is negligible, making global heavy rare earth supply chains highly vulnerable to geopolitical risk*."

23. The US can finance a vertically integrated light rare earth magnet industry domestically, but the most strategically critical magnet inputs for high-temperature defense and electric vehicle applications will still be bottlenecked by Chinese-

[12] This is shorthand for the combined rare earth oxides neodymium (Nd) and praseodymium (Pr).

controlled supply chains. The price floor, loans, and equity stake remove financial risk for MP, but they cannot change the underlying geology, making the MP deal far more about subsidizing a US-based NdPr industry than achieving true rare earth independence.

24. In short, the US cannot spend its way into having ion-adsorption clay deposits; they are the result of millions of years of weathering under very specific geological and climatic conditions found mainly in southern China and parts of Myanmar. However, there are potential game-changing HREE deposits that have yet to be discovered. Two countries in particular hold strong promise. Madagascar's Ampasindava Peninsula hosts one of the most promising confirmed HREE deposits outside China, with SGS Canada estimating resources of ~562,000 tonnes of rare earth oxides, about 20% of which are the high-value HREEs such as dysprosium and terbium. The ionic clay mineralization is geologically similar to southern China's deposits, meaning extraction could employ low-cost on-site leaching techniques. However, the project remains stalled due to strong community resistance, environmental concerns, and corporate instability.[13]

25. The other country is Vietnam, which is confirmed to have significant ion-adsorption clay deposits, although the US Geological Agency recently slashed their estimates of Vietnam's rare earths reserves from 22 million metric tonnes to 3.5 million.[14] However, while it is clear that Vietnam has rich light rare earth elements deposits, the scale of HREE deposits is still not known. Another country that could prove important is Brazil where there are ionic clay deposits in the Bahia and Goias regions although it is not clear what concentration levels of HREEs these locations may contain. The US and Australia also both do have HREE deposits, but they are concentrated in hard-to-extract hard rock or lower-grade formations, unlike China's rich ionic clay deposits. This makes them commercially unviable. However, with sufficient price support (i.e. 5 – 10x China prices) and long-term offtake agreements, some of these projects could become commercially viable. However, even if some

[13] Foreign Policy in Focus. Madagascar and the New Frontiers of Sacrifice Zones, 19 April 2023, accessed 12 August 2025.

[14] Mining.com. US agency slashes estimate of Vietnam's rare earth reserves in major revision, 13 March 2025, accessed 10 August 2025.

of projects (i.e. Round Top in the US and Browns Range in Australia) are brought online, they would unlikely to produce the scale of heavy rare earths required to come anywhere close to meeting US demand, particularly for defense and high-tech applications.

Rare earths look like the key factor in removal of the semiconductor export ban

26. When the US launched a trade war against China in April 2025, it was not simply hitting China with one of the highest tariff rates of any country. It also included an expanded export ban on semiconductors, particularly Nvidia's most powerful GPUs (graphics processing units), which are essential for high-end AI training and inference. The planned resumption of semiconductor sales announced in July 2025 was an abrupt, and mostly unexpected, reversal of an export restriction aimed at keeping advanced AI chips out of Chinese hands over national security concerns—something that enjoys rare bipartisan support in the US. As Democratic Representative Raja Krishnamoorthi stated: this decision "would not only hand our foreign adversaries our most advanced technologies, but (it) is also dangerously inconsistent with this Administration's previously-stated position on export controls for China."

27. Maybe this reversal should not have been unexpected. As noted by the U.S. Secretary of Commerce Howard Lutnick on 15 July 2025 in response to a question on Nvidia's resumption of sales of its H20 AI chips to China: "We put that in the trade deal with the magnets."[15] While the rolling shutdowns of automotive plants were what caught media attention, discussions with people in the US defense sector highlighted that the main sensitivity could be defense. A US Government Accountability Report from last year [16] highlighted that defense applications disproportionately rely on HREEs such as dysprosium and terbium for core uses like smart weapons, radar amplifiers, and high-temperature permanent magnets in jets and tanks. In NdFeB (neodymium–iron–boron) magnets, Dysprosium Terbium

[15] Reuters. Nvidia's resumption of AI chips to China is part of rare earths talks, says US, 15 July 2025, accessed 13 August 2025.

[16] Critical Materials: Action Needed to Implement Requirements That Reduce Supply Chain Risks, accessed 11 September 2025.

content is significantly higher for defense-grade applications than in commercial magnets. For example, while commercial magnets may contain only 1–2% HREEs, defense applications can require substantially higher levels to ensure thermal stability and reliability, making the defense sector far more exposed to HREE supply risks.

28. The geopolitical dividend China enjoys from its dominance of this strategic sector is unlike to disappear, particularly in the short to medium term. However, over the longer term the picture is less clear. As discussed before, other deposits may be discovered that could reduce China's dominant position. Other swing factors could be Myanmar falling out of China's orbit, strategic hoarding of rare earths, or technological change. One case in point on the latter is Toyota's development of NdFeB magnets that use little or no terbium/dysprosium.[17] However, none of these efforts thus far are near commercial scale, and most have trade-offs in performance or cost. But a concerted effort with significant government backing could sharply curtail HREE demand. Certain rare earths recycling technologies also show promise.

29. China also seems wise to the potential of hoarding and a further dimension of Beijing's strategy is its crackdown on stockpiling.[18] In mid-2025, Chinese authorities warned foreign companies that attempts to build large inventories of rare earths or derivative products such as permanent magnets would face tighter scrutiny and supply restrictions. Export licenses are now being reviewed line by line, with unusually large orders attracting delays or outright rejection to prevent buyers from insulating themselves against shortages. This has also had the secondary effect of compelling some foreign manufacturers to relocate production to China itself, integrating further into the domestic supply chain.

[17] Reuters. Insight: China frictions steer electric automakers away from rare earth magnets, 20 July 2021, accessed 13 August 2025.

[18] Financial Times. China cracks down on foreign companies stockpiling rare earths, 15 August 2025, accessed 25 August 2025.

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