

OPINION: How to make electric vehicles affordable

India needs to capitalise on rich deposits of rare-earth elements used in the production of permanent magnets that power electric vehicles.

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[Electric vehicles \(EVs\)](#) are all set to play a critical role in India's transition to a [green economy](#). However, there are speed bumps along the road, especially with regard to manufacturing. The domestic [EV manufacturing](#) industry relies heavily on the import of a key supply-chain component — the traction motor — that houses [permanent magnets](#) made of rare-earth elements (REEs).

Given India's ambitious plans for a mass-scale shift to EVs by 2030, around 9,000 and 11,000 tonnes of permanent magnets will be required in the two-wheeler and four-wheeler segments, respectively. Permanent magnets, which are extensively used in EVs, are made from neodymium, an REE. Compared to conventional magnets, permanent magnets are highly efficient as they are compact and do not get demagnetised under extreme conditions.

Though India has significant deposits — around 10 million tonne — of monazite ore from which neodymium can be extracted, these deposits are not being utilised for the indigenous manufacture of permanent magnets, as we do not have the requisite technology for processing rare-earth (RE) metals. Therefore, we export monazite to Japan, which uses it to manufacture permanent magnets.

Magnet Market

Currently, China dominates the permanent magnet manufacturing ecosystem, controlling almost 90 per cent of the market. Japan, USA, Germany, France, and Britain account for the rest.

Unfortunately, despite being home to neodymium-rich monazite, India needs to rely on China for permanent magnets that [power](#) its EVs. The government-owned India Rare Earth Limited (IREL) currently exports processed monazite to Japan,

a key component in the manufacture of magnets. India's monazite is coveted in the international market because it contains dysprosium, which distinguishes a high-grade permanent magnet from a low-grade one.

Explore domestic manufacturing

India has the technical expertise for exploration, mining, and extraction of REEs. IREL has set up a 10,000 tonnes per annum plant for monazite processing and can produce around 5,000 tonnes of RE oxides annually. Currently, these RE oxides are exported since the technology to process RE metals is not available in India. If India can acquire the technology, it will help the indigenous manufacture of permanent magnets.

It is not too late for India to capitalise on its resources. If these issues could be resolved, India will not be dependent on other countries for its EV requirements.

Globally, studies are underway to reduce the manufacturing costs of EVs by decreasing the quantity of REEs in a magnet. For instance, Hitachi Metals has developed such magnets without impacting their performance. Toyota has also developed new magnets for electric motors, reducing the use of critical REEs by 50 per cent. India should explore similar opportunities to manufacture permanent magnets at competitive prices.

Recycle and recover

REEs can also be recycled and recovered from electronic waste such as magnets used in computer hard disks and air-conditioning (AC) units. REEs constitute around 30%–33% of a hard disk drive. It is estimated that 152 million computers in India will become obsolete by the end of the year. In such a scenario, around 1,700 tonnes of permanent magnets used in hard disk drives might end-up in landfills, leading to other environmental issues.

Currently, India recycles 95 per cent of its e-waste in a crude manner. The Government of India should streamline the process so that the extraction of REEs from e-waste is effective.

India could also explore the options for REE-free motors like the ones developed

by Tesla. These motors are as efficient as permanent-magnet-based motors. Currently, such motors are at various stages of development and far from being commercialised.

Given the strategic importance of the REE sector, it will be prudent on the Government's part to prioritise it under the Aatmanirbhar Bharat mission. Research and development activities in this sector should be encouraged. The Government should also invite private participation for commercial production of REE technologies. Only such proactive steps will expedite India's transition to a green economy.

[This opinion piece was authored by Dr Anjali Singh, Research Scientist and Bhupesh Verma, Senior Research Analyst at the Center for Study of Science, Technology and Policy (CSTEP). They work in the area of Strategic Materials]