

CRITICAL MINERALS

All the Right Elements Behind The
Star of Electrochemistry

Part I: Mission Critical

**India's efforts to step up domestic
production of critical minerals remain
crucial for its energy security**

May 2024



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2 The Balancing Act: Solving Energy Storage



3 Chinese Influence on Green Energy Map



4 The Holy Grail of Lithium-Ion Batteries



5 Government Scrambles to Make Up for Lost Time



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Mineral intensity of green energy is significantly higher than conventional energy systems. Thus, transformation of energy systems to increasing mineral intensity from increasing energy density is an irreversible process for meeting net zero commitments. This is expected to result in a surge in demand for critical minerals required in such green technologies. Consequently, global energy policy's priority has been gradually shifting from fuel/energy security to mineral security.



- Global deposits of critical minerals are more concentrated than most industrial minerals, fossil fuels, and hydrocarbons. Additionally, China dominates the processing and refining of critical minerals, controlling between 65%-100% of the global capacity to make battery-grade lithium, cobalt, manganese, and graphite.



- Critical mineral global supply chains therefore, remains exposed to supply shocks from key producing/ processing regions, resulting in elevated price volatility. Consequently, countries are trying to increase self-sufficiency and reduce import dependence.



- While Sony Corporation commercialised the lithium-ion-battery (LIB) in 1991, its demand accelerated following the rapid adoption of renewable energy and electric vehicles, post the 2015 Paris Climate Agreement. This led to a steep jump in the demand for critical minerals, like lithium, nickel, cobalt, manganese, and graphite, being the building blocks for LIBs.



- India meets 100% of the requirement of battery materials like lithium, cobalt, and nickel through imports. Thus, the Government of India (GoI) has started auctioning 38 blocks of critical minerals. However, given the preliminary stage of exploration for most of the blocks, their commercialisation and associated benefits are unlikely in the current decade ending 2030.



- The grades of materials used in green technologies are significantly higher than their conventional industrial uses, requiring specialised knowhow in mineral processing and refining technologies. India's progress has been limited in this area. Therefore, there is a requirement for building domestic capability in mineral processing technologies like beneficiation and leaching.



- The risk profile of exploration activities increases for deep-seated/ critical minerals, over surficial or bulk minerals, as the probability of finding a good reserve remains low for the former. Hence, to enable a more attractive risk-return framework for bringing specialised overseas mining companies, the GoI introduced auction of exploration licence.



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