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## Rare earth magnets: Supply link from mine to magnet

*Rare earth magnets are crucial for electric vehicles, wind turbines and precision missile systems. Despite having large rare earth reserves, India has no capacity to produce these magnets yet. The govt needs to shoulder the market and revenue risks for the sector to take off*



Representative picture [Wikimedia Commons](#)

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### Article Content:

Rare earth magnets are the invisible force behind the world's transition to electric vehicles, renewable energy, and cutting-edge defence systems. At the heart of these technologies lies a small but indispensable component: the neodymium-iron-boron permanent magnet. Without it, electric motors stall, wind turbines falter, and advanced missile systems lose precision. India, despite its sizeable rare earth reserves, has no domestic capacity to produce these critical magnets. We have to address this strategic blindspot that could cripple the country's ambitions in EVs, renewables, and defence unless addressed immediately.

### Why the markets won't solve this

The rare earth supply chain is notoriously capital-intensive and high-risk. Developing a mine-to-magnet project can take 5-10 years, with massive upfront costs and no guaranteed cash flows. Traditional project finance models do not work here as banks see too much risk and not enough precedent. Experience shows the market has been flooded to drive down prices and kill off competitors multiple times. No investor will risk capital in a sector where prices can fall below the cost of production overnight due to geopolitical manipulation.

Under these conditions, mere funding support engineered through grants and tax concessions may be sub-optimal. Governments must support an enterprise with an assured offtake and price over its lifetime. In effect, the private sector takes on the technology and production risk, and the government takes on the complete market and revenue risks.

In 2022-23, Apple signed a multi-year, \$500-million procurement deal with a Nevada-based rare earth miner and processor. Crucially, the tech giant agreed to prepay \$200 million to help the company establish a full-fledged domestic supply chain—from mine to magnet. This wasn't charity; it was strategic foresight. Apple, whose devices and production lines depend heavily on rare earth magnets, saw the writing on the wall: continued reliance on foreign supplies was a vulnerability.

Soon after, the US Defense Advanced Research Projects Agency (DARPA) stepped in with an even more dramatic move. It committed to guarantee a price of \$110/kg for neodymium-praseodymium (NdPr) oxide, a key ingredient in rare earth magnets, at nearly double the prevailing global market price. Why? Because without such assurance, no company would risk building costly infrastructure in a price-volatile, externally-dominated market.

India imports nearly all the 900 tonnes of magnets used annually despite holding the fifth-largest rare earth reserves in the world. Not a single commercial magnet factory exists in the country as of 2025. India's only meaningful processing activity is via IREL (India), which produces about 1,500 tonnes of NdPr oxide, most of which is used in R&D or exported.

The recent shortage in the supply chain as a result of geopolitical events sent a shockwave through India's automotive and electronics sectors. Factories were caught off guard. A small magnet—worth less than 5 percent of a vehicle's value—threatened to paralyse entire production lines.

That's why the Apple and DARPA approach is so important. Apple broke the 'chicken-and-egg' financing deadlock by acting as an anchor buyer. DARPA solved the viability problem by assuring a fair return on investment, regardless of global price swings.

### **A strategic policy blueprint**

India must respond with the same clarity and urgency that the US demonstrated in the sector. At the core of this strategy should be a government-backed price guarantee mechanism. Just as DARPA committed to paying nearly double the market price for NdPr oxide to secure a viable domestic industry, India must step in assure producers that their investments will not be derailed by sudden price collapses orchestrated by foreign suppliers. A stable price fixed for 10-15 years can provide the necessary foundation of certainty.

India must identify and empower at least three champions with deep capabilities in metallurgy, forging, and materials science. There are established players to take this forward. This must be complemented by a network of anchor buyers—public and private companies that can enter into structured buying agreements with domestic magnet manufacturers, with financial support covering any cost differential versus imports. These contracts will ensure that the production facilities are optimally used and financially sustainable.

India should also establish a strategic magnet reserve akin to the strategic petroleum reserve, to provide buffer stocks during disruptions and ensure supply continuity for critical sectors like defence and renewable energy.

The development of dedicated rare earth industrial parks in mineral-rich regions such as Odisha, Andhra Pradesh, or Tamil Nadu can drive economies of scale and enable shared infrastructure. These clusters can benefit from plug-and-play facilities and integrated logistics.

The Apple-DARPA blueprint offers a clear model of a three-pronged support—upfront capital, assured offtake, and price guarantees to enable investments in refining, alloying, and precision magnet production. This is a working model of supply chain resilience in rare earths and magnets that India must emulate.

***(Views are personal)***

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