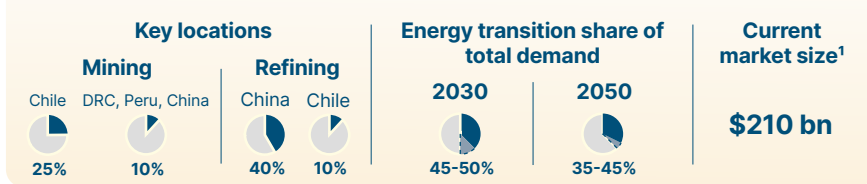


# Copper

## for the energy transition

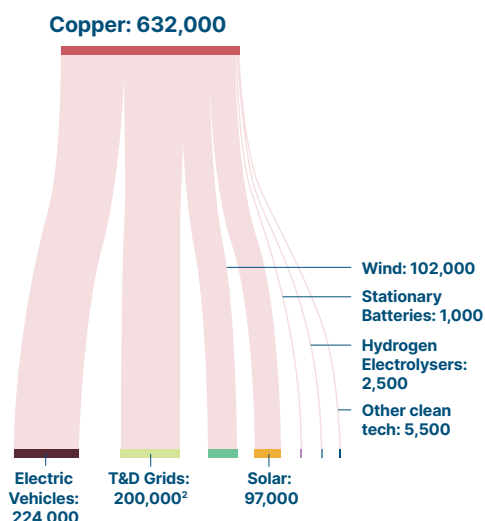


### Outlook to 2030 and key challenges

- Demand**
- Copper **demand is highly cross-cutting**, used in all clean energy technologies – two largest energy transition demand drivers are grids and electric vehicles.
  - Large non-energy sector demand** growth, driven by industrialisation and economic development in middle-income countries.
  - Difficulty of substituting copper** requirements make mitigation of demand challenging over short-mid term to 2030, although some substitution of copper with aluminium in grids is possible.
- Supply**
- Challenges facing expanding supply include: depletion of existing mines, falling ore grades, lack of investment in expanding production, and long project timescales (15–20 years).
  - Lack of scrap availability in certain less mature geographies, but **high prices could incentivise greater use of recycling** from existing stock of copper in use.
- Key challenges**
- Low and falling ore grades** lead to high energy and water intensity of production, as well as very large waste and tailings production.
  - Sulphidic tailings lead to **acid mine drainage**, key issue for local toxicity and pollution concerns.
  - Copper refining is quite concentrated, with 40% of production in China.

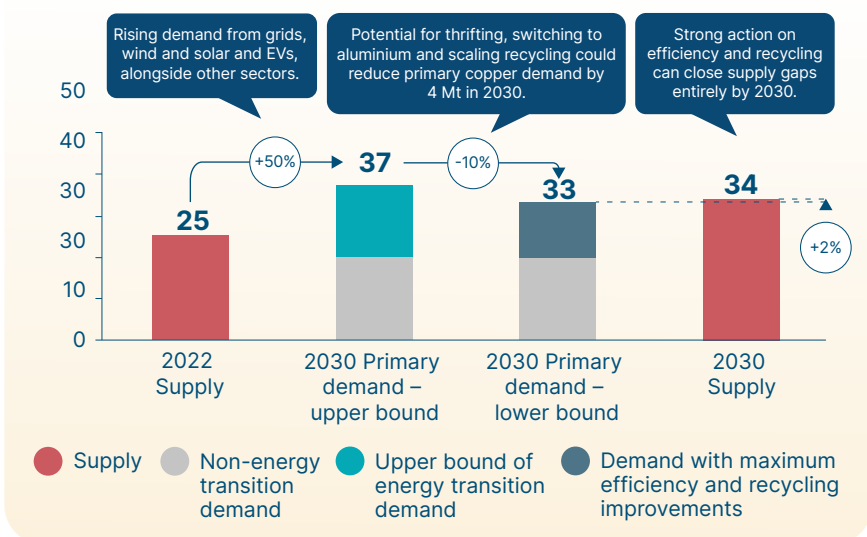
#### Cumulative demand 2022–50 from clean energy technologies

Thousand metric tonnes



#### Demand and primary supply in 2030

Million metric tonnes

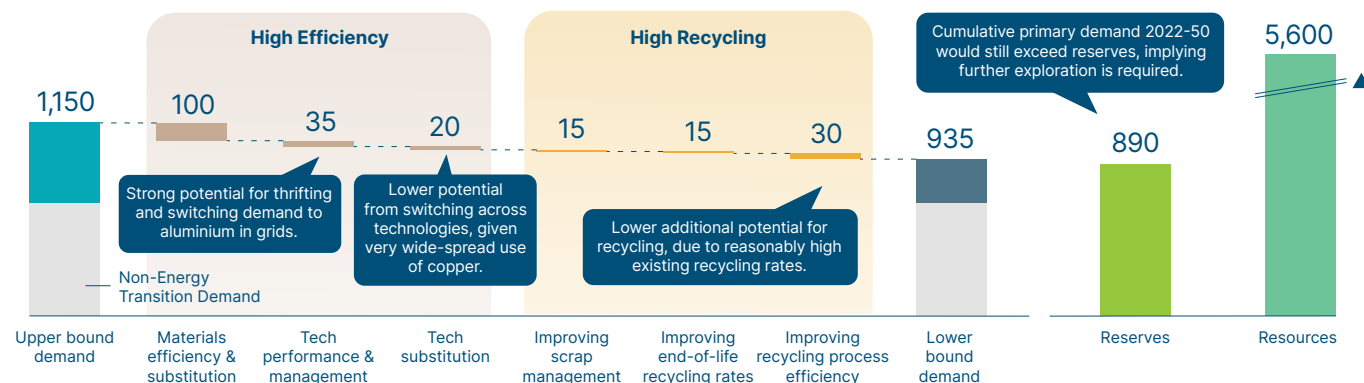


### Strong potential to reduce long-term demand through thrifting and substitution

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

Million metric tonnes

**Potential for substitution** (M)   
 **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), *Global copper outlook 2022–40*; S&P Global (2022), *The future of copper*; 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. <sup>1</sup> Calculated assuming average 2022 price of around \$8,500 per tonne of copper. <sup>2</sup> T&D = Transmission and Distribution. L=Low, M= Medium, H = High.