

India's EV Push Amid Chinese Export Restrictions on HREEs

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India's EV Push Latest News

- China—holding over 90% of global rare earth processing—has imposed curbs on exports of key **heavy rare earth elements (HREEs)** critical for EV motors, threatening global EV supply chains.
- In response, **Indian start-ups** like Simple Energy and Chara Technologies are **developing rare-earth-free or rare-earth-light electric motors**.
- This marks **a crucial step toward Atmanirbhar Bharat**, de-risking supply chains, and strengthening India's EV ecosystem.

Background - China's Rare Earth Export Controls

- **Export curbs on 7 HREEs (April 2025):** Samarium, gadolinium, terbium, dysprosium, lutetium, scandium, yttrium.

- **Expansion of export curbs (October 2025):** Holmium, erbium, thulium, europium, ytterbium along with related magnets and materials.
- **Reason behind curbs:** These restrictions emerged amidst **a prolonged US-China trade war**, creating **strategic vulnerabilities** for global EV firms.
- **Indian imports:** India imported **2,270 tonnes** of rare earths in 2023-24 (23% rise since 2019-20), with **65% reliance on China**.

Indigenous Technological Responses in India

- **Simple Energy:**
 - **Key innovation:** Developed and homologated a heavy rare-earth-free Permanent Magnet Synchronous Motor (**PMSM**).
 - **Eliminated restricted HREEs by:**
 - Using optimised compound magnets (iron, neodymium, boron, praseodymium, holmium).
 - Employing proprietary algorithms for real-time heat, torque and magnetic field management.
 - **Performance:** Almost 99.5% equivalence to conventional PMSM motors.
 - **Handling Chinese restrictions:** Holmium was later added to the restricted list. The company has already developed holmium-free magnets and has buffer stock.
 - **Market presence:** All current EVs use restricted-HREE-free motors. 1,050 units sold in October 2025 (highest ever, recording 215% YoY growth).
- **Chara Technologies:**
 - **Key innovations:** Developed **India's first** EV-grade Magnet-Free Synchronous Reluctance Motor (**SynRM**), eliminating all magnet requirements.
 - Overcame traditional SynRM limitation (low-speed industrial application) by creating
 - High-speed, variable-speed EV-compatible motor.
 - **Comparable torque and power** to rare-earth-based PMSM motors, with only a slight increase in size — about 16% larger.
 - **Deployment:** Currently used in agricultural and industrial machinery, with expected entry into the three-wheeler segment.

Strategic Significance for India

- **Supply chain security:** Reduces dependence on China's volatile supply of rare earths. Mitigates risks for India's rapidly growing EV and electronics industries.
- **Atmanirbhar Bharat and technological sovereignty:** Boosts indigenous R&D, IP creation, and local manufacturing capabilities.
- **Geopolitical cushioning:** Provides strategic resilience in the face of global critical mineral weaponisation.
- **Industry momentum:** Ola Electric, TVS Motor and others are also exploring rare-earth-free motors (e.g., ferrite motor approved recently).

Challenges

- **Technical and manufacturing challenges:** Matching compactness, efficiency, and performance of rare-earth PMSM motors (especially for SynRM). Scaling production while reducing size and weight.
- **Cost and supply stability:** Availability of alternative magnet compositions must be sustainable and cost-effective. Global rare earth volatility continues to pose uncertainty.
- **Market adoption:** Original equipment manufacturers' (OEM) willingness to shift from established PMSM technologies to new indigenous designs.
- **Raw material ecosystem:** India still lacks a robust domestic rare earth mining, processing, and refining ecosystem.

Way Forward

- **Strengthening critical mineral security:** Accelerate exploration under the **National Mineral Exploration Policy**. Build processing/refining capacity through PPPs and global partnerships.
- **R&D and innovation support:** Incentivise indigenous EV component technology under PLI schemes, R&D grants, and Start-up India.
- **Creating a local magnet and material ecosystem:** Encourage production of ferrite, non-rare-earth magnets, and alternative alloys.
- **Scaling manufacturing:** Support commercialisation via demand aggregation, state EV policies, and fleet adoption.
- **Strategic global collaboration:** Tie-ups with Japan, Australia, US for technology and mineral supply diversification.

Conclusion

- India's indigenous EV motor innovations represent a significant step towards **technological self-reliance and supply chain resilience** amid China's tightening rare earth export controls.
- These innovations are **reducing India's vulnerability**, strengthening its EV ecosystem, and aligning with national goals of Atmanirbhar Bharat, energy security, and sustainable mobility.
- **Continued investment** in R&D, critical mineral sourcing, and industrial scaling will be **essential to sustain this momentum**.

Source: **IE**

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