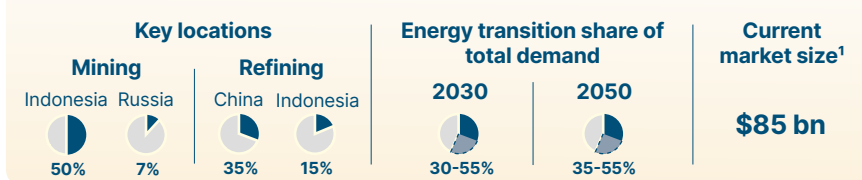


Nickel

for the energy transition

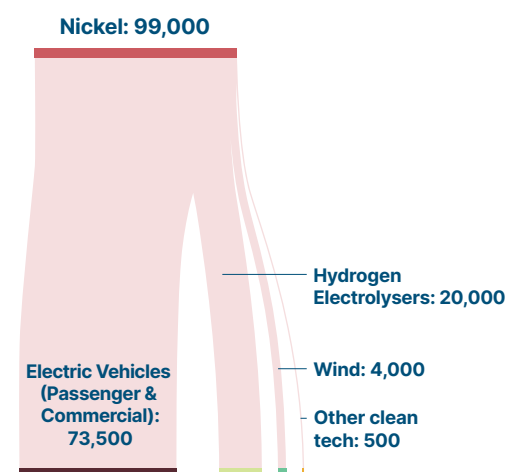


Outlook to 2030 and key challenges

- Demand**
- Shift away from cobalt-rich batteries has led to increased demand for high-nickel battery chemistries.
 - Nickel demand could be substantially offset if nickel-free **lithium-iron-phosphate (LFP) batteries** grow rapidly in market share.
 - Additional strong demand growth from (alkaline) hydrogen electrolyzers and steel in wind turbines.
 - Uncertainty** around magnitude of future demand from **non-energy sectors** (steel) – lower demand could release more supply for energy transition.
- Supply**
- Recent years have seen a very **large, rapid expansion in supply from Indonesia**. Future supply growth also expected to come from Philippines and Canada.
 - Potential **challenges in supply of high-purity class 1 nickel** and refined nickel sulphate, used in battery applications.
- Key challenges**
- Future Indonesian supply is from laterites – production routes are more **carbon-intensive**, and rely on coal-intensive grid.
 - Large-scale nickel projects have long lead times (15–20 years), but recent projects in Indonesia have moved much faster (~5 years).

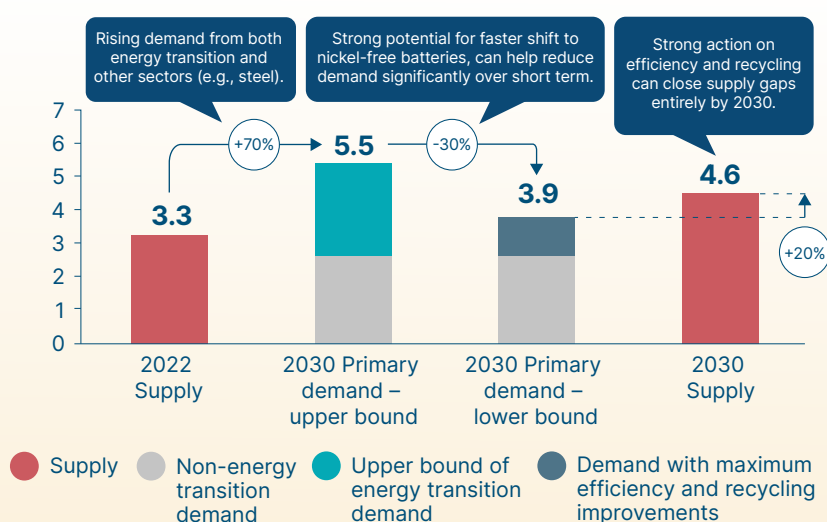
Cumulative demand 2022–50 from clean energy technologies

Thousand metric tonnes



Demand and primary supply in 2030

Million metric tonnes



Strong potential for shift to nickel-free LFP batteries, but reserves will need to expand

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

Million metric tonnes

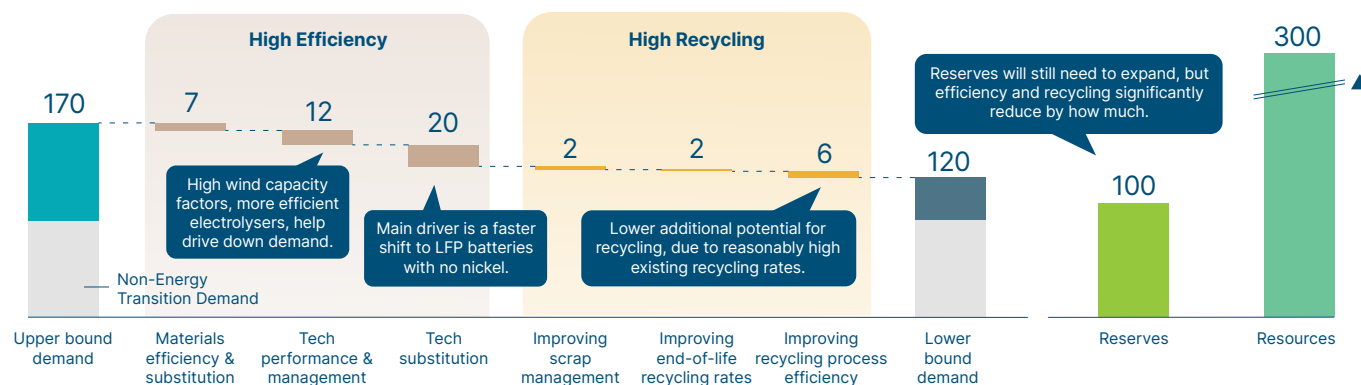
Potential for substitution

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*; BNEF (2023), *Transition metals outlook*.

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. ¹Calculated assuming average 2022 price of around \$26,000 per tonne of nickel. L=Low, M= Medium, H = High.