Nucleus Wealth

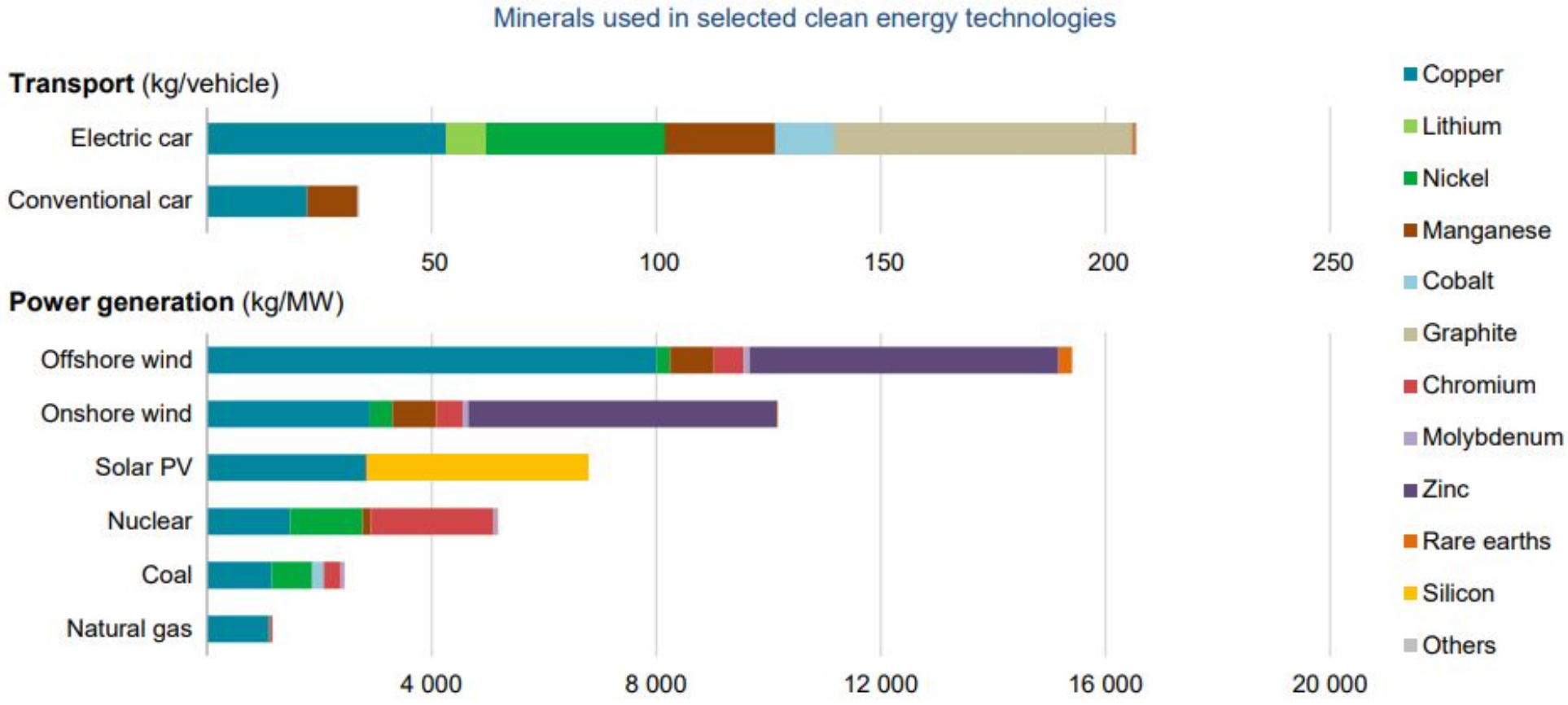
THE GREAT COPPER PANIC

The Great Copper Panic

- Green Metals: do we have enough?
- Political Risks
- Myth busting
- The great copper panic
- Investment implications

Green Metals: do we have enough?

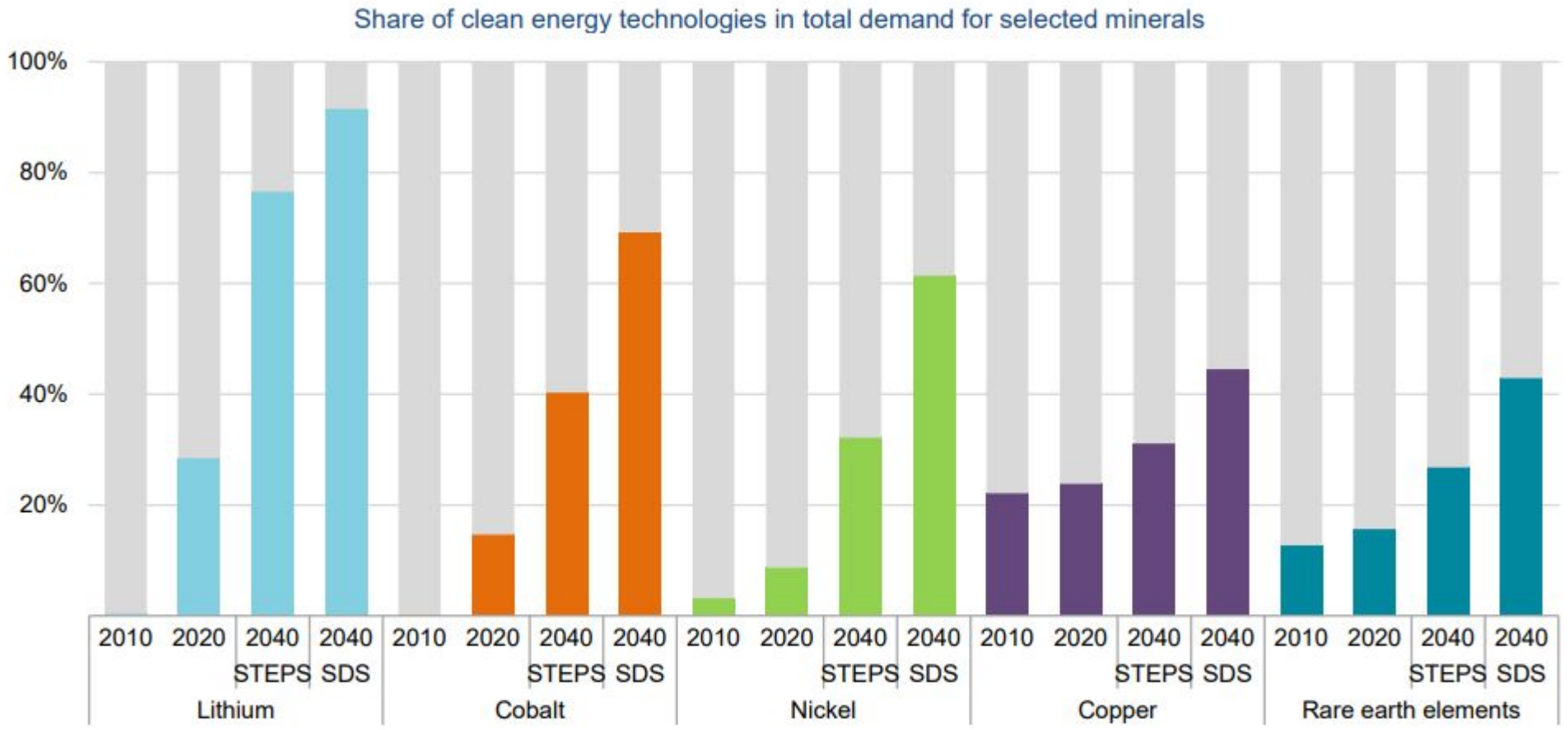
The rapid deployment of clean energy technologies as part of energy transitions implies a significant increase in demand for minerals



Notes: kg = kilogramme; MW = megawatt. Steel and aluminium not included. See Chapter 1 and Annex for details on the assumptions and methodologies.

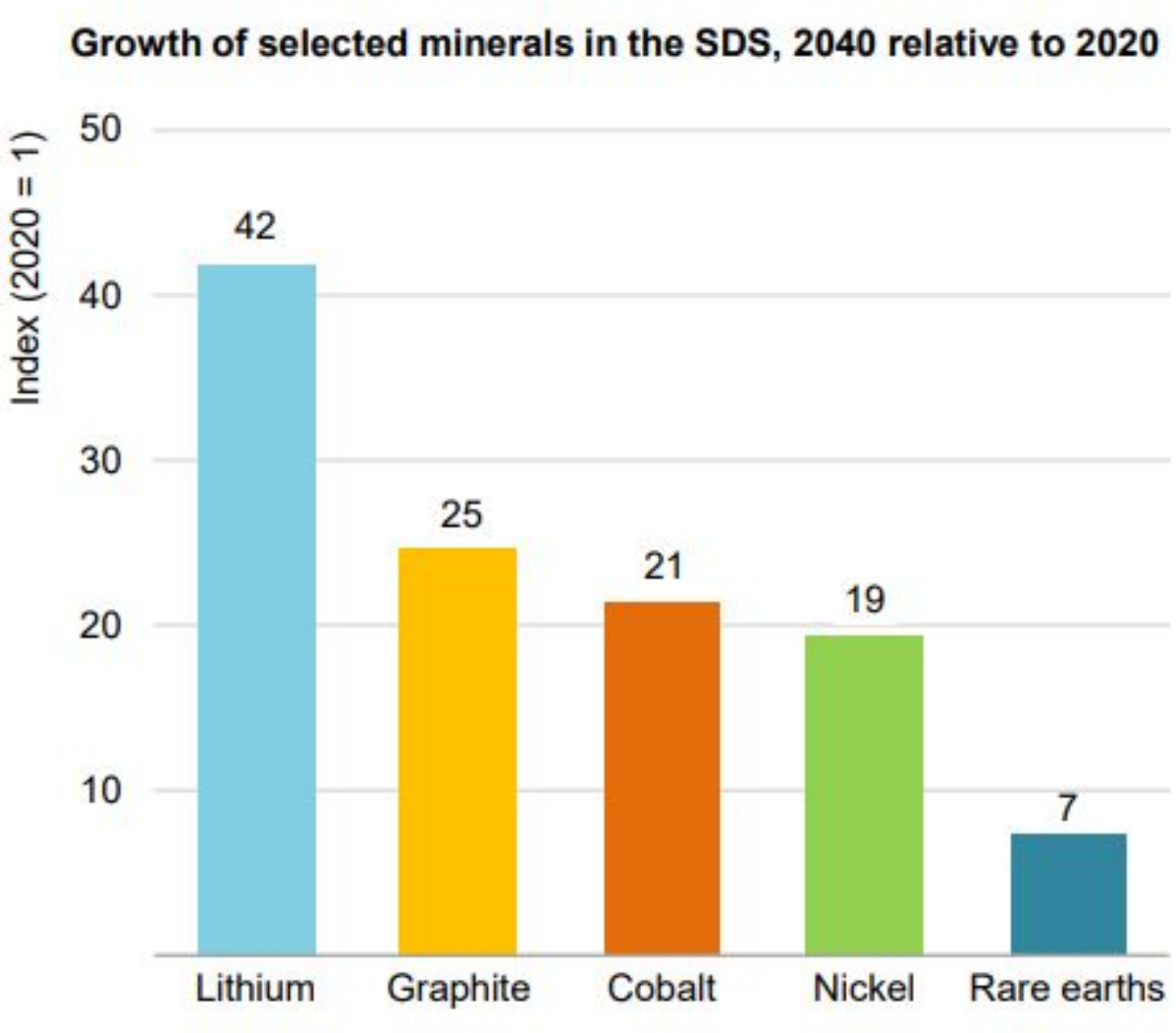
Green Metals: do we have enough?

The energy sector becomes a leading consumer of minerals as energy transitions accelerate

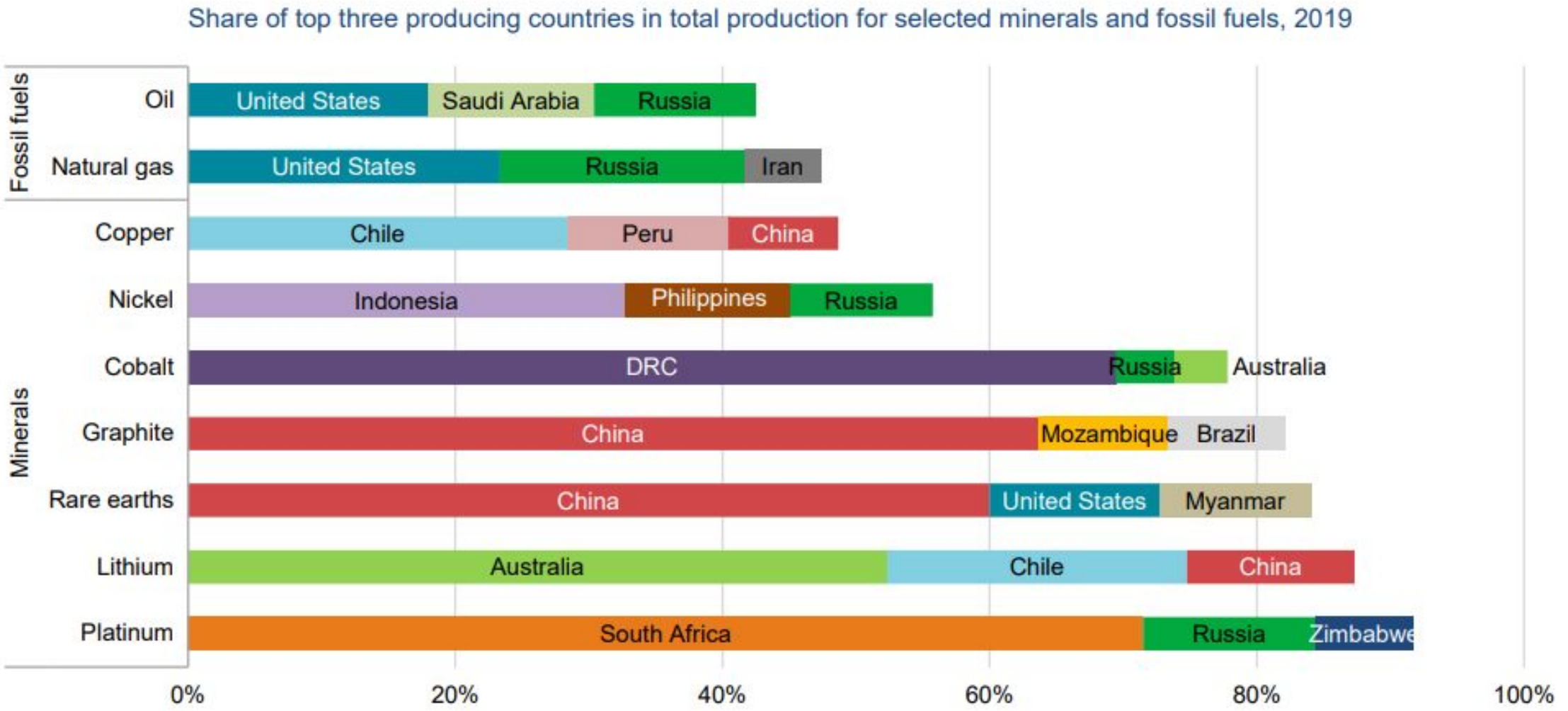


Notes: Demand from other sectors was assessed using historical consumption, relevant activity drivers and the derived material intensity. Neodymium demand is used as indicative for rare earth elements. STEPS = Stated Policies Scenario, an indication of where the energy system is heading based on a sector-by-sector analysis of today's policies and policy announcements; SDS = Sustainable Development Scenario, indicating what would be required in a trajectory consistent with meeting the Paris Agreement goals.

Green Metals: do we have enough?

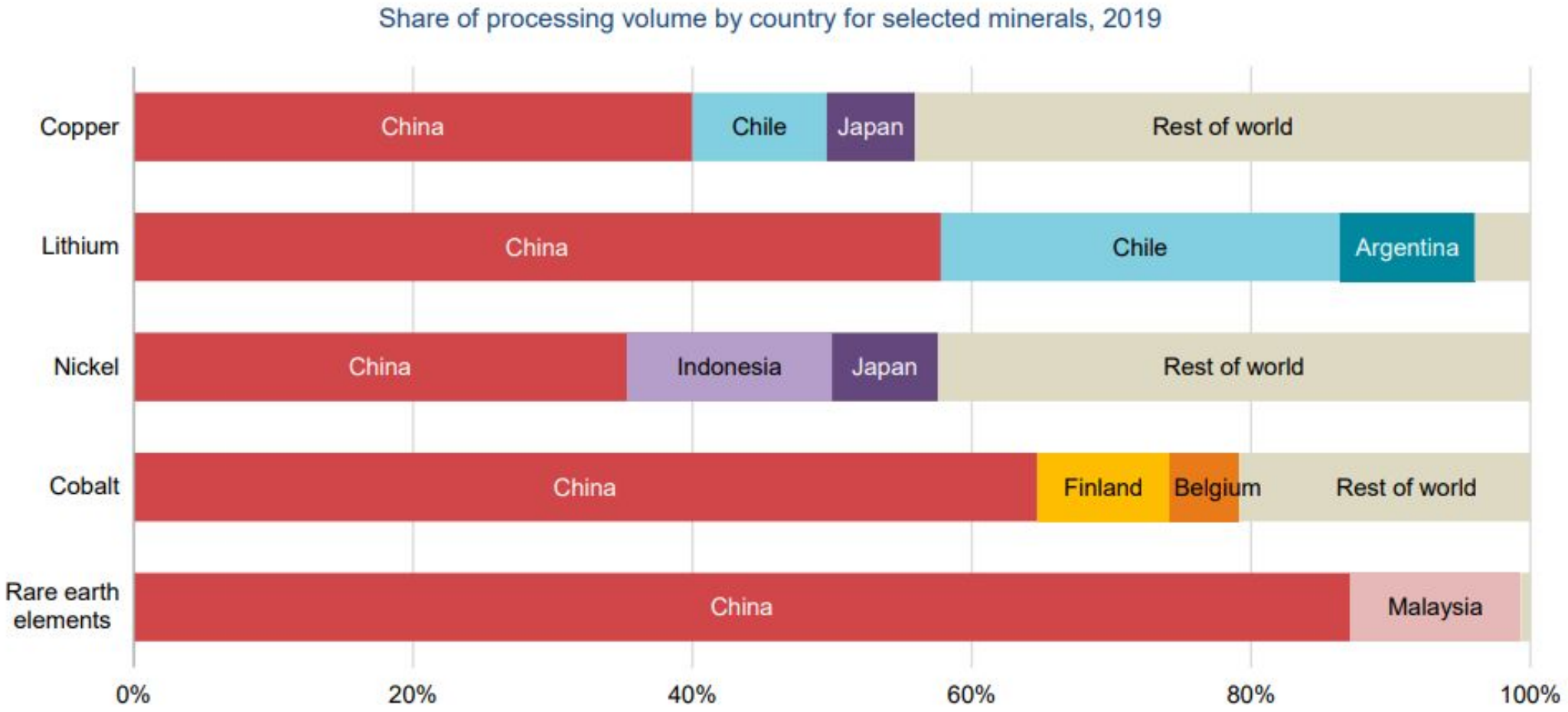


Political Risks: Extraction



Sources: IEA (2020b); USGS (2021).

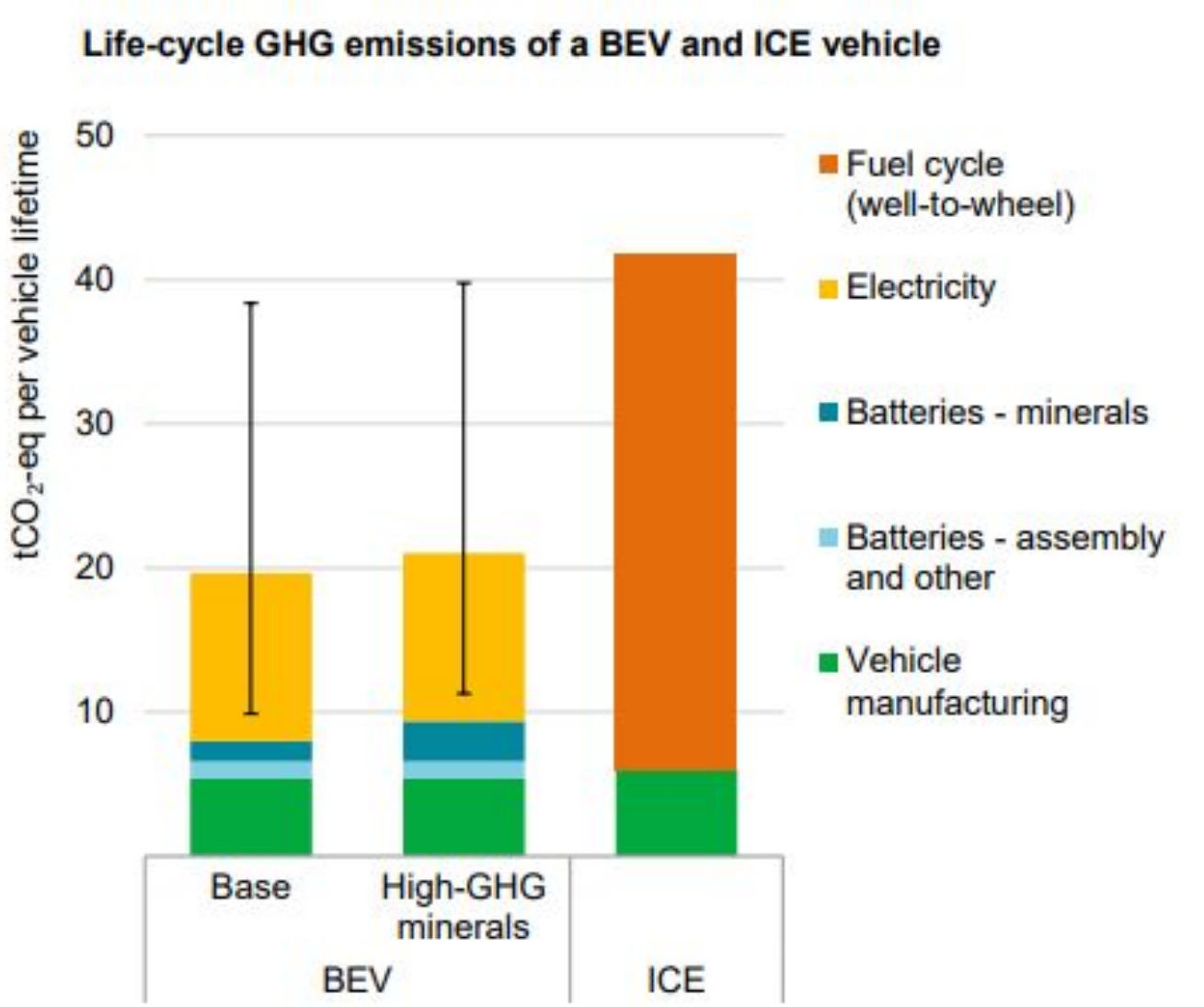
Political Risks: Processing



Note: The values for copper are for refining operations.

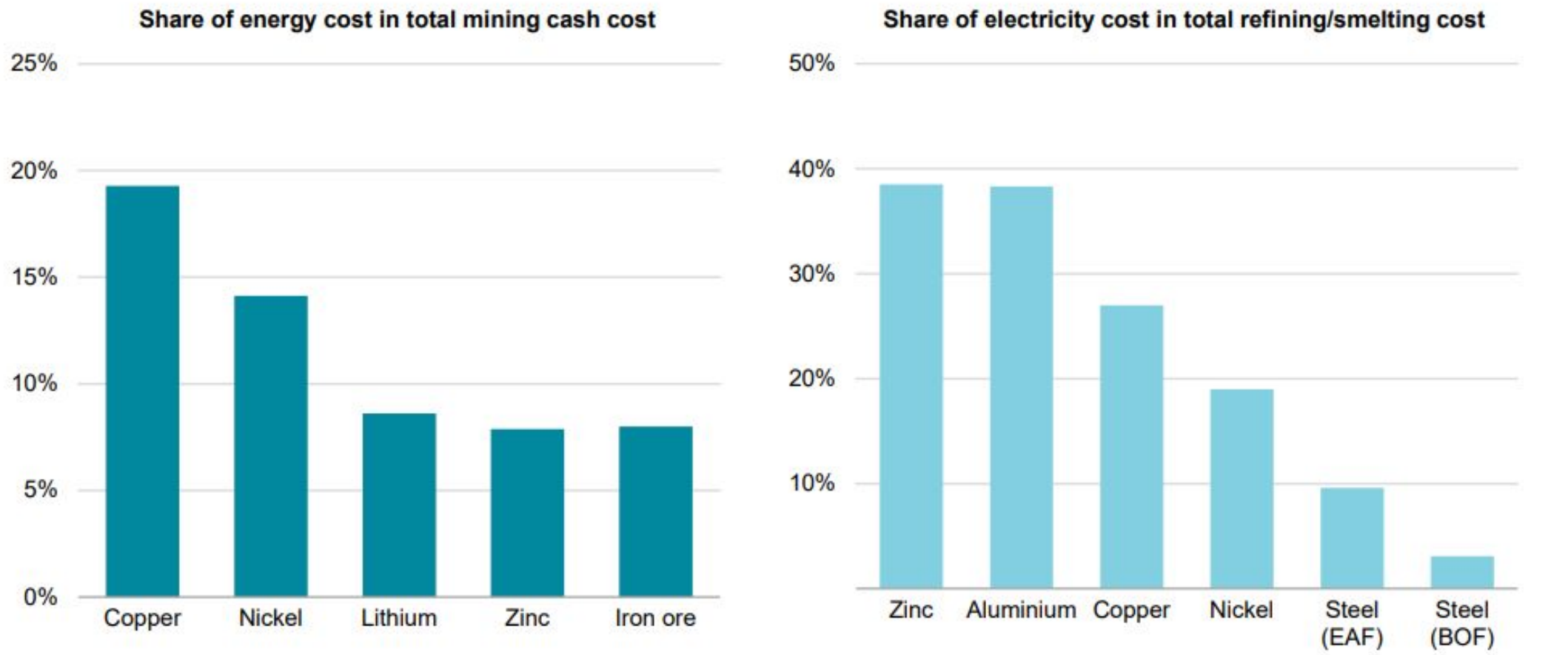
Sources: World Bureau of Metal Statistics (2020); Adamas Intelligence (2020) for rare earth elements.

Mythbusting: Emissions



Mythbusting: Emissions

Share of energy cost in total mining cash cost and electricity intensity for selected materials

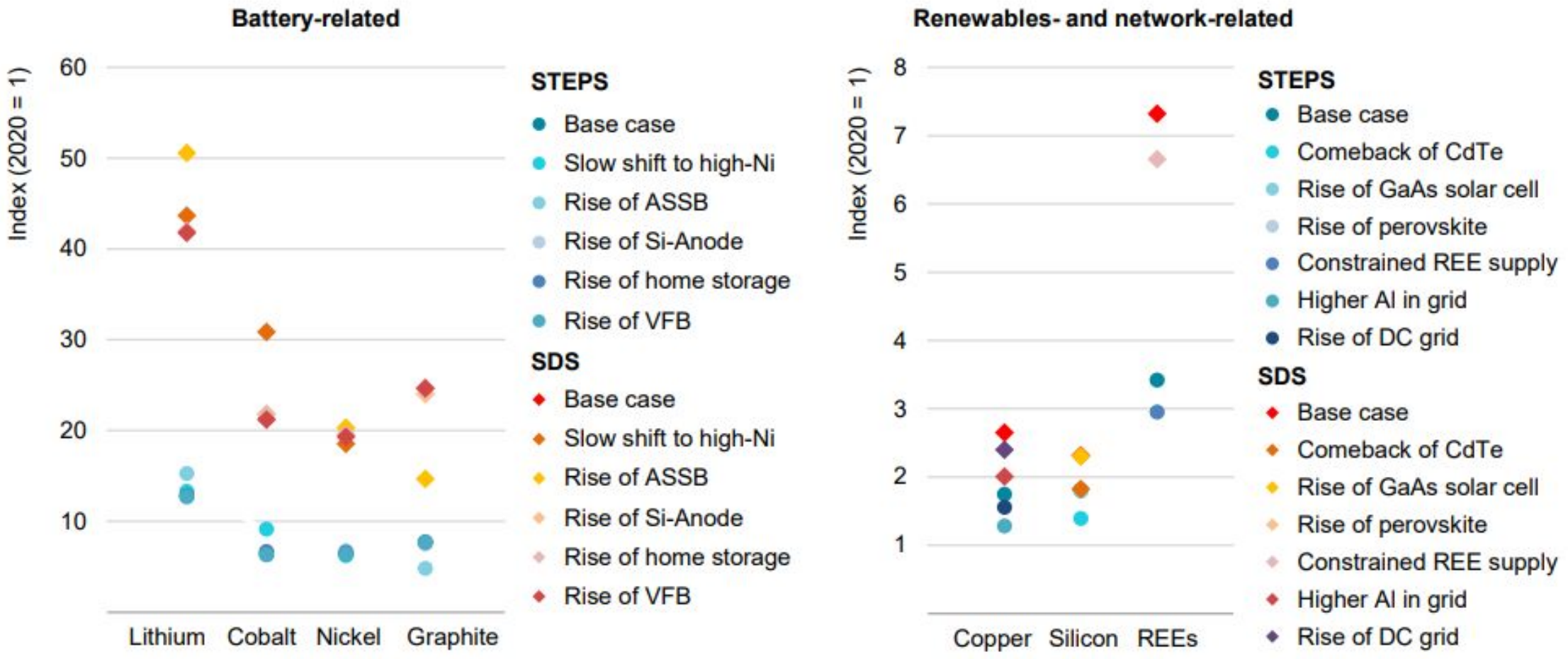


Notes: ESG = environmental, social and governance; EAF = electric arc furnace; BOF = basic oxygen furnace. Energy and electricity costs show global average values, and can vary by region and operational practice.

Source: IEA analysis based on S&P Global (2021) for mining, BHP (2011) for iron ore and Eurometaux (2020) for refining/smelting.

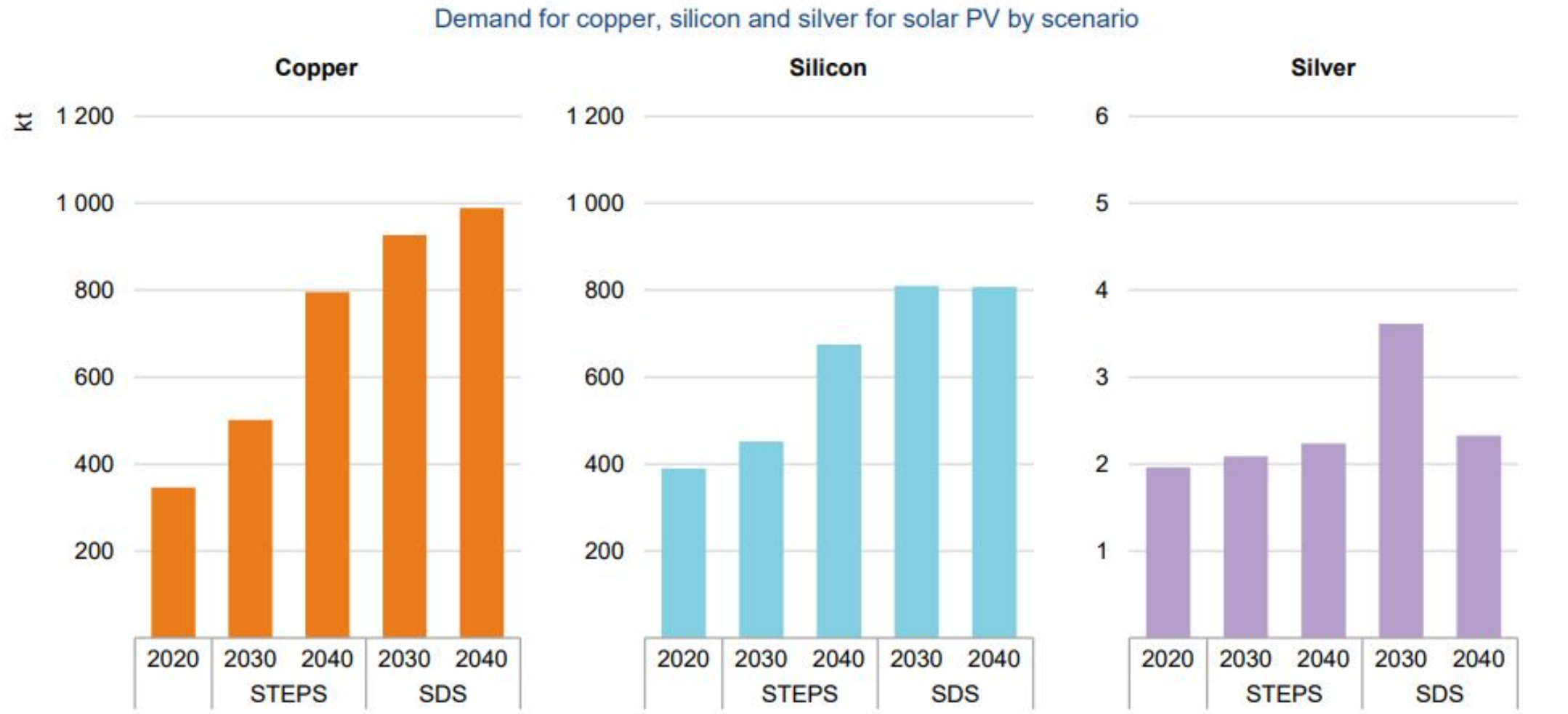
Mythbusting: Technology vs Price

Mineral demand from clean energy technologies in 2040 relative to 2020 under different scenarios and technology evolution trends



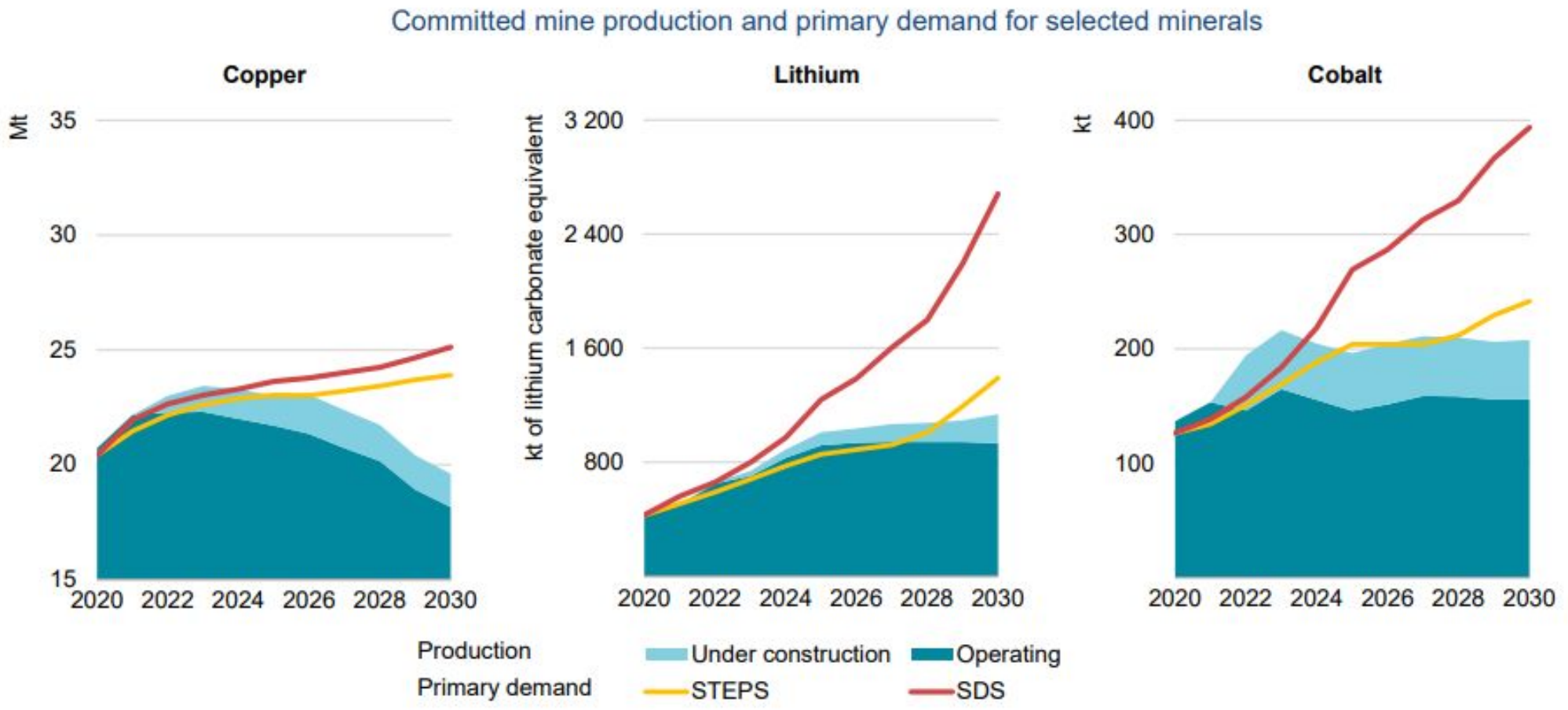
Notes: Al = aluminium; ASSB = all-solid-state batteries; CdTe = cadmium telluride; DC = direct current; GaAs = gallium arsenide; Ni = nickel; Si = silicon; VFB = vanadium redox flow batteries.

Mythbusting: Amounts



Note: kt = thousand tonnes.

Mythbusting: Amounts



Notes: Primary demand is total demand net of recycled volume (also called primary supply requirements). Projected production profiles are sourced from the S&P Global Market Intelligence database with adjustments to unspecified volumes. Operating projects include the expansion of existing mines. Under-construction projects include those for which the development stage is indicated as commissioning, construction planned, construction started or preproduction. Mt = million tonnes.

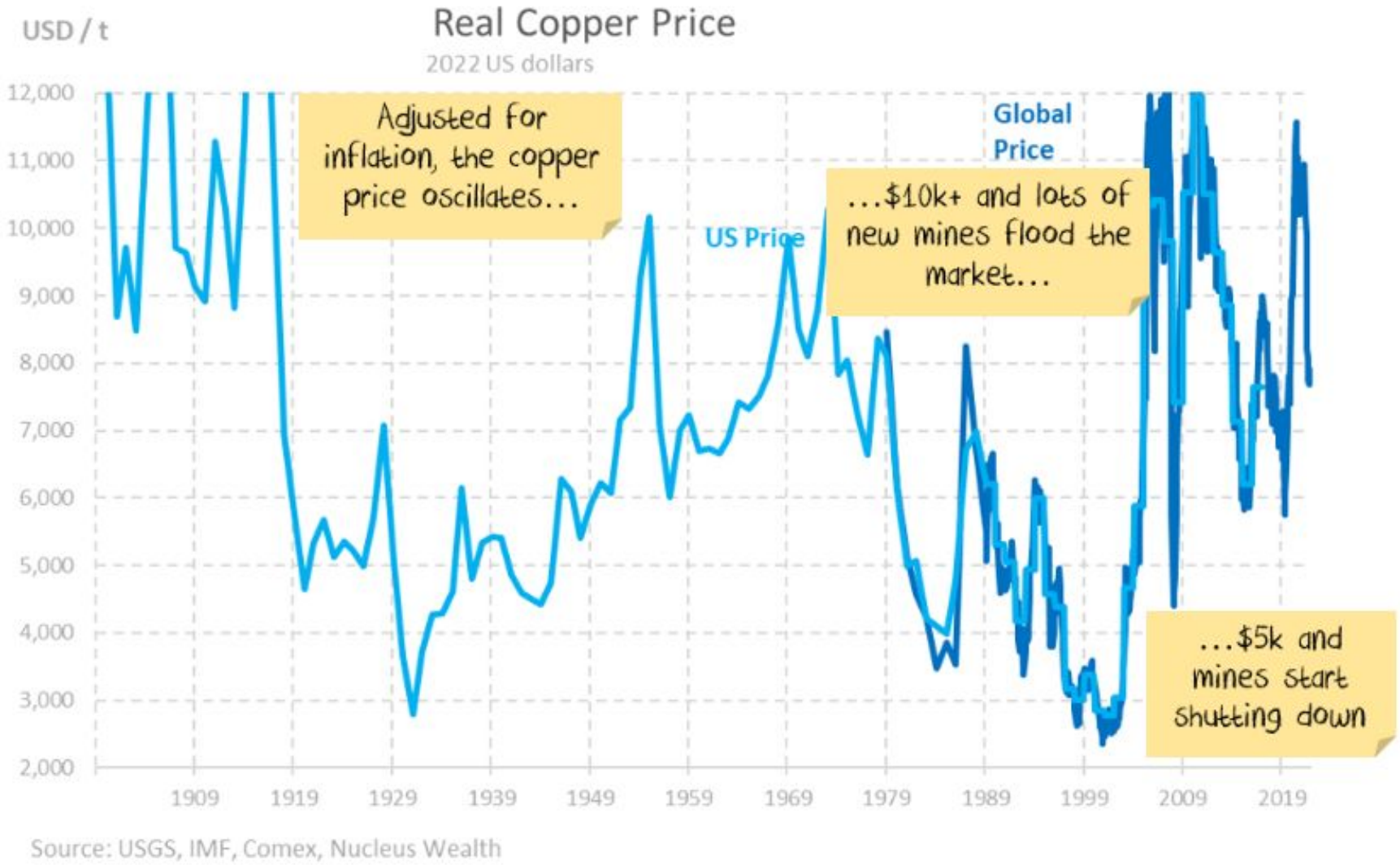
Source: IEA analysis based on S&P Global (2021).

Lots of Capex

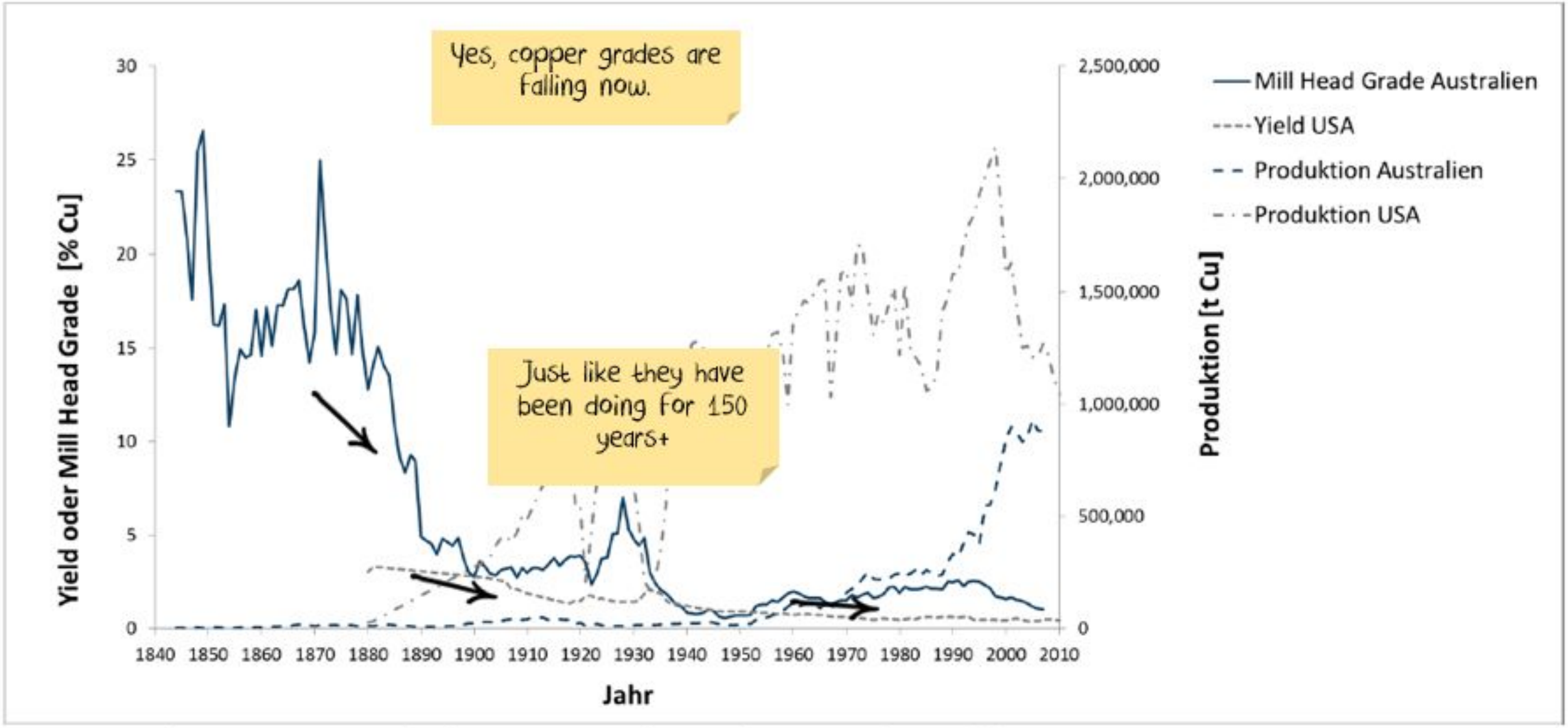
Investment in new mineral supply projects has been on an upward path…

Notes: Capital cost for cobalt includes only those projects whose primary commodity is cobalt. The figures do not include sustaining capital expenditure.
Source: S&P Global (2021).

Copper: Long term prices

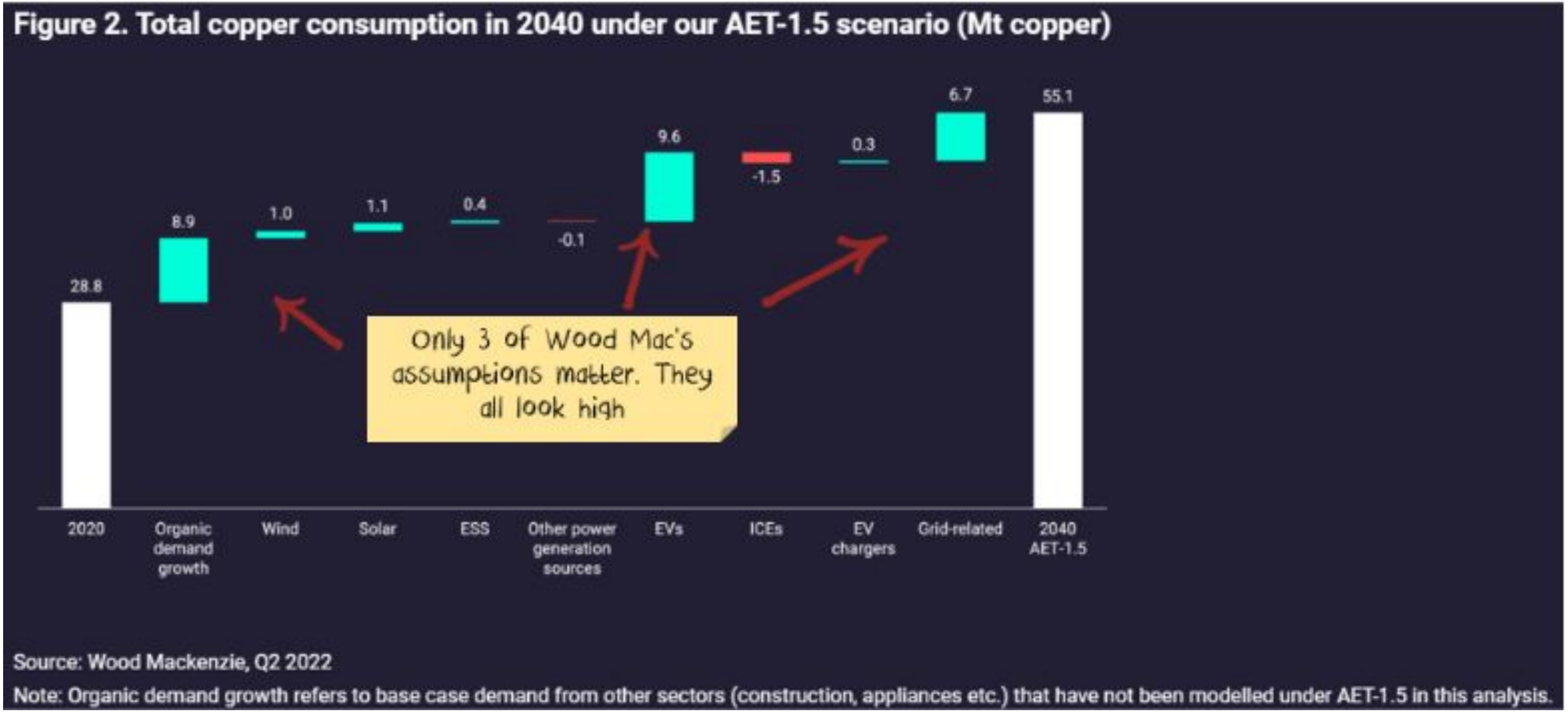


Copper: Long term prices

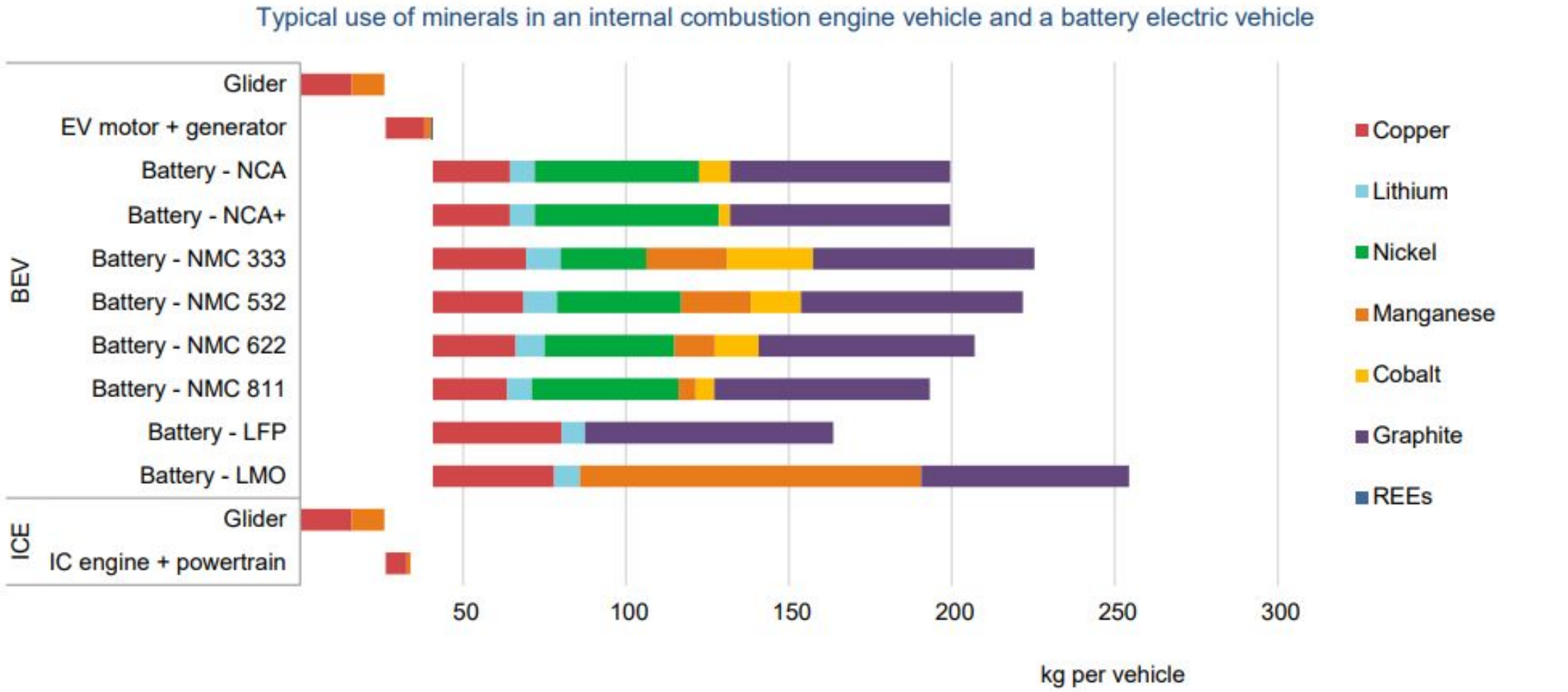


Source: Nadine Rotzer & Mario Schmidt Decreasing metal ore grades 2018, Nucleus Wealth

Copper: the shortage “suggestion”



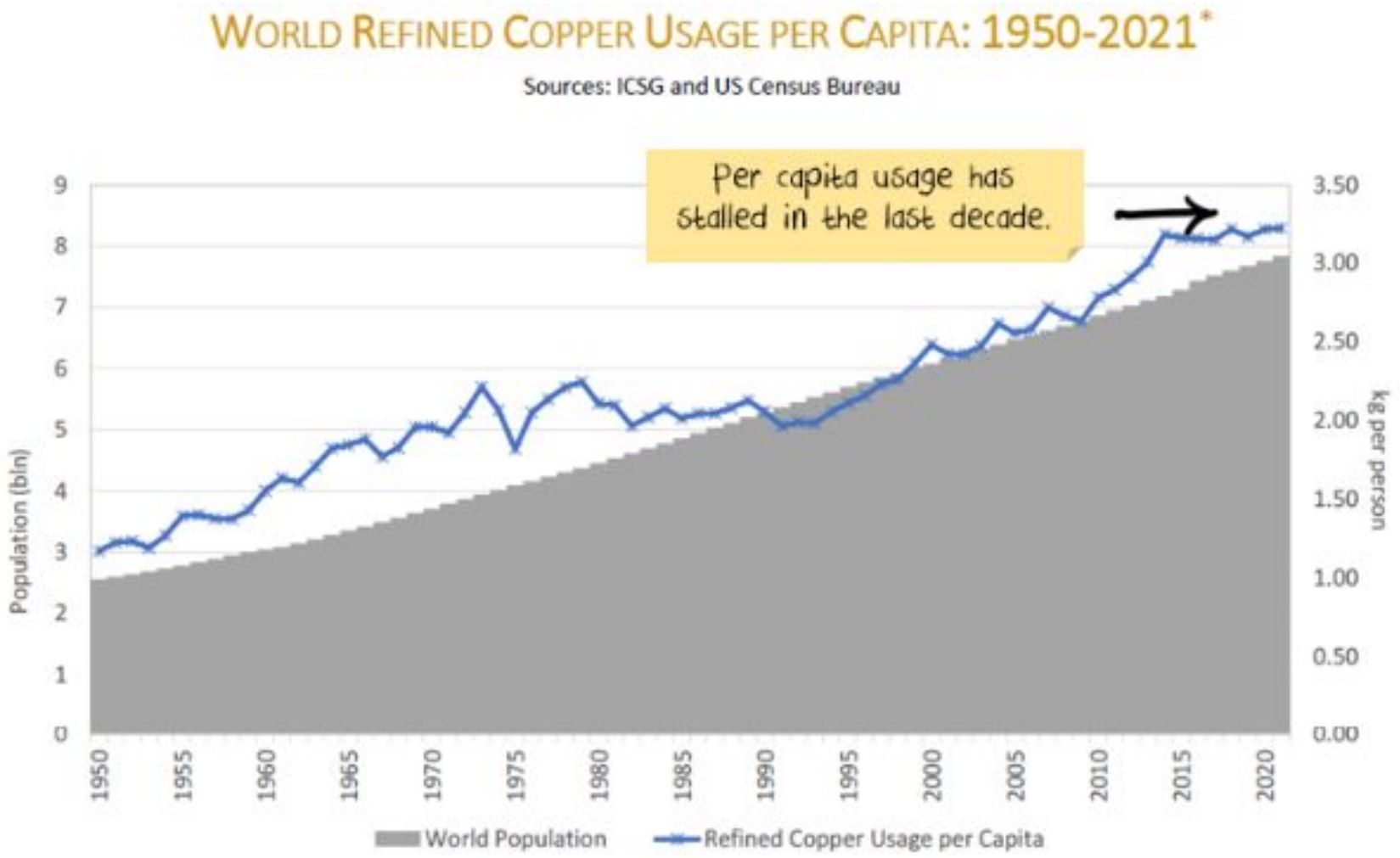
Copper: EVs



Notes: For this figure, the EV motor is a permanent-magnet synchronous motor (neodymium iron boron [NdFeB]); the battery is 75 kilowatt hours (kWh) with graphite anodes.

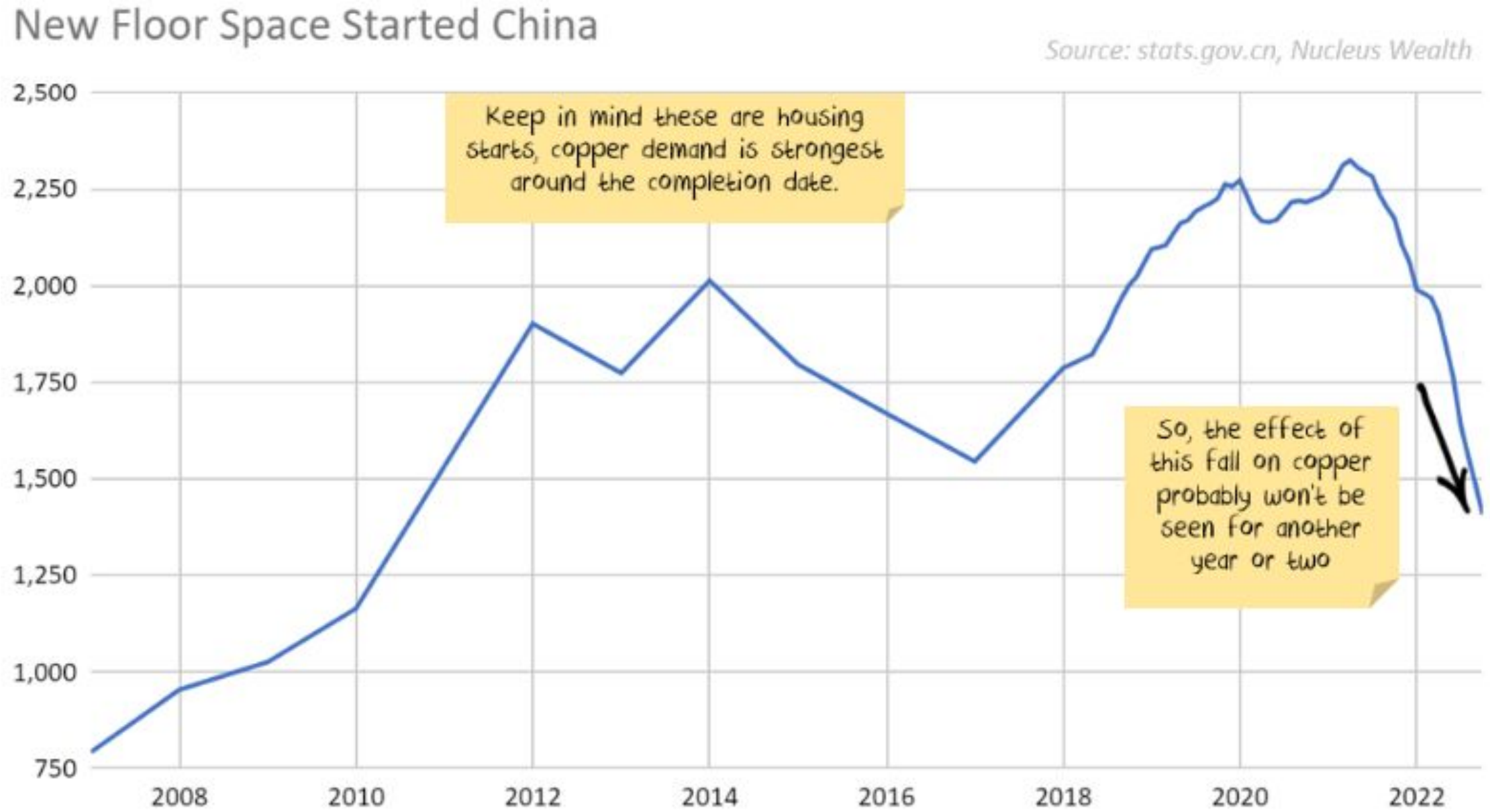
Sources: Argonne National Laboratory (2020b, 2020a); Ballinger et al. (2019); Fishman et al. (2018b); Nordelöf et al. (2019); Watari et al. (2019).

Copper: Organic Growth

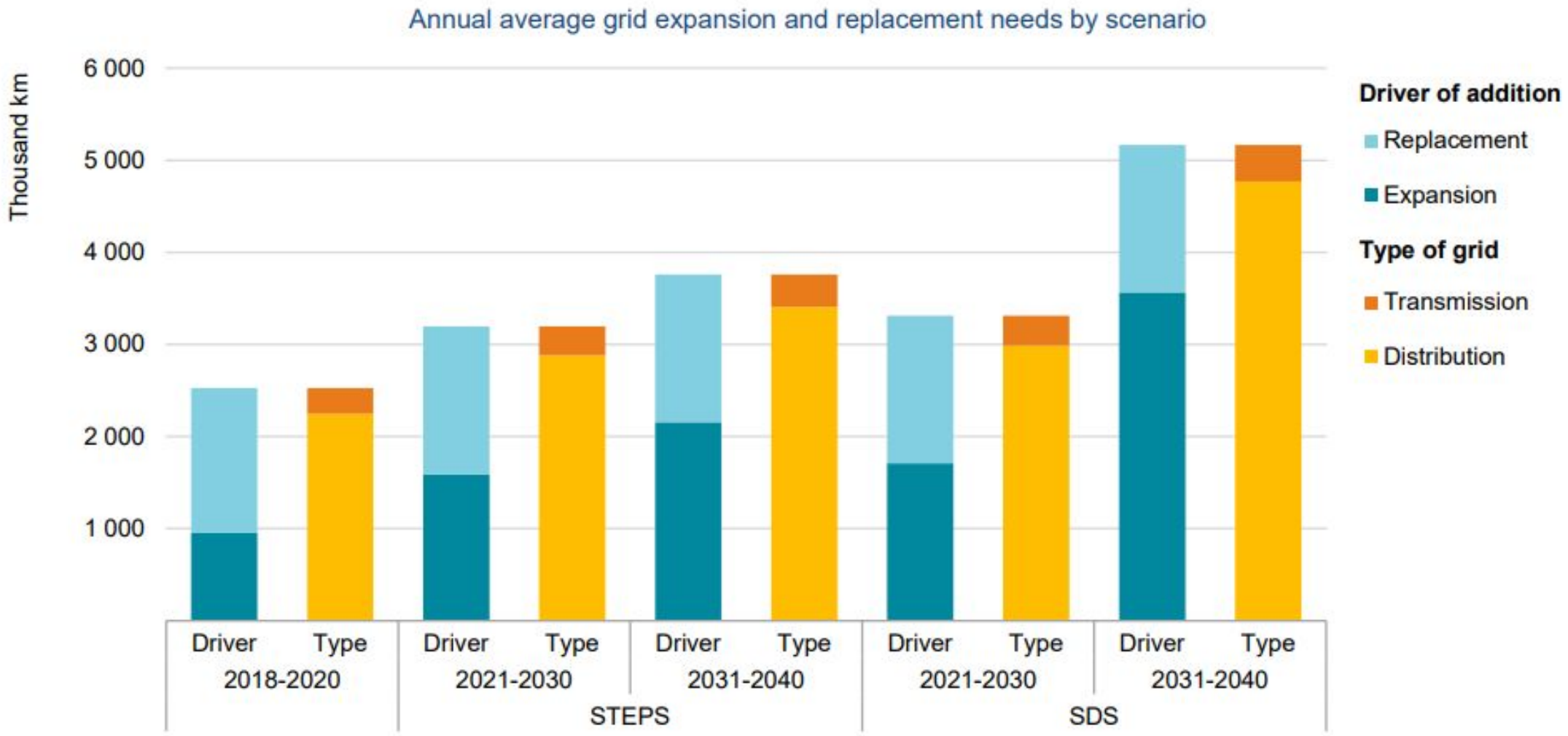


*Refined copper is typically used by semis fabricators or the "first users" of refined copper, including ingot makers, master alloy plants, wire rod plants, brass mills, alloy wire mills, foundries and foil mills. As a result, per capita usage of refined copper refers to the amount of copper used by industry divided by the total population and does not represent copper used in finished products per person.

Copper: Organic Growth



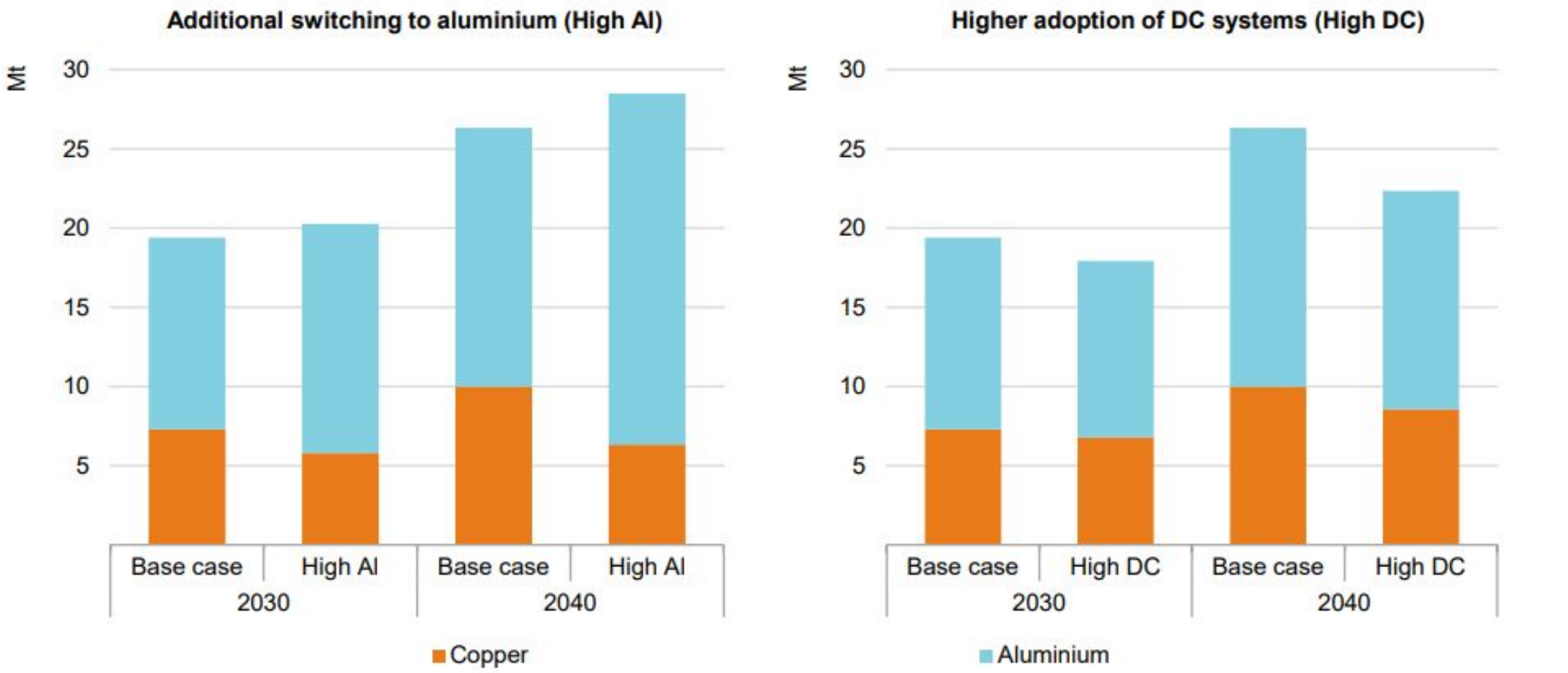
Copper: Grids



Source: IEA (2020c).

Copper: Grids

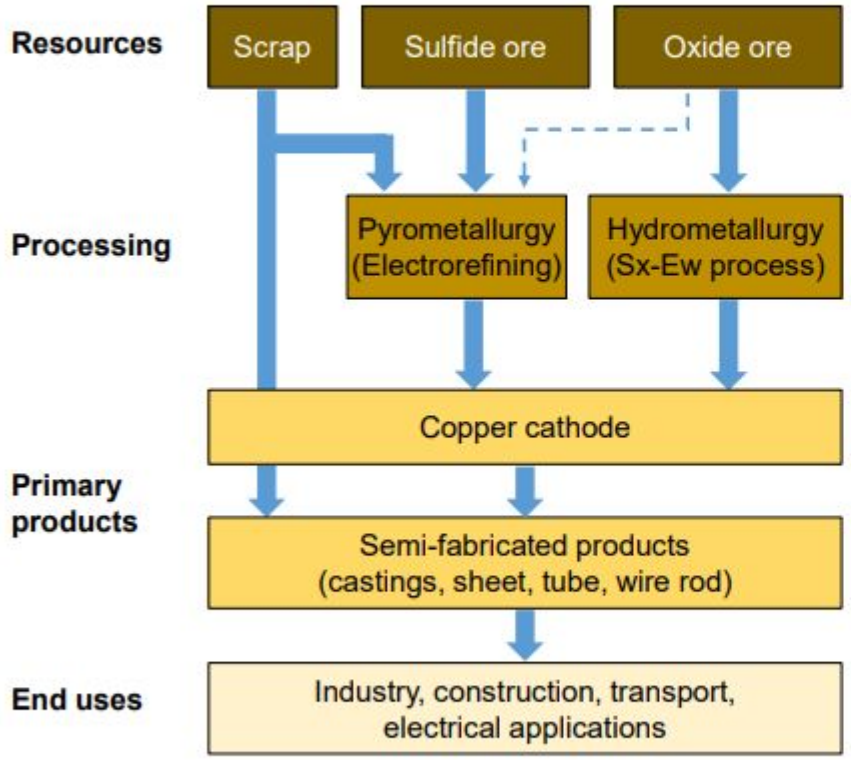
Copper and aluminium demand for electricity networks in the SDS under alternative cases



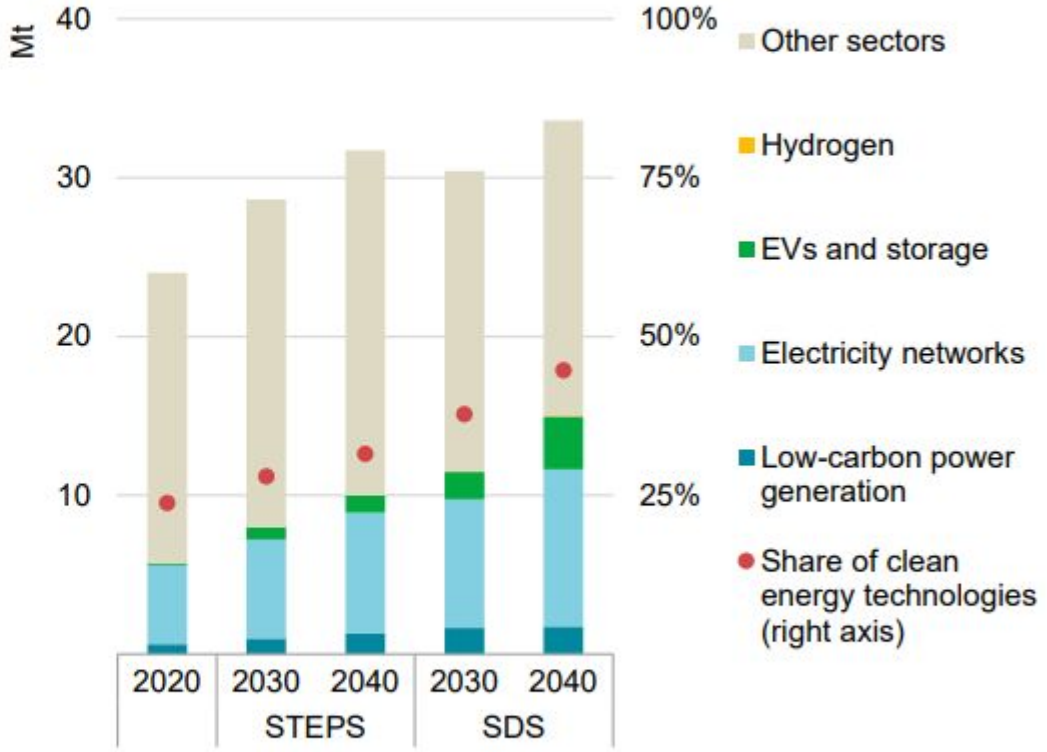
Copper: Total

Copper: From resource to consumer

Copper supply chain



Total copper demand by sector and scenario



Notes: EVs = electric vehicles. Sx-Ew = solvent extraction and electrowinning. High-grade oxide ore is processed in pyrometallurgy. Demand does not include the volume reused in a semi-fabricated form.

Viewer question of the week:

Which mineral is the best play on an electric future?

Drop your answers in the comments

Investment Implications

- Don’t buy the hype
- Technological risk
- Are you looking to buy a “gold miner” or someone selling picks and shovels