

Copper

Complex copper

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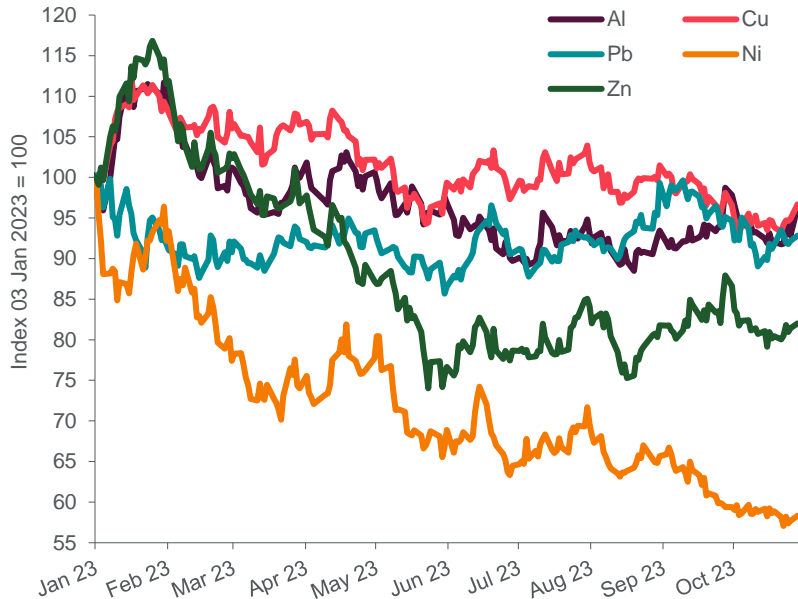
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1. Recent trends

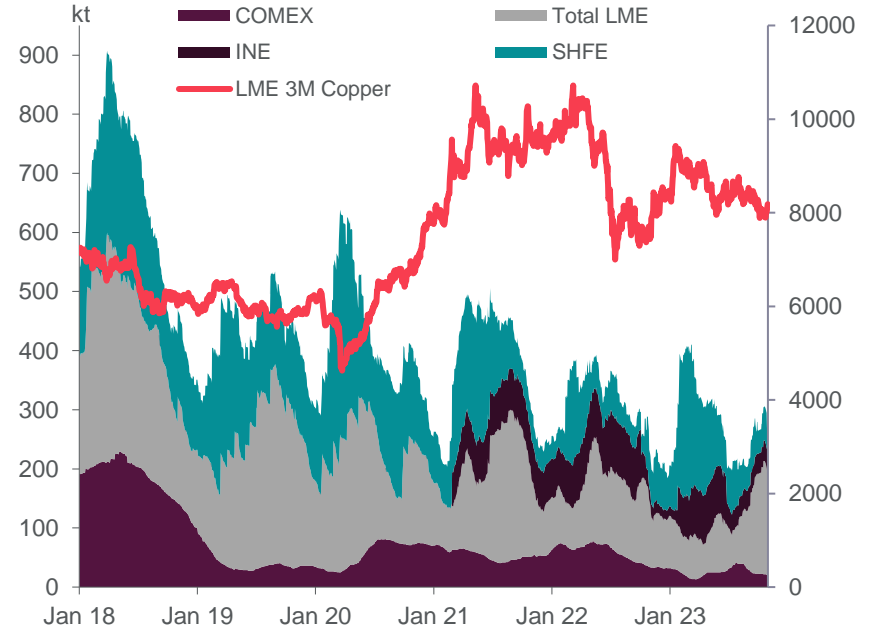
Copper prices remain volatile

Macro economic uncertainty weighs heavy on commodity prices in 2023

Indexed LME prices



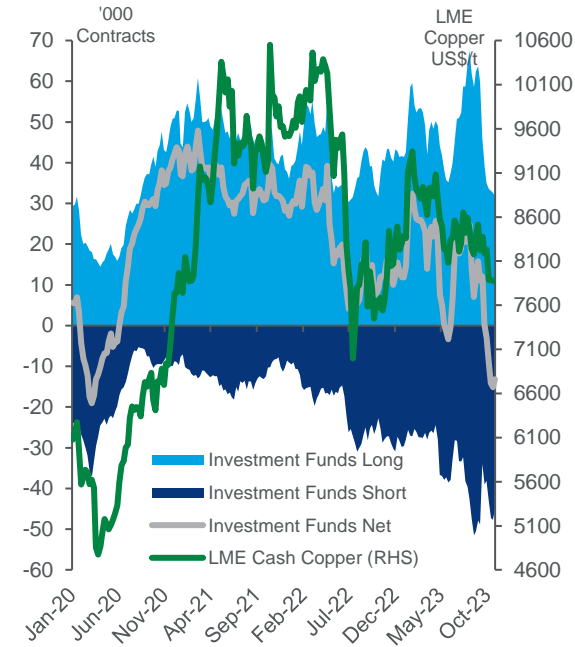
Copper prices and reported stocks



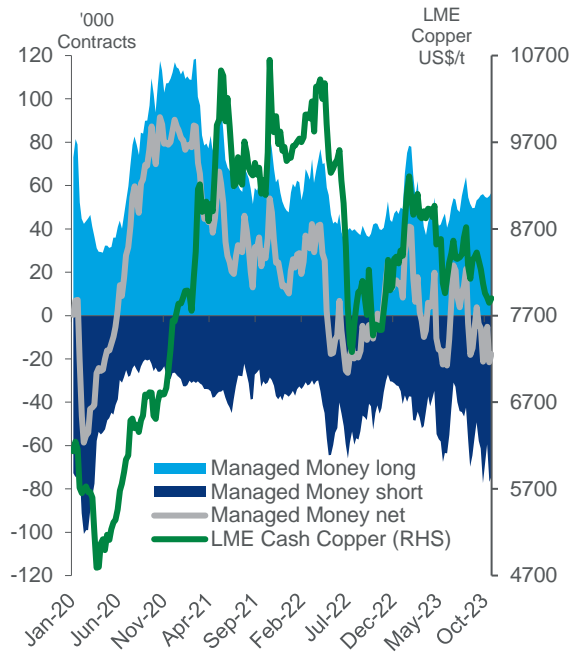
Speculative interest has influenced prices...and so has the dollar

LME and CFTC copper positions and LME copper prices vs trade weighted dollar index

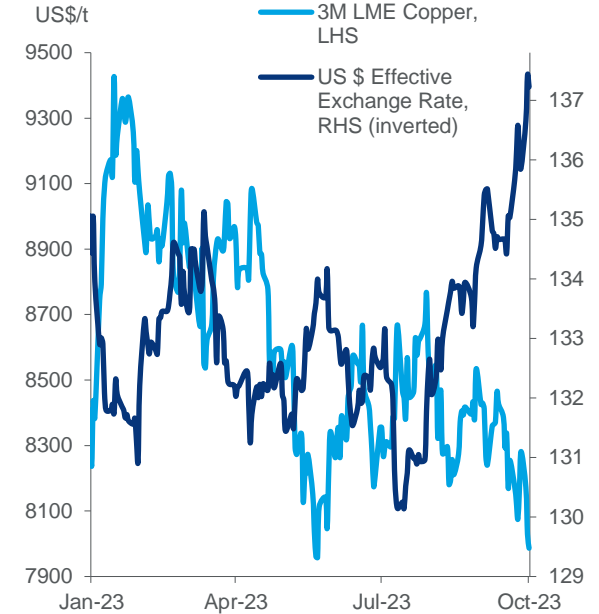
LME managed money copper positions



CFTC managed money copper positions



LME Copper vs trade weighted dollar index

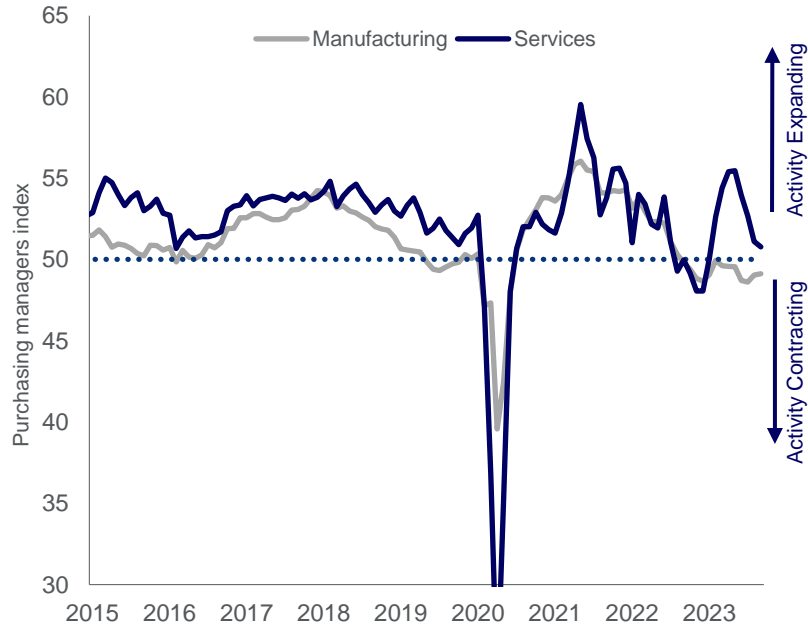


2. Copper demand

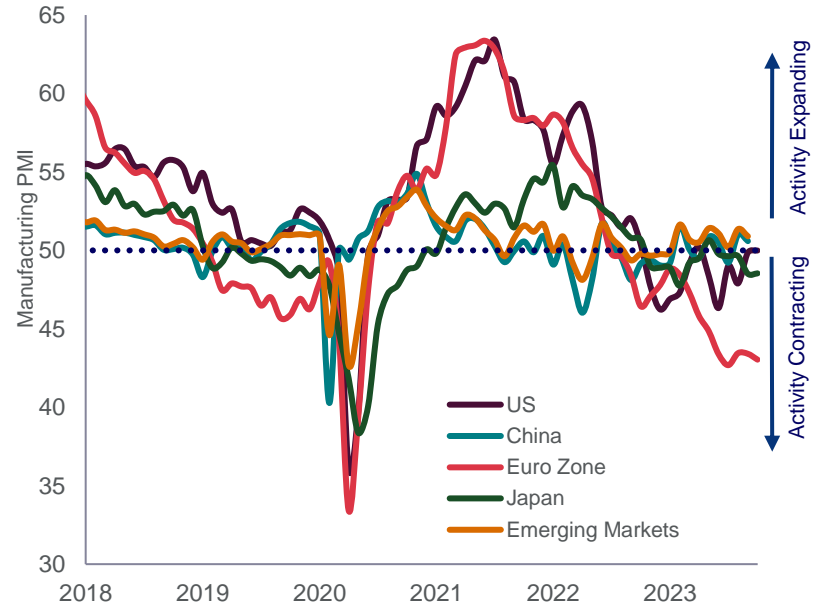
Uncertainties for copper consumption amid a gloomy macroeconomic environment

Manufacturing activity continues to be impacted; services sector is also softening

Global manufacturing and services PMI



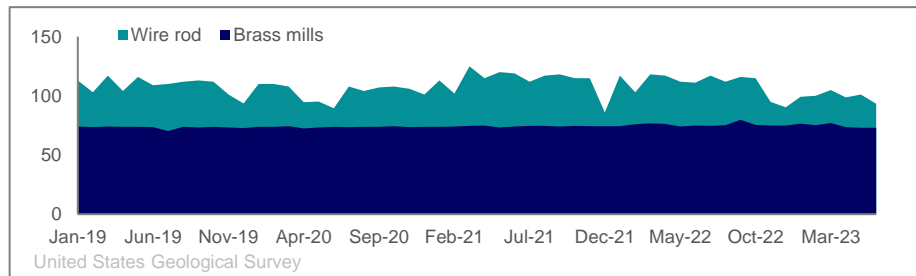
Regional manufacturing PMIs



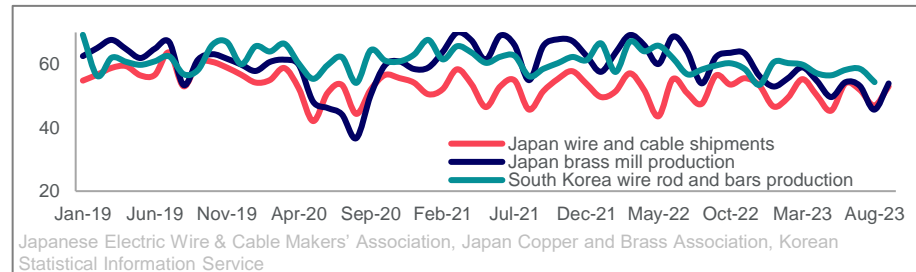
Assessing the year so far – reported semis production and sales trends

Wire rod production holding up better than brass mills in most geographies.

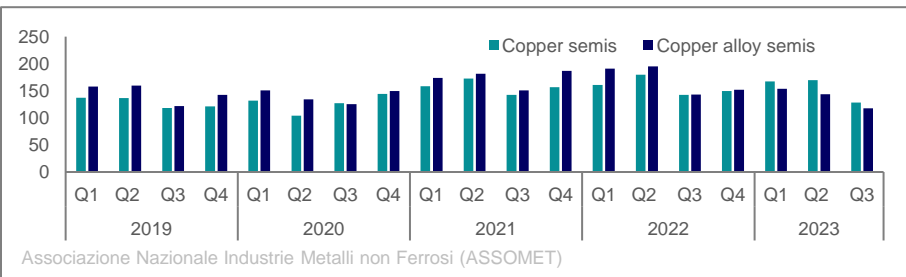
US – copper wire rod and brass mills production



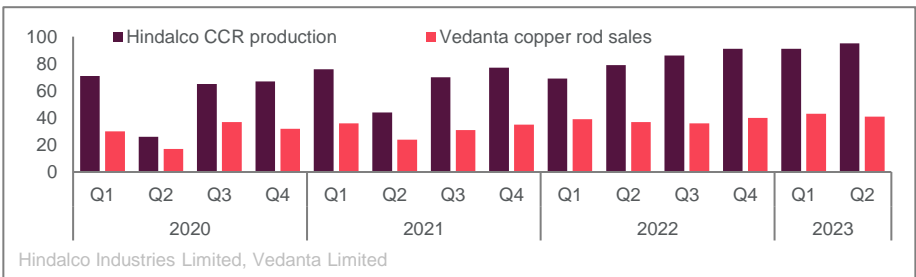
Industrialised Asia – Japan and South Korea



Italy – quarterly semis production



India – Hindalco and Vedanta performance

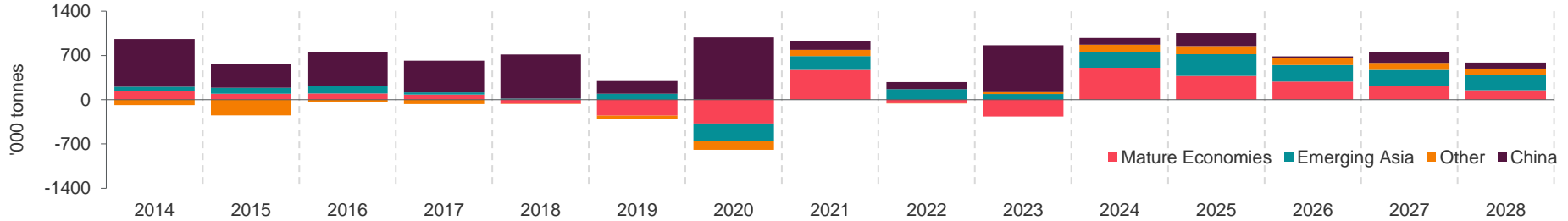


CCR - continuous cast copper rods

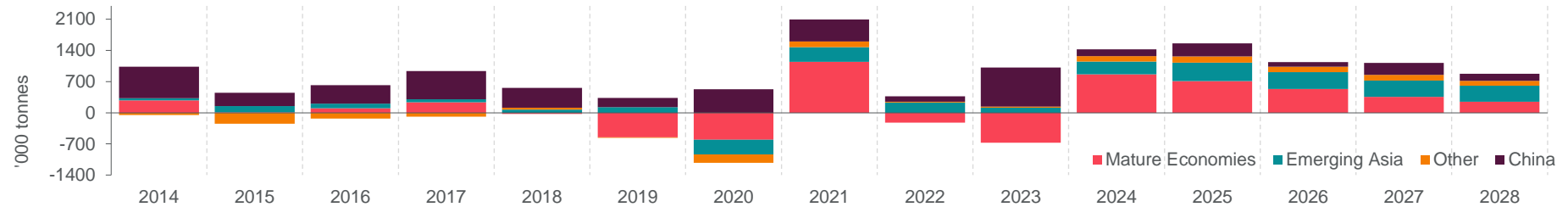
Medium-term consumption supported by end-use recovery and new semis capacity

Slowing consumption in the Western markets while China performs better than anticipated. On a positive note, energy transition-related end-uses are supporting semis production in select geographies.

Refined copper consumption outlook



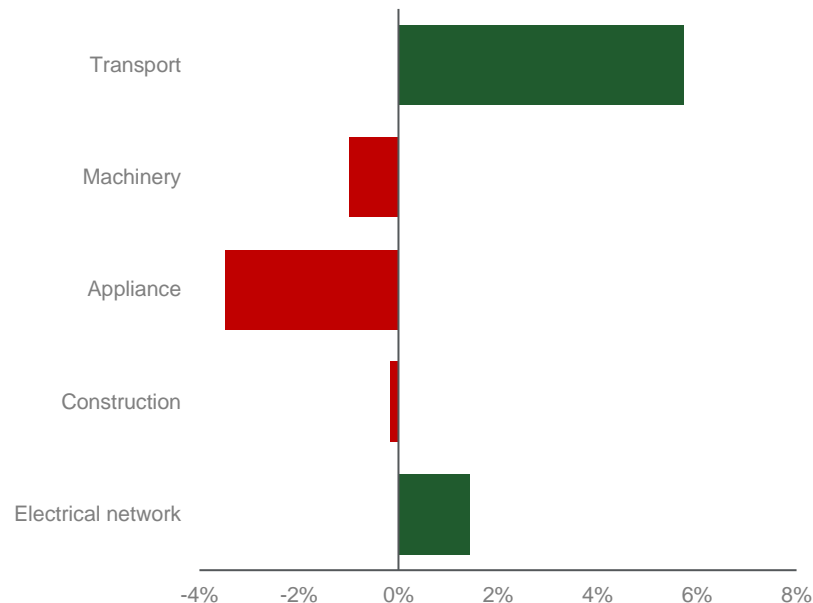
Total copper consumption outlook (refined plus direct use of scrap)



Energy transition-related sectors power China's copper consumption

Total copper consumption in China is expected to register a CAGR of 0.7% between 2023 and 2033 and reach 17.5 Mt by 2033.

CAGR of demand by sector between 2023-2033



- Recently, China issued a work plan for the steady growth of the automotive industry (2023-2024) to support EV demand, with a target of 9 million units of EV sales and 27 million units of total vehicle sales in 2023.
- An extension of the EV purchase tax from 2023 to 2027 announced in June 2023.



- China is targeting of 1,200 GW of wind and solar capacity by 2030. Also, reaching the carbon-neutral target by 2060 implies that renewable power capacity in China will continue to grow after that.
- Corresponding grid upgrades in transmission (more aluminium intensive) and distribution (more copper intensive) networks to incorporate more renewables will also drive copper demand.

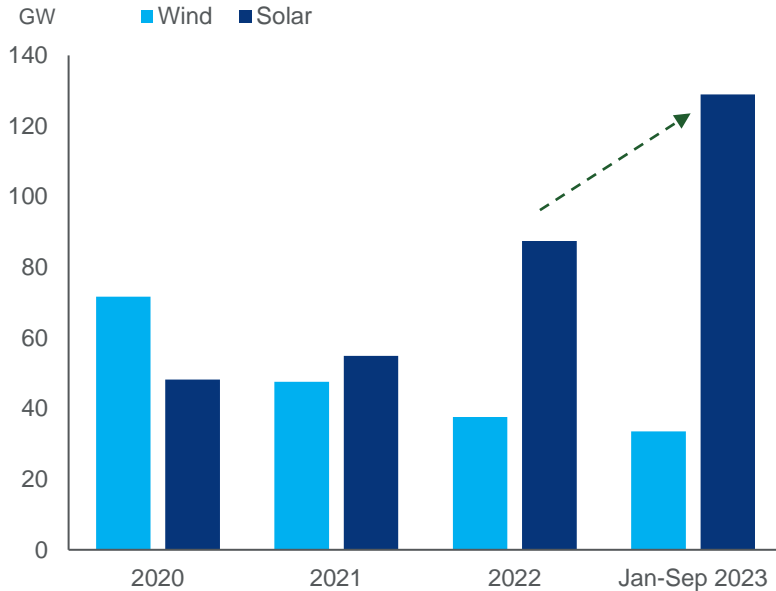


- The slowdown in population growth will negatively impact demand from the construction, appliance and machinery sectors. These last two sectors will also likely be hit further by off-shoring of supply chains from China to emerging Asia and potentially some re-shoring.

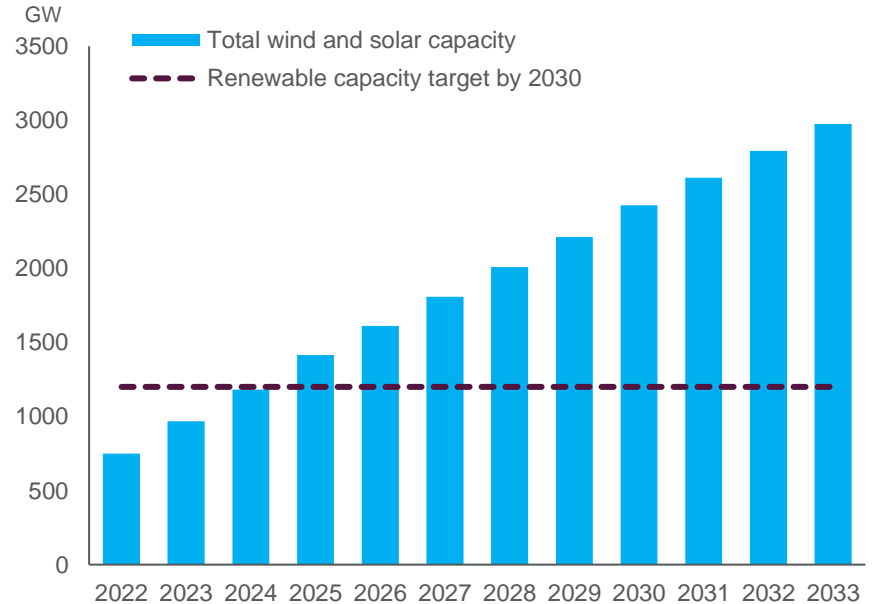
Decarbonisation ambitions has pushed China to bring on more renewable capacity

Improved renewable installation will underpin a demand growth of 5.9% in the electrical network sector in 2023. Also, ongoing development in renewables will underpin a CAGR of 1.4% in demand from this sector between 2023 and 2033.

The newly installed wind and solar power capacity increased by 74% and 145% y-o-y in the year to September



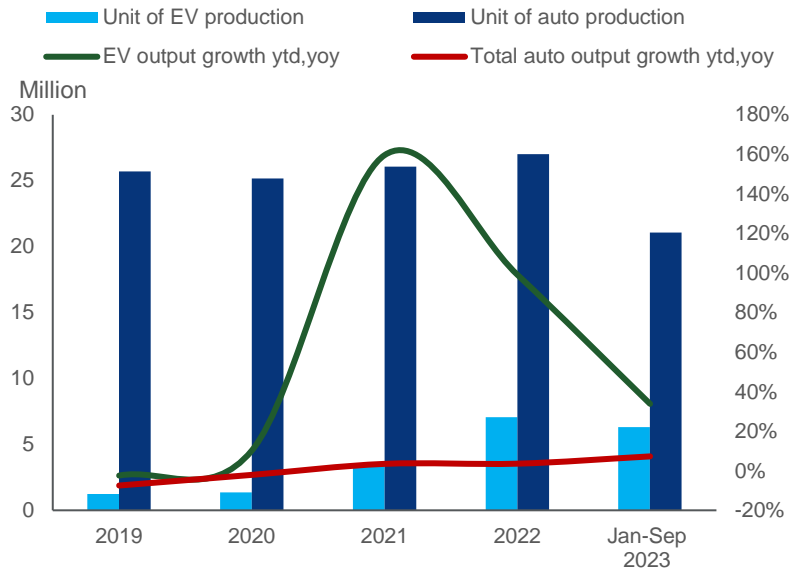
Wind and solar power to reach the 1,200 GW target five years ahead of the government plan



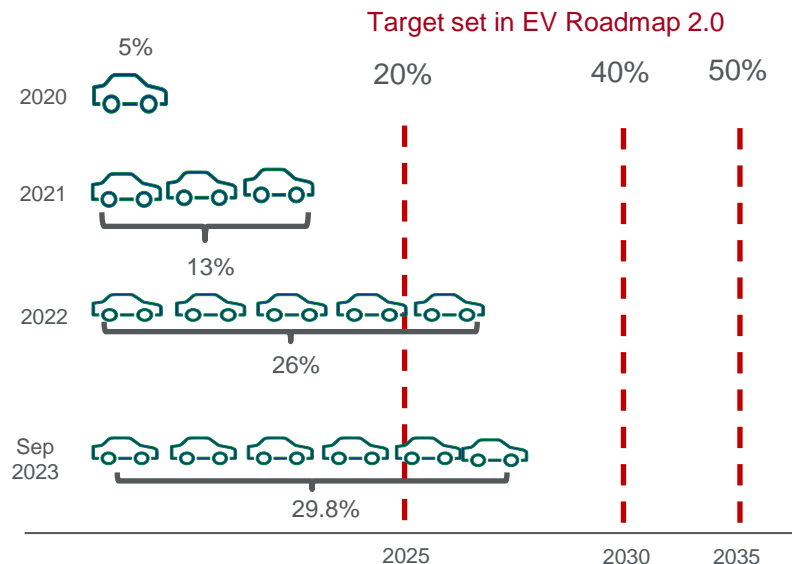
EVs to drive copper demand in the transportation sector

Robust EV growth supports demand from the transportation sector to grow by 8.1% in 2023. Further out, EV tax exemption and the ongoing decarbonisation trend will drive demand to grow at a CAGR of 5.7% over the investment horizon.

The divergence in output growth of EVs and total vehicles suggests that EVs outpace their traditional ICE counterparts.



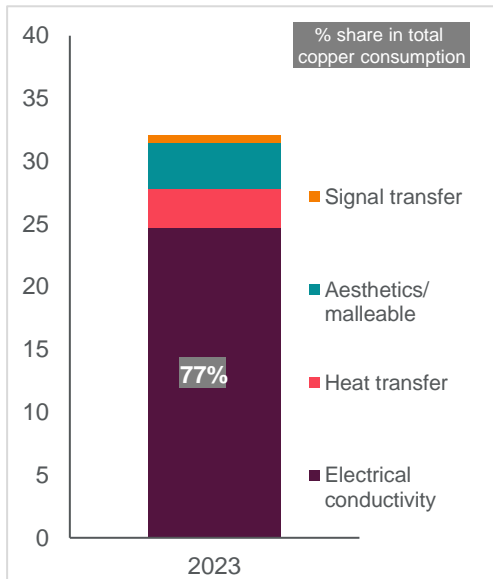
The subsidies from government is supporting EV sales penetration rate moved up further and reached 29.5% in August 2023



Copper's credibility as an electrical conductor will underpin its role in energy transition

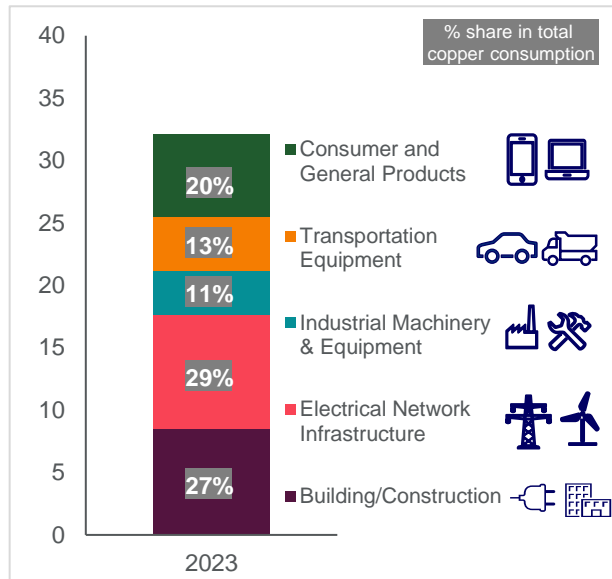
EVs, renewables and investment in support infrastructure to underpin copper end-use demand and production of related semis, predominantly copper wire rod and electrodeposited foil.

Consumption by property (Mt)



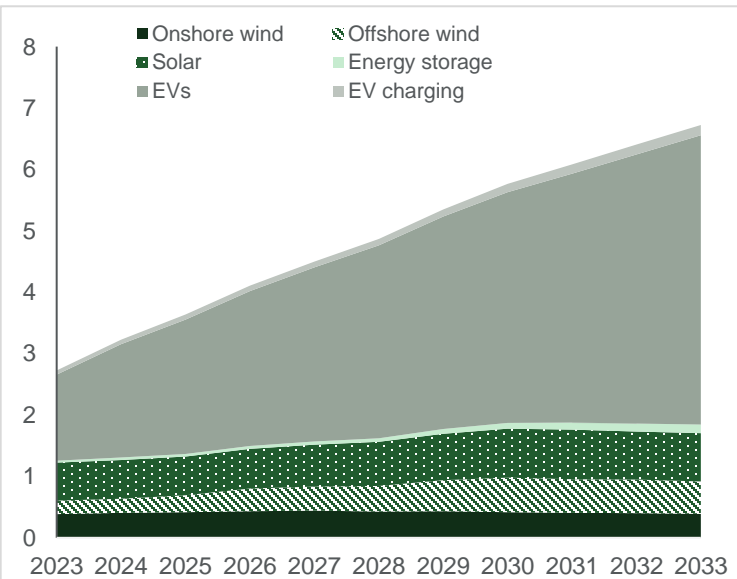
Electrical conductivity continues to account for 77% of copper use by 2033

Consumption by industry (Mt)



Share of transportation equipment to increase to 18% by 2033

End-use demand from green sectors (Mt)

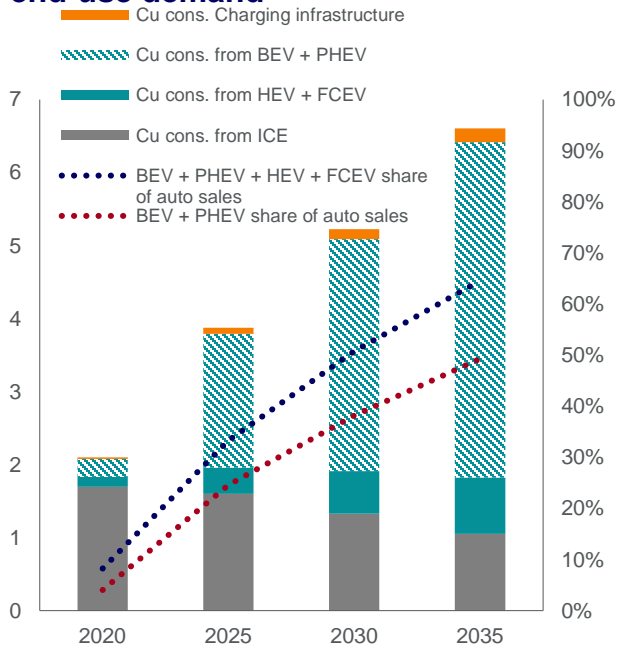


Share of green end-uses in total consumption to more than double from around 8% to 16% by 2033*

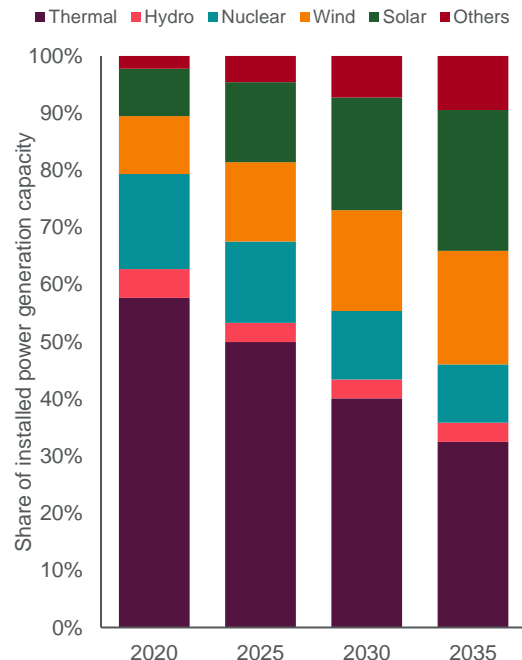
Decarbonisation commitments are an upside risk to our base case forecasts

Increasing EV penetration, higher renewable capacity and grid expansions will all support copper consumption

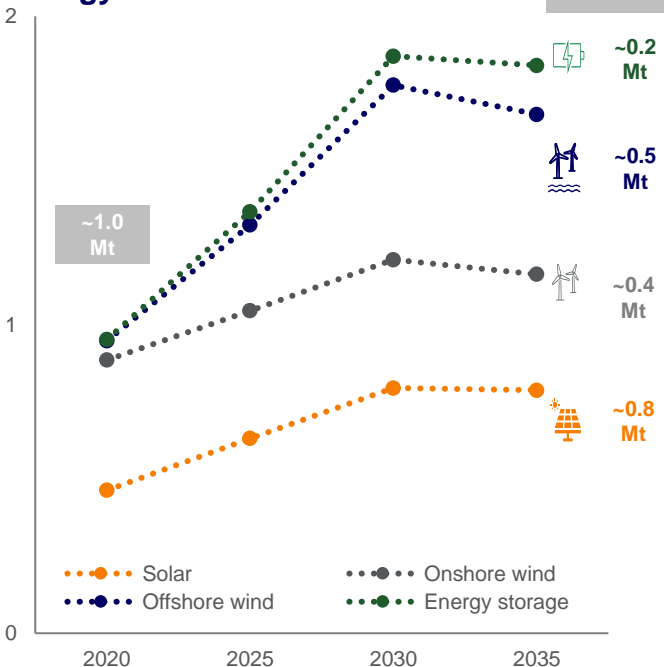
Copper intensive EVs will underpin end-use demand



Renewables share in power mix



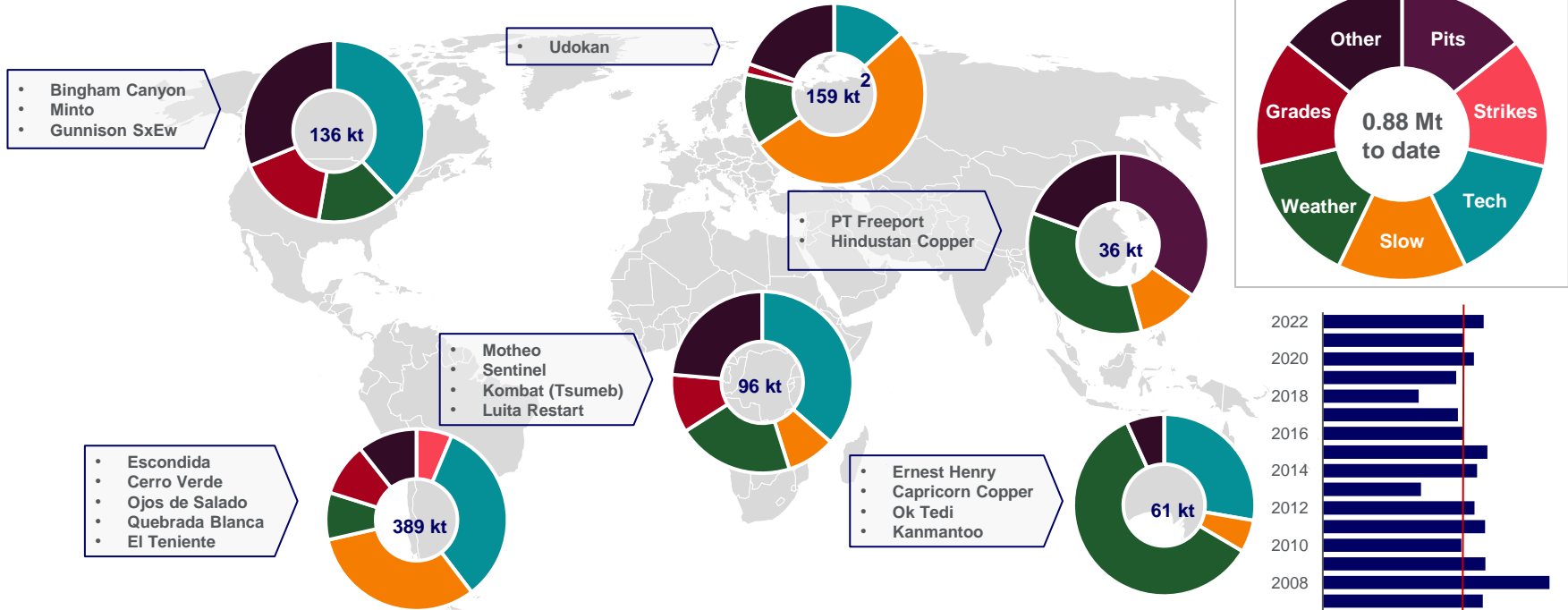
End-use demand from renewable energy sources



3. Copper supply outlook

Copper mine disruptions in 2023

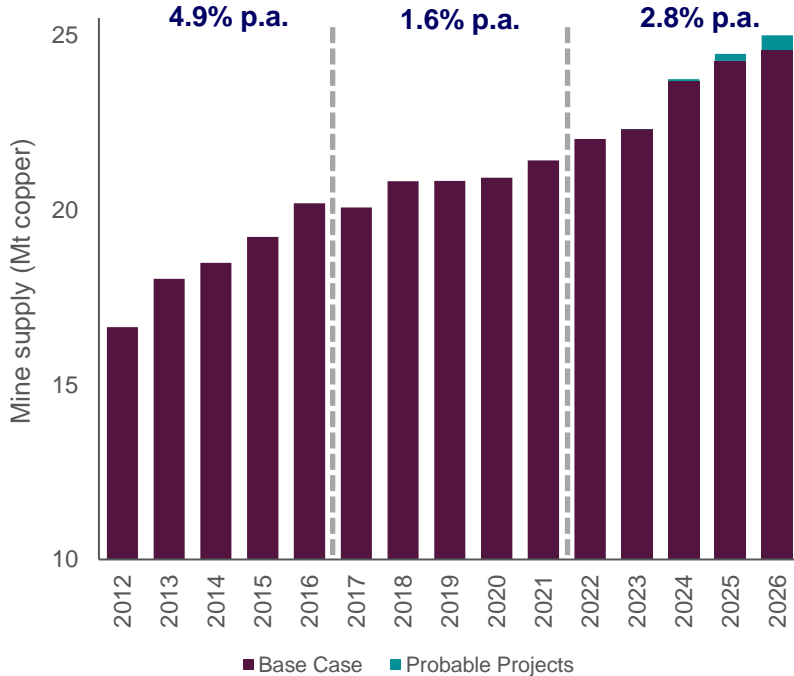
Identified mine disruption rates to date for 2023 stand at ~3.7% or 880 kt.



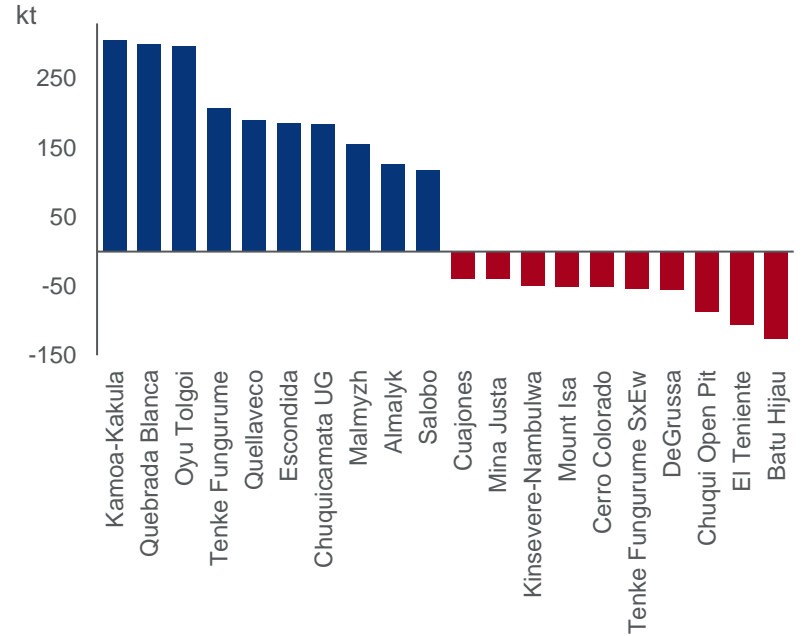
Global mine supply to peak in 2026

Growth will come from a combination of project ramp-ups, brownfield expansions and new greenfield mines.

Mine supply growth¹



Largest base case production changes 2022 to 2026

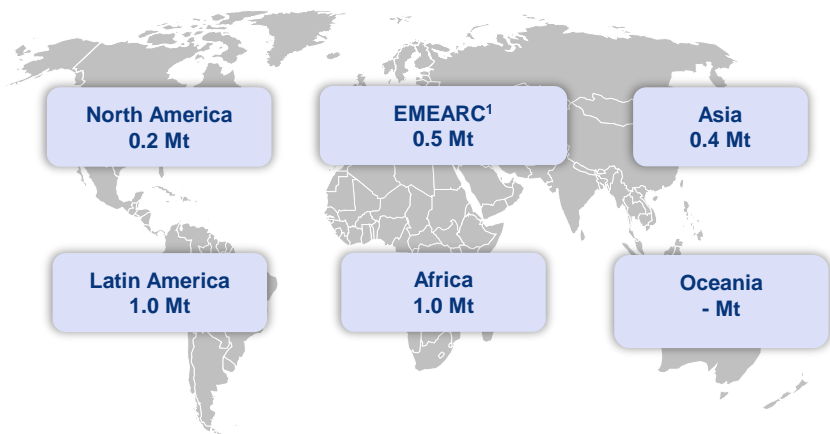


Notes: 1) After disruption allowance * 70% brownfield, 50% greenfield & mine life extension

Base case copper mine supply in the near and medium-term

Strong growth delivered by “base case” mines, either already operating or in construction.

Sources of base case mine supply growth until 2026



+3.2 Mt between 2023-2026 before adjustments

New supply is expected from projects including...

Quebrada Blanca Phase 2: Ramp-up to continue into next year. Net increase of +220kt between 2023-2026



Collahuasi Expansion: Net growth of +140kt by 2026

Chuqui UG: Growth of approximately +90kt by 2026

Mantoverde: Expected start-up in 2024, adding +80ktpa

Udokan: Started up this year. Ramping up to peak of 140 ktpa in first phase



Malmyzh: Currently under construction. Approximately 160 ktpa.



Almalyk: Mine and smelter expansion adding +120kt by 2026



Oyu Tolgoi: Growth of approximately +250 kt by 2026



Tenke Fungurume: Production will be increased by 200 ktpa. Still in development, with start up expected in 2024

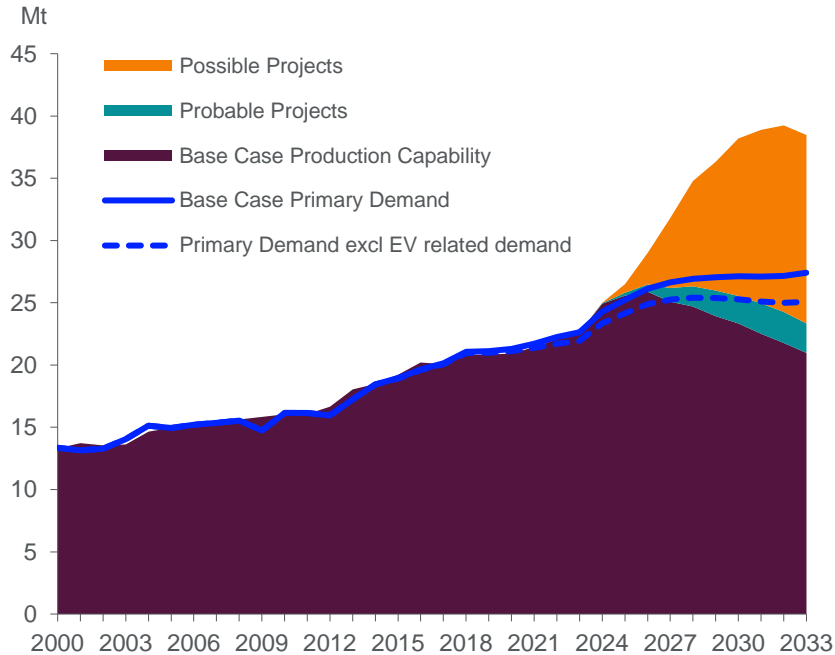


Kansanshi: Expansion now approved. +140kt by 2026

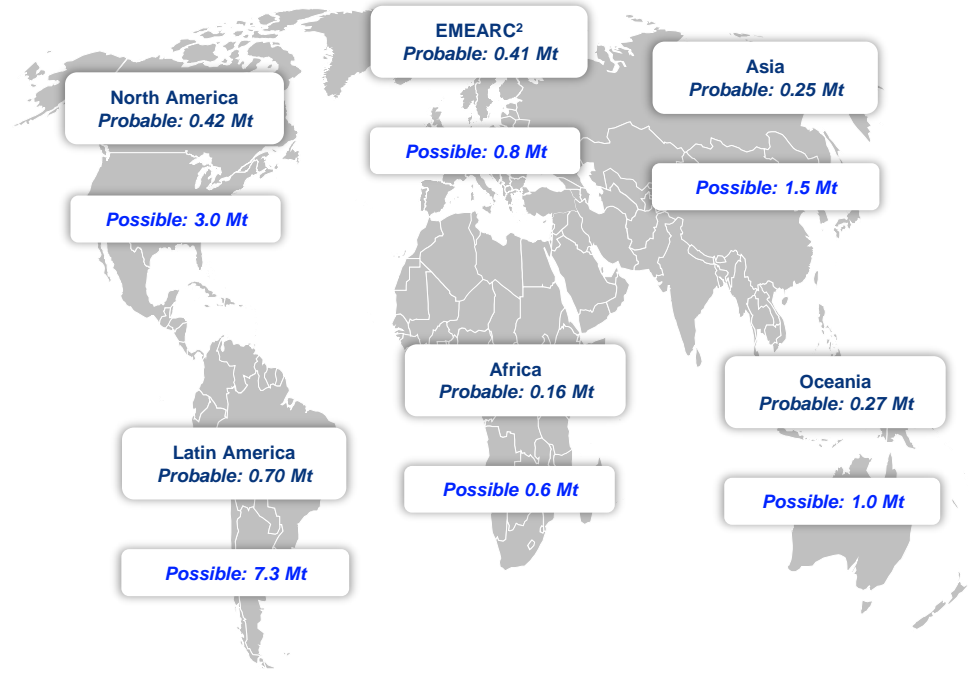
New supply is required from new projects to satisfy future demand

From 2026, new mine production is required to keep pace with demand

Global copper production and primary demand



16.4 Mt¹ of copper in probable & possible projects



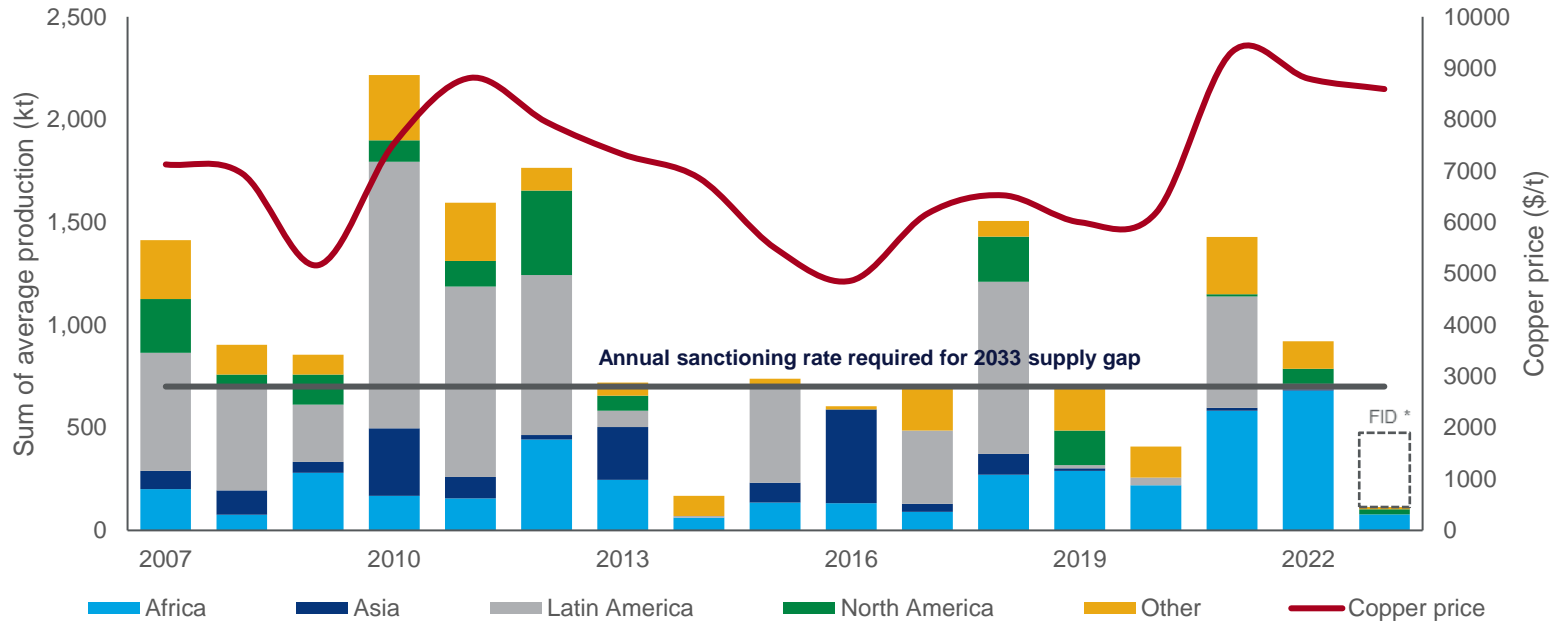
1) Sum of average production over 2024 – 2033 for pipeline of new projects.

2) EMEARC = Europe, Middle East, Russia & Caspian

More mining projects need to be approved to meet demand from 2025

To fill the expected 2033 supply gap, around 700 kt of production will need to be added each year.

Quantity of copper projects sanctioned since 2007

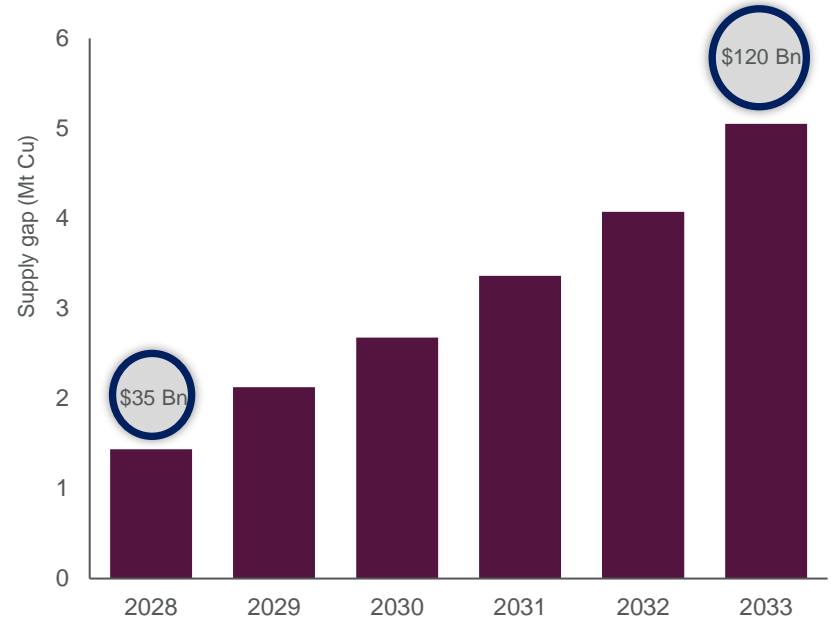
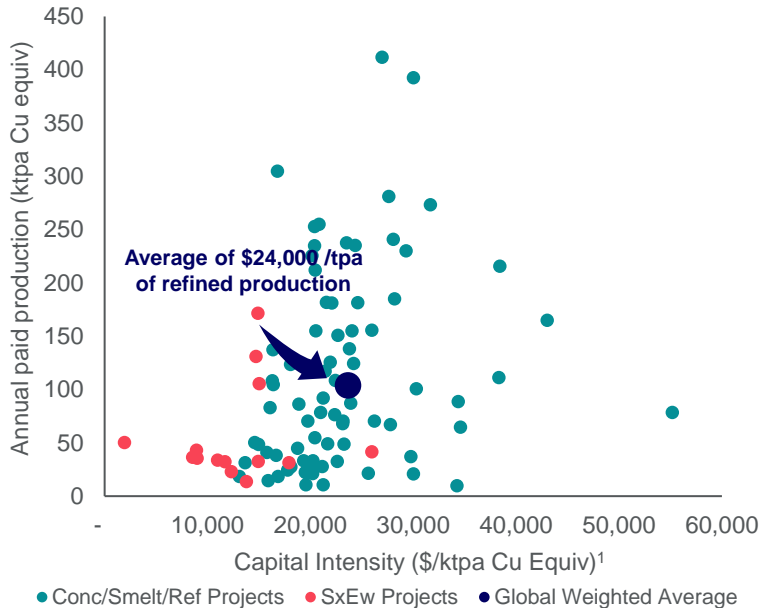


* FID - Final Investment Decision

How much investment is required to deliver mine supply ?

It will cost \$120 Bn to meet the requirement for mine supply by 2033, this rises to \$465 by 2050.

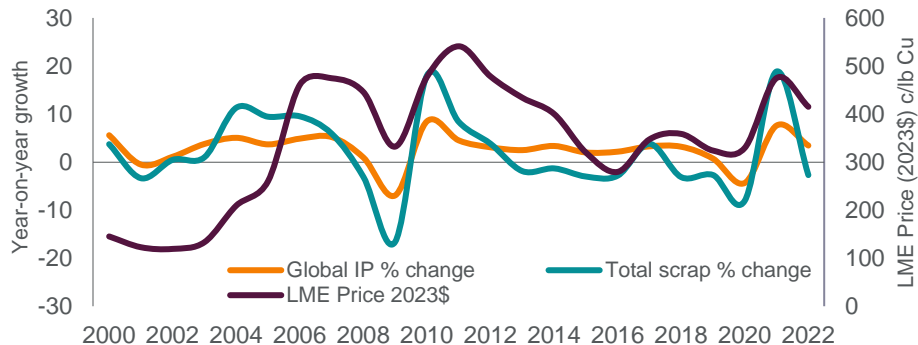
Capital intensity of copper projects included in cost analysis **Future investment is needed to meet primary demand**



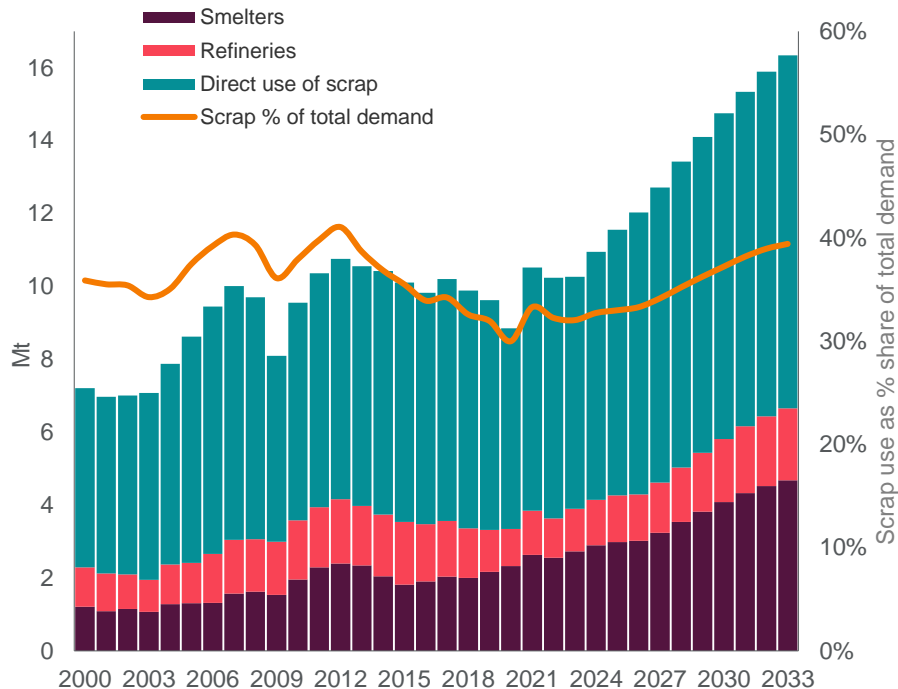
Scrap will play a pivotal role in tempering the supply-demand gap

However, it does not negate the need for new primary supply. The secondary market has its own challenges.

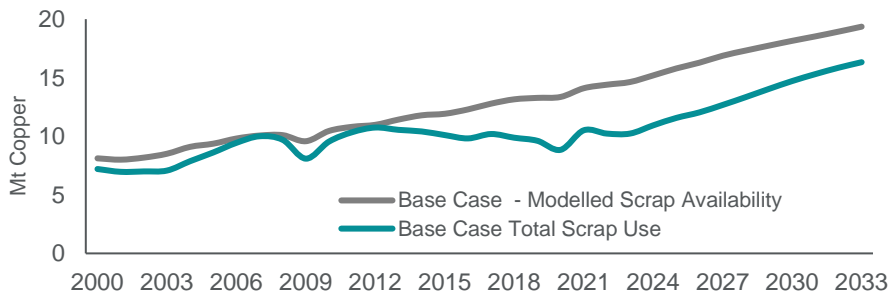
Global IP, LME prices and scrap use



Global copper scrap use by type



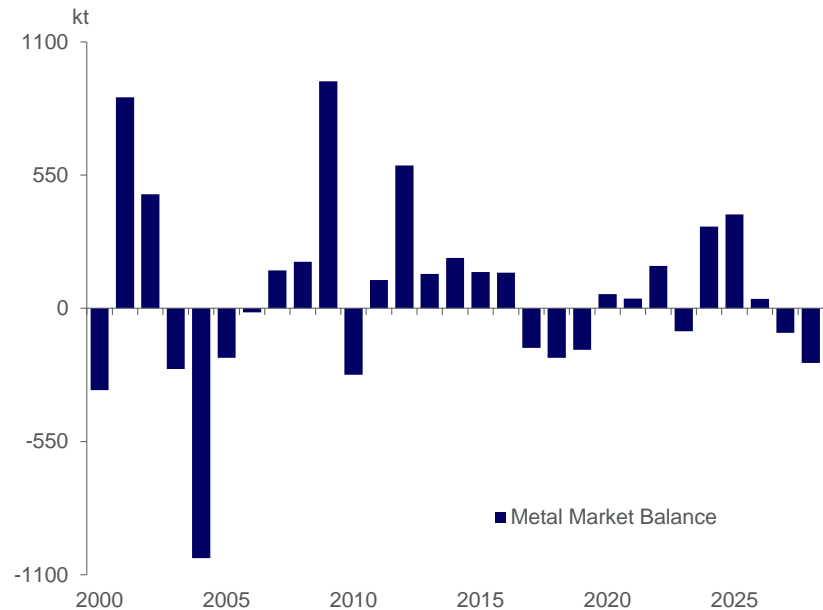
Modelled scrap availability versus global scrap use



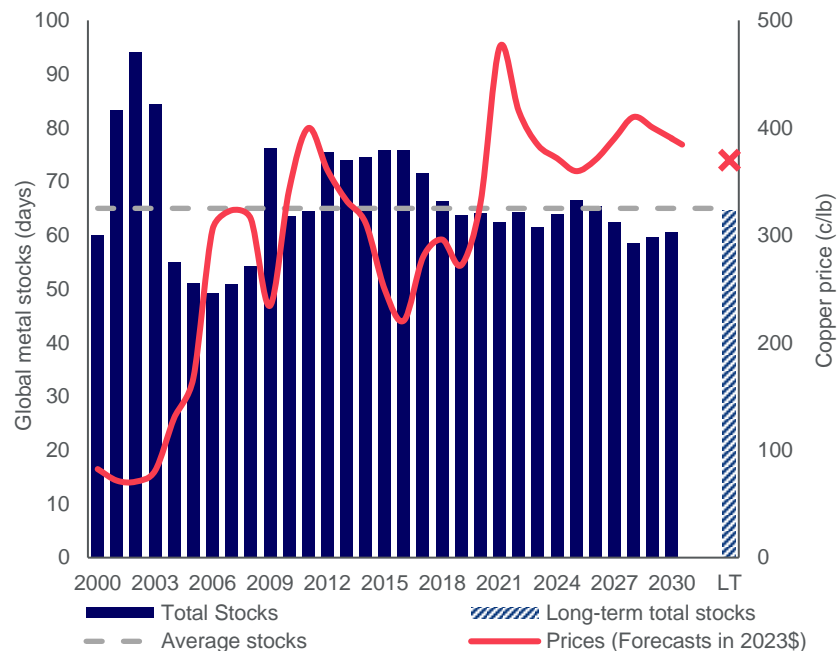
Surpluses to emerge supported by above average mine supply growth

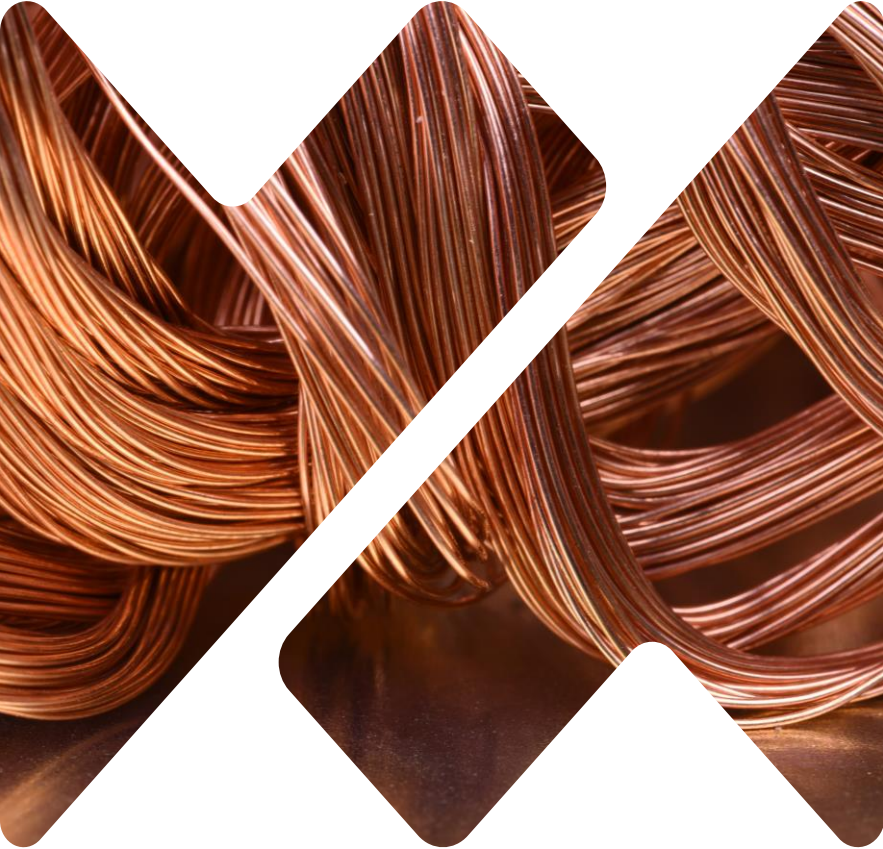
Market fundamentals should dictate the price, but sentiment is a key influence in the very short term

Global refined copper market balance



Copper prices and stocks days of consumption

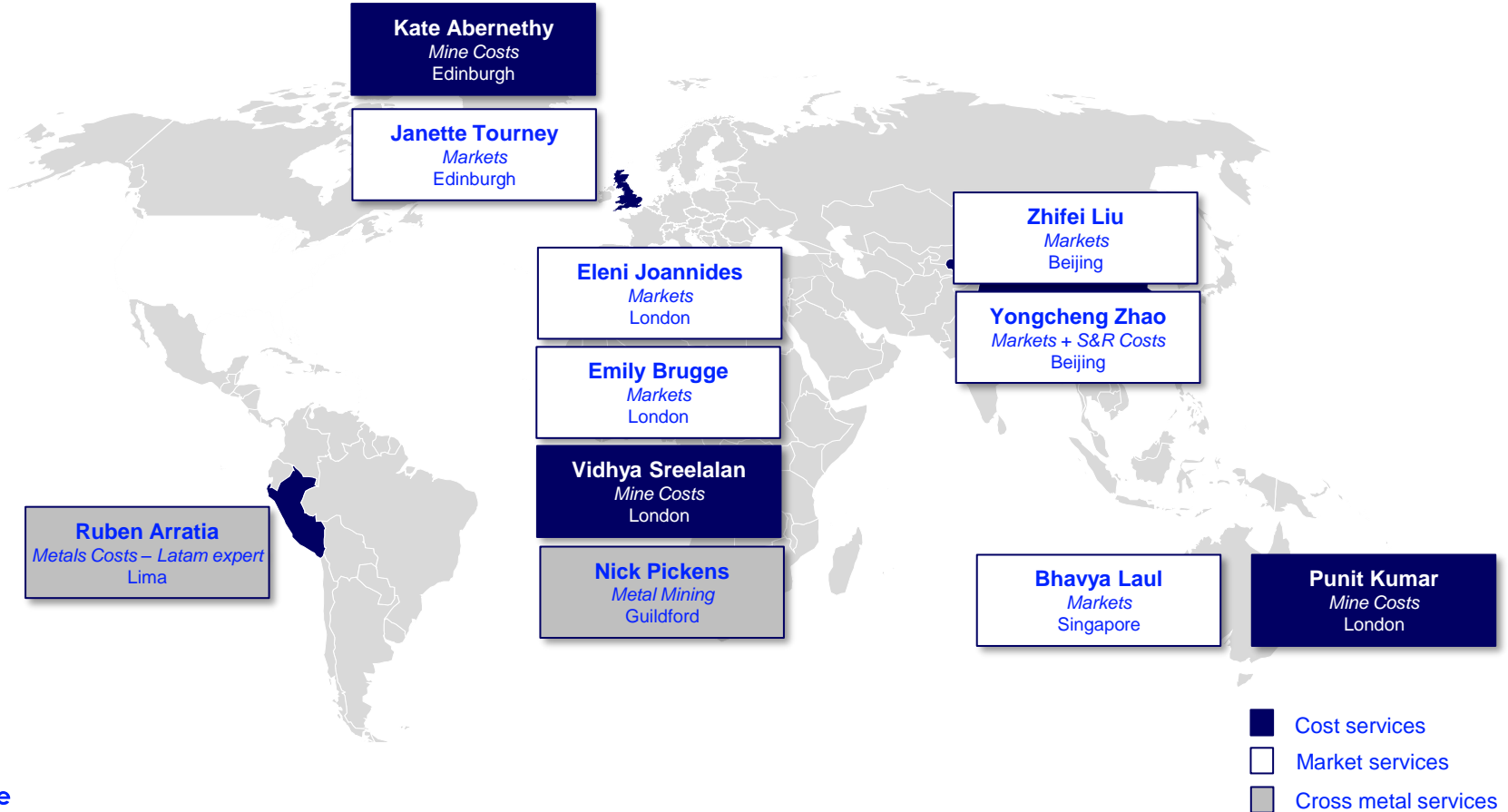




Key Takeaways

- Volatility has prevailed across commodity and energy markets over the past couple of years. This trend is expected to continue.
- Copper's key property as an electrical conductor will underpin demand as the energy transition evolves.
- New mining projects are still required to meet future demand for copper.
- Scrap will be an increasingly important contributor.

Copper Team



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