

Jack-in-the-Stox: Who in America Is Actually Hurt by China's Rare Earth Export Restrictions?

written by Jack Lifton | September 30, 2026

In his ongoing *Jack-in-the-Stox* series, [Jack Lifton](#) comments on public companies, technologies, capital markets, supply chains and geopolitics. He is not a licensed investment adviser, and his views are provided for informational purposes only. Nothing in this column constitutes investment advice or a recommendation to buy, sell or hold any security.

Washington and Wall Street frequently discuss China's restrictions on rare earth exports as though they impose a uniform burden on the American economy. They do not. The exposure of a defense contractor differs fundamentally from that of an automobile manufacturer, a semiconductor equipment supplier or a producer of medical instruments. Understanding those differences requires examining what each industry purchases, the function that material performs and the time required to qualify an alternative.

Rare earths are not a single, interchangeable commodity. A separated oxide, a metal, an alloy and a finished permanent magnet represent distinct industrial products, with different specifications, production requirements and customers. Possession of one does not establish the ability to manufacture

the next. For an end user, the relevant measure of supply security is therefore not the availability of an element somewhere in the world, but the availability of a qualified product in the required form, quantity and delivery window.

China's April 2025 controls illustrate why precision matters. The [announcement](#) established licensing requirements for specified medium and heavy rare earth materials and products; it was not a universal prohibition on every rare earth shipment. It also provided for withholding the release of goods while customs authorities investigated uncertainty about their classification. A licensing regime can consequently introduce disruption without becoming an absolute embargo.

The useful investment question is not simply, "Which companies use rare earths?" It is: **Where can the absence of a particular qualified material interrupt production, and who possesses a commercially credible alternative?** The publicly listed companies discussed below illustrate the relevant industries and technologies. Their inclusion should not be interpreted as an assertion that each currently faces a disclosed shortage or has the same dependence on Chinese suppliers.

Defense and Aerospace

Defense and aerospace present the clearest intersection between materials dependence and strategic competition. Samarium-cobalt magnets are particularly important in demanding applications that require magnetic performance at high temperatures. Dysprosium and terbium can improve the resistance of neodymium-iron-boron magnets to demagnetization under elevated-temperature operating conditions. These are functional distinctions, not minor variations within an undifferentiated market.

[Lockheed Martin Corporation](#) (NYSE: LMT) and [RTX Corporation](#)

(NYSE: RTX) provide publicly traded examples of the aircraft, missile, sensing and aerospace systems businesses relevant to this analysis. Their significance here is not that every system they manufacture has an identical materials requirement. It is that complex defense products depend on networks of specialized suppliers whose components must satisfy demanding performance requirements.

For a defense manufacturer, securing additional neodymium or samarium oxide does not resolve a shortage of qualified actuators, magnetic assemblies or other engineered components. The oxide must pass through the appropriate conversion and manufacturing stages, and the resulting component must meet the requirements of the particular system. Changing suppliers may therefore involve considerably more than negotiating a different purchase price.

This creates a vulnerability that conventional commodity analysis can miss. A contractor might be financially capable of paying substantially more for a material while remaining unable to obtain an approved component within its production schedule. Financial capacity cannot compress every metallurgical, manufacturing and qualification process.

My judgment remains that military end uses are the most plausible targets for deliberately restrictive licensing. Selective treatment of an application, customer or intermediary can exert strategic pressure without requiring China to abandon the much larger civilian market. Investors should distinguish that potential for deliberate denial from the broader problem of administrative delay.

Automotive Manufacturing

Automotive exposure operates through a different economic mechanism. Rare earth permanent magnets are important in many electric vehicle traction motors, while the broader sector also uses numerous smaller motors and electromechanical systems. The extent of the requirement depends on the component and motor architecture; neither every electric motor nor every vehicle design has the same rare earth content.

[General Motors Company](#) (NYSE: GM) and [Ford Motor Company](#) (NYSE: F) are obvious listed-company reference points, but their exposure should be assessed at the level of individual vehicle platforms and their supplier networks rather than through an assumed company-wide measure of rare earth consumption. The important questions are which components depend on rare earth materials, whether alternative suppliers have been qualified and how quickly a disrupted component could be replaced without affecting production. Access to a mineral resource alone does not resolve this vulnerability; the material must still pass through processing, alloy and magnet production before becoming a qualified component that can be used in vehicle manufacturing.

My expectation is not that China's preferred outcome is a universal shutdown of American civilian automobile production. Chinese manufacturers have an economic interest in selling into international markets. That interest, however, is not a guarantee of predictable licensing, timely shipment or uninterrupted component availability.

A production line does not need to lose its entire magnet supply to encounter difficulty. The absence of one indispensable, qualified component can prevent the completion of an otherwise finished vehicle. The resulting financial exposure may include idle capacity, additional inventories, expedited logistics and

delayed deliveries—costs that are poorly represented by the purchase price of the missing material.

For automotive investors, the important distinction is between **material cost exposure** and **production continuity exposure**. A relatively inexpensive input can create a disproportionately expensive interruption.

Semiconductors and Advanced Electronics

Semiconductor exposure is less visible because the rare earth requirement may reside in the manufacturing equipment rather than in the finished chip. [Applied Materials, Inc.](#) (NASDAQ: AMAT) and [Lam Research Corporation](#) (NASDAQ: LRCX) illustrate the equipment businesses through which this dependence should be investigated. Both belong in a serious assessment of industrial materials risk, even though neither should be treated as a proxy for the permanent magnet market.

Applied Materials, for example, identifies a yttrium-coated process chamber in its Centura etch product [documentation](#). Semiconductor equipment patent literature describes the use of high-purity yttrium oxide coatings to improve resistance to corrosive plasma environments. These are engineered surfaces serving a specific manufacturing function, not simply quantities of an element that can be substituted without consequence.

The implication is important. Availability of a substitute oxide is not equivalent to availability of a qualified coating or chamber component. The material must perform within a process in which contamination, erosion and reproducibility matter. A purchasing department cannot establish equivalence merely by confirming that two suppliers offer products bearing the same

chemical name.

This is why aggregate tonnage provides such an incomplete measure of industrial vulnerability. A factory using a small quantity of specialized material may face severe disruption if that material is indispensable and no qualified alternative is immediately available. The economically relevant quantity is the output placed at risk, not just the mass of the missing input.

Criticality is not measured in tonnes. It is measured by the consequence of absence.

Robotics and Industrial Automation

The ambition to rebuild American manufacturing depends in part on the ability to automate it. That requires more than software, artificial intelligence and factory construction. It also requires the physical systems that translate control instructions into precise, repeatable motion.

[Rockwell Automation, Inc.](#) (NYSE: ROK) provides an example in industrial automation and control. [Teradyne, Inc.](#) (NASDAQ: TER) offers exposure to automation through its robotics activities, alongside its semiconductor and electronic test businesses. These are different business models, but both demonstrate why the investment discussion must extend beyond mines and magnet manufacturers to the equipment used by industrial customers.

High-performance servomotors and precision-motion systems are important applications for rare earth permanent magnets. Their value lies in the performance of the complete system: the relationship among magnetic properties, torque, dimensions, thermal behavior and control requirements. Replacing a magnet or motor can consequently become a system-engineering exercise rather than a straightforward sourcing decision.

There is an uncomfortable circularity here. An economy seeking to reduce its dependence on Chinese manufacturing may rely on automation equipment whose upstream materials and components remain exposed to Chinese supply chains. Building the factory does not, by itself, remove that dependence.

For investors, the resulting question is whether an automation supplier can translate demand into delivered, supported equipment at the required pace. An attractive order book is not a substitute for dependable component availability. Reindustrialization should be evaluated as a coordinated manufacturing undertaking, not as the sum of separate announcements about mines, factories and robots.

Energy

Energy is another sector in which exposure depends heavily on engineering architecture. [GE Vernova Inc.](#) (NYSE: GEV) participates across power generation, wind and electrification. Its breadth alone should caution investors against assigning one uniform rare earth exposure to every part of the business. A wind turbine, a gas turbine and a grid system do not represent interchangeable materials requirements.

[Vestas Wind Systems A/S](#) (Nasdaq Copenhagen: VWS) provides another listed example. Vestas' EnVentus platform was introduced with a permanent magnet generator paired with a medium-speed drivetrain. That is a specific engineering choice, and it is the level at which materials exposure should be examined.

The analytical mistake is to assume either that all wind generation requires rare earth magnets or that an alternative generator design eliminates the problem at no economic cost. Different architectures involve different combinations of materials, dimensions, power electronics, maintenance

requirements and operating performance. A design that is technically feasible is not automatically the most attractive design for a particular project.

Substitution should therefore be assessed against the economics of the complete system. Relevant questions include the cost of redesign, the time needed for validation, changes in manufacturing requirements and the implications for installation and service. Simply identifying a technology that uses fewer rare earths does not establish that an existing product can be converted quickly or economically.

Engineers can identify alternatives. Investors must determine whether those alternatives preserve the economics on which the original project was financed.

Medical and Specialty Equipment

Medical applications demonstrate why the rare earth discussion cannot be reduced to permanent magnets. [GE HealthCare Technologies Inc.](#) (NASDAQ: GEHC) markets gadolinium-based MRI contrast agents, including Omniscan. The relevant material in that application is part of a diagnostic pharmaceutical product, a different supply chain from the magnet system of the imaging equipment itself.

[Boston Scientific Corporation](#) (NYSE: BSX) provides a separate example through its holmium laser systems for urological procedures. Its MOSES Raydar product documentation identifies a holmium laser system and the Ho:YAG wavelength. This is another specialized materials application, distinct from both MRI contrast chemistry and motor magnets.

The distinction matters because “medical rare earth demand” is not a single market. Different products require different

elements, chemical forms and manufacturing processes. A supply response that addresses one application may do nothing for another.

These markets need not be the intended targets of export restrictions to experience disruption. In my assessment, uncertainty about classification, documentation or permissible end use can encourage suppliers to defer transactions rather than risk an adverse regulatory interpretation. Commercial caution can amplify the effect of a control beyond the transactions that a government explicitly intends to prevent.

For investors, small material volumes should not be mistaken for small operational consequences. The correct inquiry concerns qualified alternatives, inventory coverage and the practical time needed to validate a change—not whether the application consumes enough tonnes to appear prominently in a global demand forecast.

The American Rare Earth Industry and Its Allied Supply Chain

Given the breadth of my work across the rare earth industry, naming and discussing the companies contributing to an American and allied supply chain would require a substantially longer treatment than this column allows. A selective list would inevitably leave out others whose work merits consideration. My focus here is therefore the industrial challenge itself, rather than an assessment of individual companies.

The most consequential long-term exposure may be that of the emerging American rare earth industry itself. China's position rests on considerably more than mineral resources: it encompasses processing capacity, specialized equipment,

technical knowledge and established downstream manufacturing. Reproducing that combination requires more than developing additional mines or financing individual plants. It requires connecting the stages of production into a commercially functioning supply chain.

Those stages are not interchangeable. The ability to produce a separated oxide does not, by itself, establish the ability to manufacture a metal, an alloy or a finished magnet. Each operation has its own technical requirements, and its output must be suitable for the next manufacturing step. The relevant question is therefore not simply whether a particular capability exists, but whether it can supply the required product consistently, at sufficient throughput and to the customer's specifications.

The less visible constraint is operating knowledge. A financed plant must still be operated by people who understand what happens when feed composition changes, how impurities move through the process, and how adjustments affect recovery, purity and throughput. Equipment can be purchased, but recognizing a developing process problem before it compromises a production campaign requires experience. Capital can support the development of that expertise; it cannot substitute for it.

An allied supply chain also requires coordination among capabilities located in different countries. Resources, separation expertise, metallurgical capacity and component manufacturing do not necessarily exist in the same jurisdiction. The commercial task is to connect them through compatible specifications, dependable supply arrangements and customer qualification. A collection of separately financed facilities should not automatically be mistaken for an integrated industrial system.

Restrictions affecting access to production technology and specialized equipment can therefore have consequences beyond an interruption in material shipments. They can constrain the means of establishing an alternative source, not merely access to the existing one. Where operating knowledge is also difficult to obtain, the challenge extends to training the people who must commission, troubleshoot and sustain production. This is why technical expertise belongs alongside feedstock and financing in any serious assessment of supply security.

The distinction is fundamental. Finding another source of rare earth material addresses a supply requirement. Establishing the ability to process that material repeatedly, economically and to specification addresses an industrial capability requirement. The American and allied industry must accomplish both.

The Investor's Question

For investors, the decisive question is not which company controls the largest rare earth resource, but which can convert available feedstock into a qualified product that a customer will purchase. Geological scale matters, but it does not establish operating competence, product suitability or commercial viability. The distinction is between what a deposit contains and what a business can reliably deliver.

Due diligence should begin with the customer's requirements and work backward through the production process. Which rare earths can the company recover, in what saleable forms, at what specifications and at what sustained throughput? Has the customer qualified the product, and does that qualification apply to a laboratory sample, an initial production campaign or recurring commercial supply? These are different milestones, and investors should not value them as though they were equivalent.

The next questions concern the company's ability to sustain that production. What feedstock is available, on what commercial terms, and with what processing requirements? Which operations depend on external technology, equipment, reagents or technical personnel? The industrial capability required extends beyond the plant itself to the specialized equipment, process knowledge and workforce needed to produce material consistently to specification.

Valuation must connect those capabilities to achievable selling prices, recovery rates, operating costs, capital requirements and customer demand. Strategic importance does not, by itself, establish an attractive investment: a nationally useful facility may still struggle with high costs, insufficient utilization or uncertain sales. The financing challenge is particularly acute when substantial capital must be committed before customers will make firm purchasing commitments. Investors must therefore distinguish between **adding value to a material and retaining enough of that value to earn an adequate return on capital.**

The sector distinctions examined here remain important. Defense, automotive manufacturing, semiconductors and medical equipment do not face identical sourcing constraints, qualification requirements or consequences from interruption. My investment framework nevertheless applies the same test across them: identify the particular supply constraint, establish what resolving it requires, and determine whether the proposed supplier possesses the necessary capability. Resource size alone cannot answer those questions.

The rare earth problem is therefore not simply a mining problem. **It is an industrial capability problem.** A mineral deposit begins a supply chain; it does not complete it. Its contents become useful through separation, refining and the subsequent manufacturing steps required to meet a customer's

specifications.

For the emerging American and allied supply chain, the measure of progress must be qualified products delivered repeatedly to paying customers—not merely resources identified or capacity announced. For investors, the additional test is whether those deliveries can support a durable, profitable business. That is the distinction between industrial capability and a stock-market story, and it is why my guiding rule remains: **Follow where value is added.**