Neodymium

for the energy transition

Key locations

Mining

China 70%

USA 15%

Refining

China 85%

Energy transition share of total demand

2030 55-70%

2050 55-65%

Current market size[1]

$5 bn

Outlook to 2030 and key challenges

Demand

- Neodymium is a crucial element in high-strength permanent magnets, used in both wind turbine generators and EV motors.
- Some potential to shift to rare-earth free EV motors, or to wind turbine designs with much lower neodymium intensity.

Supply

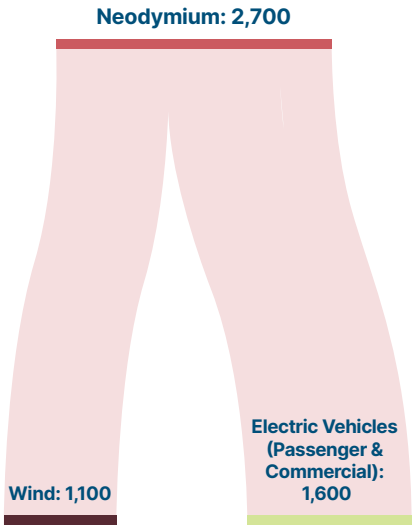
- China dominant supplier, but significant new supply from Myanmar and new projects proposed across US, Australia, Canada.
- Supply depends on relative prices of other rare earth elements (e.g., cerium) as these are mined together in same ores.

Key challenges

- Low environmental standards for mining and refining in China, along with **production of toxic waste** from mining.
- Concerns around corruption and human rights abuses for expansion in supply from Myanmar.

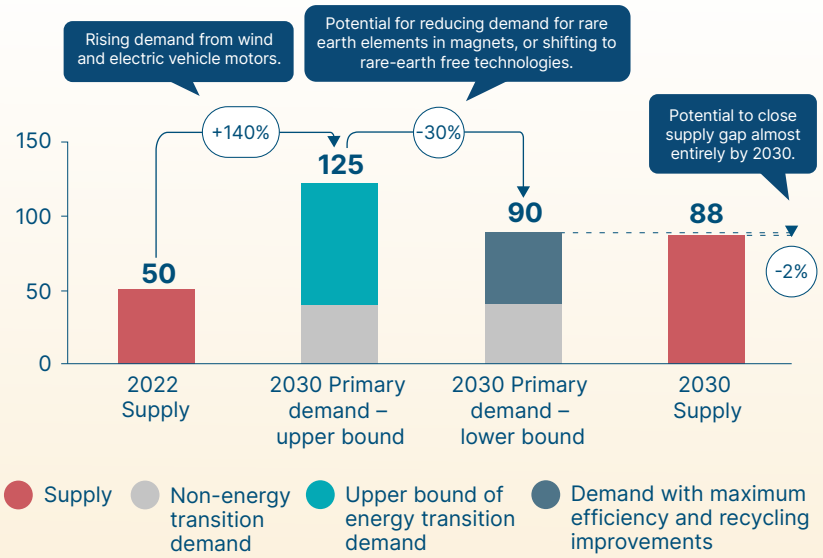
Cumulative demand 2022–50 from clean energy technologies

Thousand metric tonnes



Demand and primary supply in 2030

Thousand metric tonnes



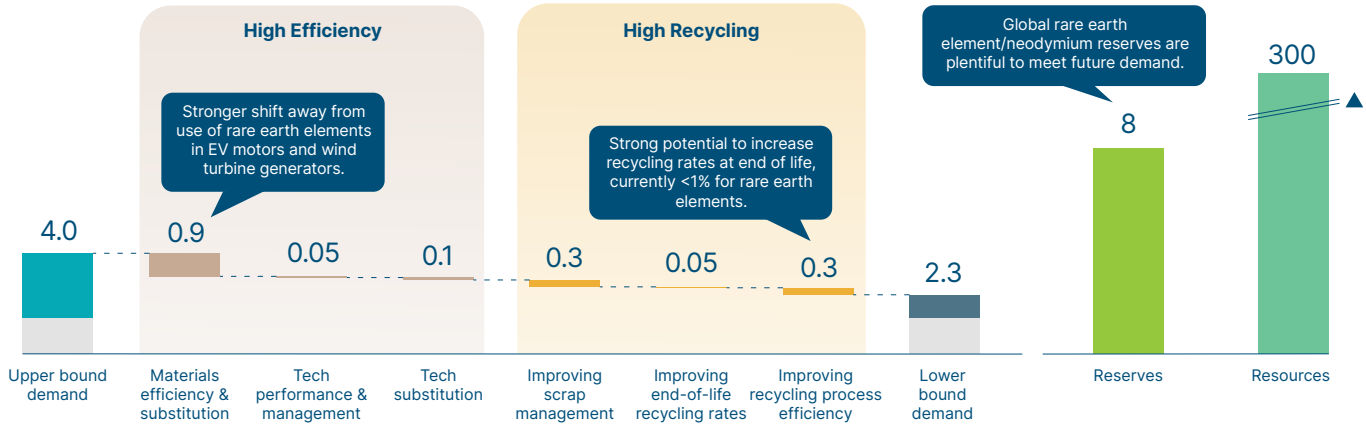
Potential to shift away from rare earth elements in EV motors and wind turbines

Cumulative primary demand 2022–50, reductions due to efficiency and recycling levers, and resources and reserves

Million metric tonnes

Potential for substitution H

Potential for recycling to meet supply M >40% of clean energy demand could be met by recycling by 2050



SOURCES: Systemiq analysis for the ETC; IEA (2021), *The Role of Critical Minerals in Clean Energy Transitions*; BNEF (2022), *2H Battery metals outlook*; IEA (2023), *Energy Technology Perspectives*.

NOTE: The upper bound demand is the ETC's Baseline Decarbonisation scenario, which assumes an aggressive deployment of clean energy technologies for global decarbonisation by mid-century, but materials intensity and recycling trends follow recent patterns. The lower bound demand is the ETC's Maximum Efficiency and Recycling scenario, which assumes accelerated progress in material and technology efficiency, and recycling clean energy technologies, thereby reducing requirements for the primary supply (i.e. mined supply) of materials.
[1]Calculated assuming average 2022 price of around $90,000 per tonne of neodymium. L=Low, M= Medium, H = High.