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## **Indian Rare Earth Industry: Current status and future opportunities**

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Rare earth elements (REE) and other energy critical materials are extensively used in clean energy applications like wind turbines, electric vehicle batteries/electric motors, solar energy collectors, thin film technologies and in many strategic applications. The supply chain for rare earth sector generally consists of exploration, mining, extraction and manufacturing of finished products. Among rare earth containing products, the permanent magnets and phosphors are the market drivers. Magnets made from rare earths are many times more powerful than those made from conventional materials. In view of the near monopoly of supply from China, there is a need for an appropriate strategy for their indigenous production.

In India, monazite mineral has been the principal source of rare earths. It occurs in association with other heavy minerals, such as ilmenite, rutile, zircon, etc., in the beach sands and inland placer deposits. It also contains thorium and uranium and hence comes under Department of Atomic Energy . Although India possesses large deposits of monazite, the more valuable heavier rare earth elements (HREE) are not present in this mineral. The feasibility of exploring some other non-radioactive minerals, like xenotime which is richer in HREE, need to be accelerated in context of public-private partnership. There is a need for strengthening of exploration expertise with modern concepts and tools including remote sensing capabilities. This will enable locating suitable target areas for further search of economically exploitable deposits of the preferred REE. Further, in case of REE the key issue is the separation of the individual elements. State of the art rare earth metals extraction techniques and facilities have to be pooled and the gap in the areas needs to be identified. Recycling of end-of-life rare earth containing products are another source of critical rare earths and these technologies need to be developed on commercial scale.

As large scale adoption of clean technology is expected in future, it is important to achieve self-sufficiency in rare earths value chain. India needs to take necessary initiatives in value-added refining, metal/alloy production and manufacturing components for end-use. The issues surrounding the REEs need serious and sustained attention and we need a national level programme to develop a robust REE sector roadmap.