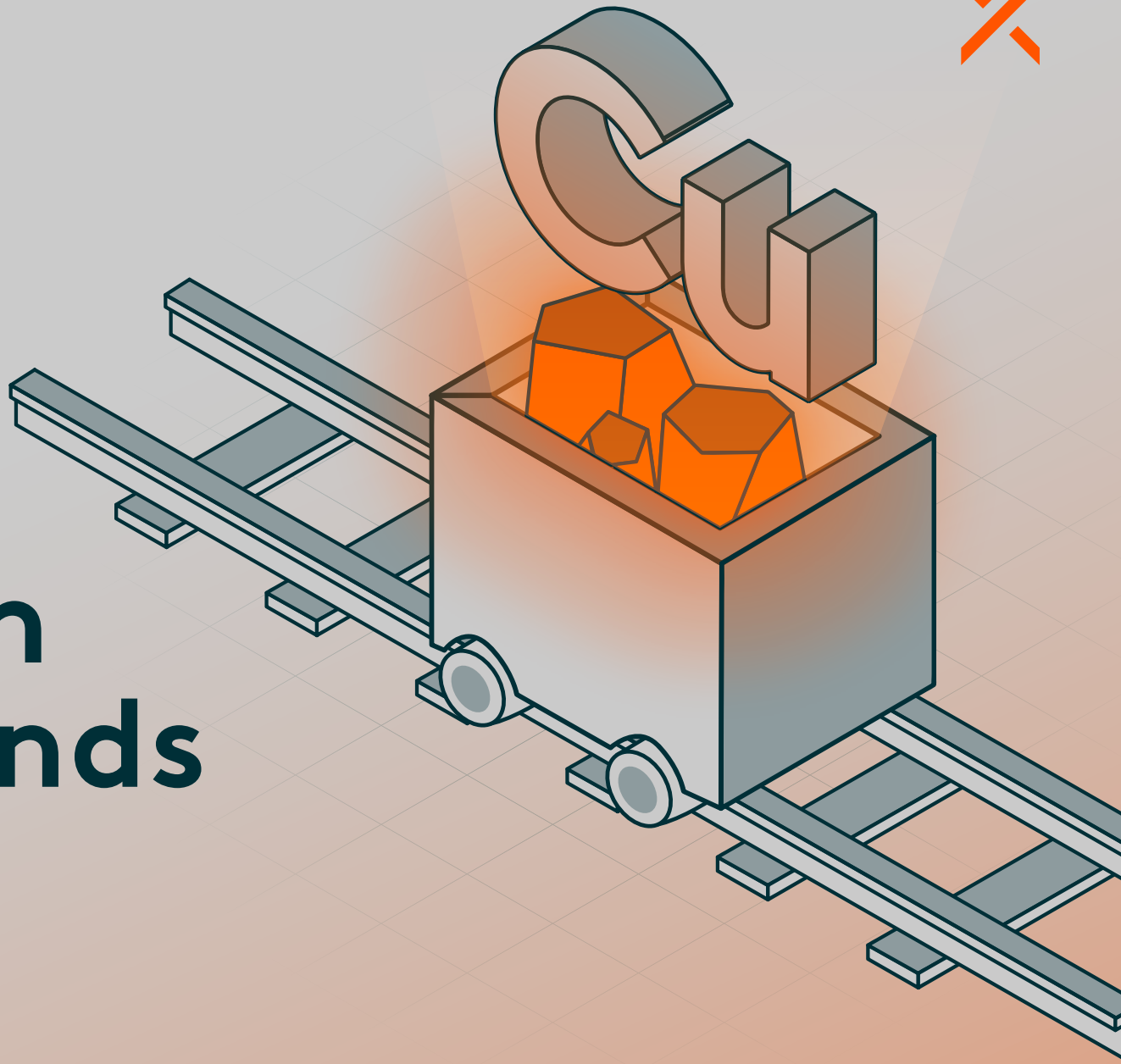
Copper:

At the Intersection of Megatrends



GLOBAL X

by Mirae Asset

From Cyclical Metal to Strategic Constraint

BOTTOM LINE

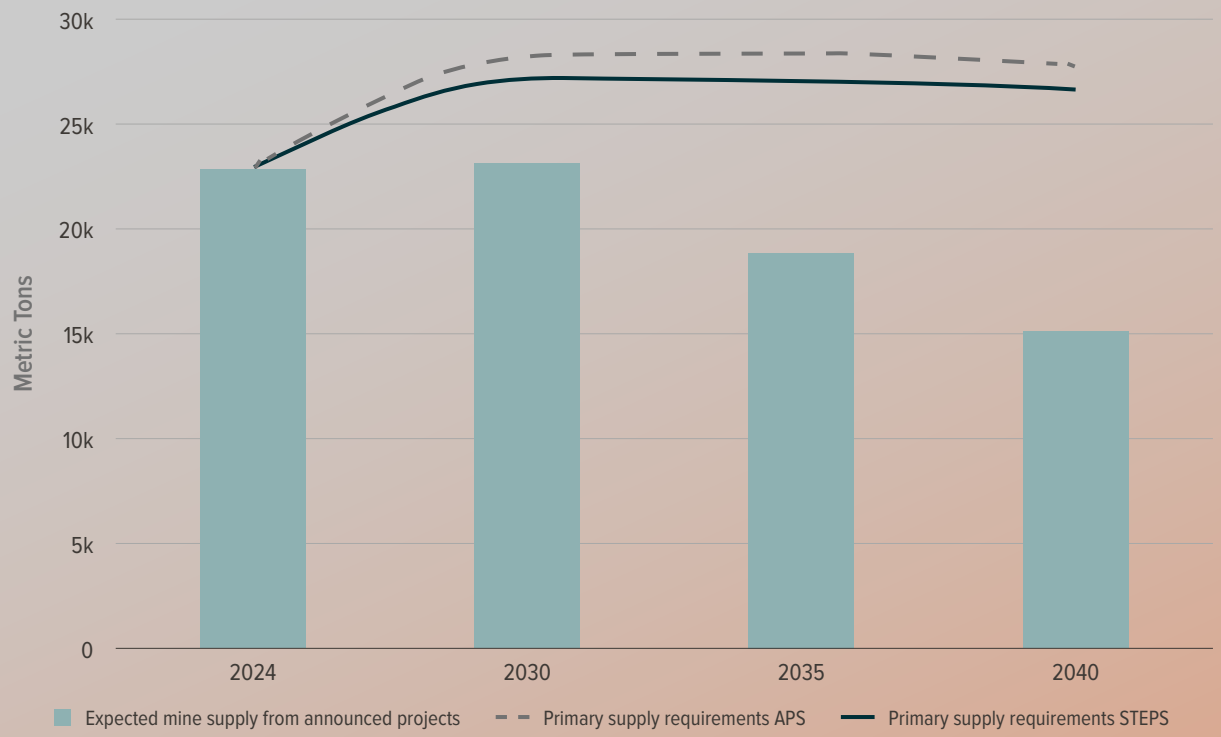
Copper demand has leaned on construction, autos and China's infrastructure waves – sectors with meaningful GDP elasticity and cyclical exposure.[1] Today, the centre of gravity is rotating toward AI/data-centre campuses, power grids, defence rearmament, EVs and fast-charging – programmes mapped years ahead by utilities, hyperscalers and governments, and therefore less sensitive to short-term cycles.[2]

On the supply side, near-term refined balances look comfortable (despite some signs of tightness along the refinery chain), with forecasts of a surplus in 2025, but the forward-looking supply pipeline may give way to structural tightness as new mined output lags strong projections in demand.[3] Announced mines meet only ~70% of primary supply needs by 2035, implying persistent tightness unless more projects, brownfield debottlenecks and recycling scale materialise.[4] Meanwhile, diversified miners are pivoting towards copper via M&A and capital markets, potentially signalling a strategic bid for high-quality copper optionality.[5][6][7]

As this tightening supply outlook meets surging physical demand, copper is emerging as not just a beneficiary of the AI era, but as a potential constraint – the critical material that could govern its speed and scale.

WHAT THIS MEANS FOR MINERS →

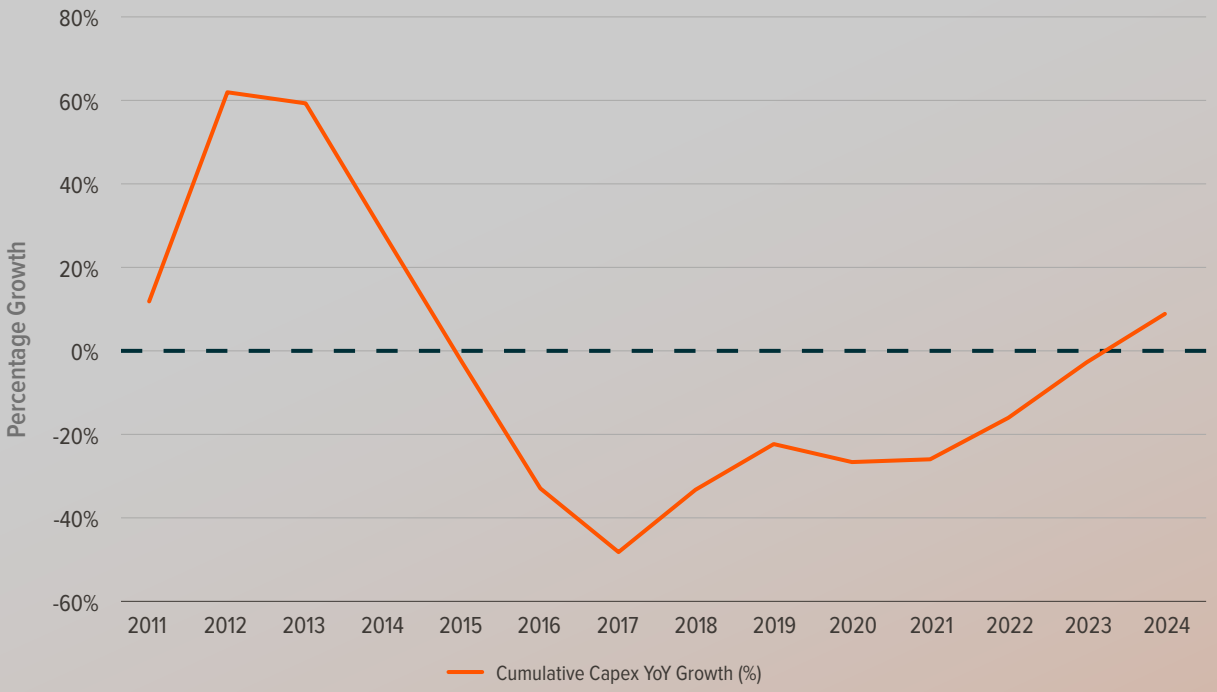
FIGURE 1: MODELLED DEMAND VS SUPPLY OUTLOOK



Source: IEA (2025), Copper, IEA, Paris. There is no guarantee that any trends observed in this material will continue. Any views and opinions are based on current market conditions and are subject to change.

From Cyclical Metal to Strategic Constraint

FIGURE 2: MSCI WORLD METALS & MINING INDEX COMPOUNDED CAPEX GROWTH



Source: Bloomberg, Index is MSCI World Metals & Mining, Ticker: MXWO0MM Index. There is no guarantee that any trends observed in this material will continue. Any views and opinions are based on current market conditions and are subject to change.

01 Data centres and digital infrastructure

How copper is used here

AT A GLANCE

Power backbone: busbars/busways, switchgear, PDUs/UPS, grounding.[8]

Thermal systems and interconnects within servers/racks.[9]

High-reliability cabling where PoE/ short-run performance matters.[10]

SEE ALL →

Why demand growth is 'real economy' and sticky

AI build-outs are multi-year commitments

IEA expects data-centre electricity demand to more than double by 2030, largely due to AI—potentially locking in long-dated electrical packages rich in copper.[11]

Hyperscaler capex has shifted from R&D to concrete and cables

Dell'Oro projects global data-centre capex compounding ~21% annually to 2029, with hyperscalers accounting for ~50% of a ~$1.2T total—sustained ordering for power gear, busbars and switchrooms.[12]

Campus scale is rising, not just count

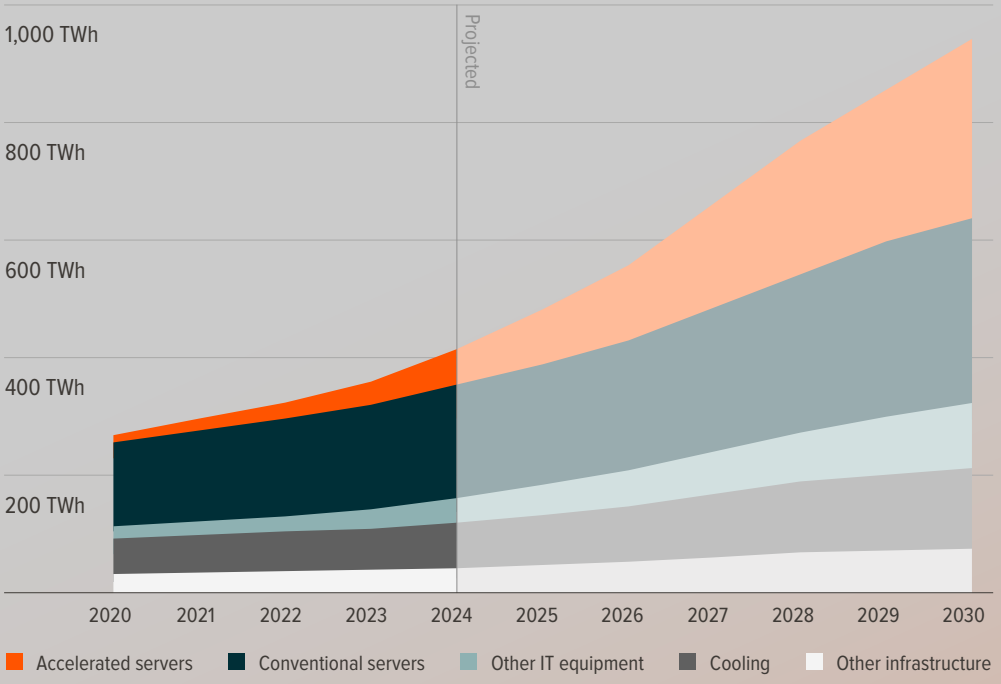
Synergy counts 1,136 hyperscale sites by end-2024 and notes increasing average size/density—each increment scaling electrical copper needs.[13]

Persistence of Demand

DC campuses are planned, permitted and power-contracted on multi-year arcs; grid equipment and cable lead times have lengthened, reducing cyclicality.[14]

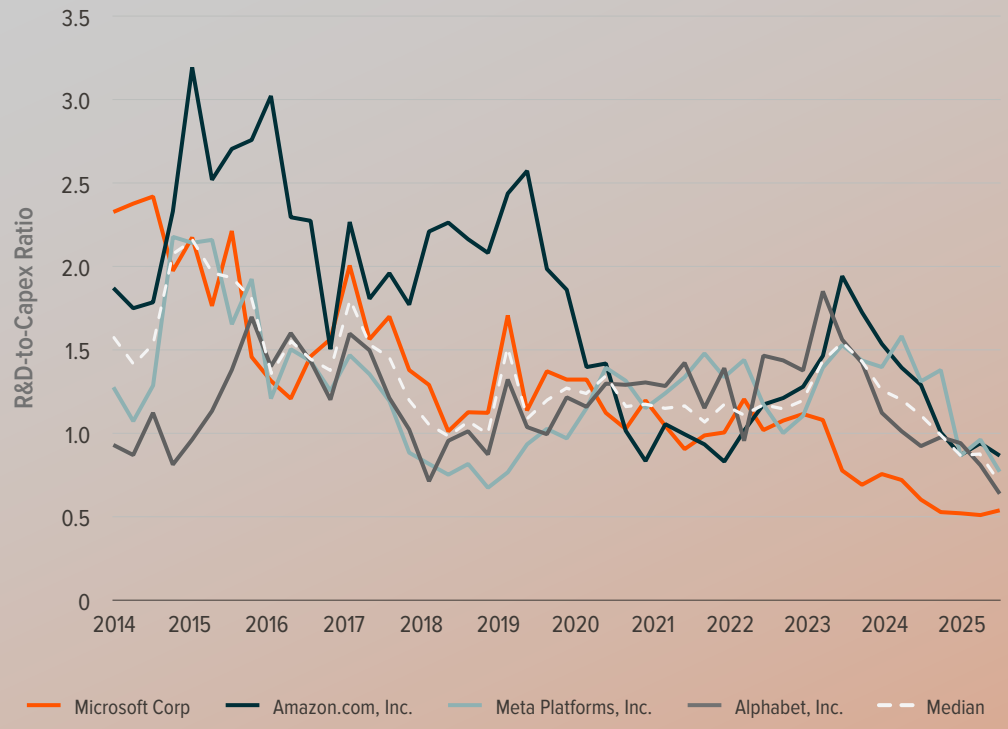
01 Data centres and digital infrastructure

FIGURE 3: IEA'S BASE CASE FOR DATA CENTRE ELECTRICITY CONSUMPTION



Source: IEA (2025), Global data centre electricity consumption, by equipment, Base Case, 2020-2030. There is no guarantee that any trends observed in this material will continue. Any views and opinions are based on current market conditions and are subject to change.

FIGURE 4: HYPERSCALERS: R&D-TO-CAPEX RATIO

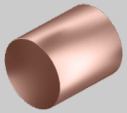


Source: Global X illustration with information derived from Bloomberg. There is no guarantee that any trends observed in this material will continue. Any views and opinions are based on current market conditions and are subject to change.

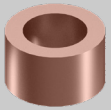
02 Defence rearmament

How copper is used here

AT A GLANCE



Power wiring and RF cabling, radar and communications hardware.[15]



Copper-nickel alloys in naval systems: corrosion-resistant piping and heat exchangers in ships/submarines.[16]

Munitions and aerospace components: brass casings, connectors, and beryllium-copper contacts for rugged electronics.[17]

SEE ALL →

Structurally higher spending, with an emphasis on procurement over R&D

Budgets are stepping up for a decade-plus

NATO adopted a 5%-of-GDP defence and security investment goal by 2035 (3.5% core defence + 1.5% related), structurally lifting procurement capacity.[18]

Near-term floor is already higher

By 2025 all 32 NATO members met the longstanding 2% target, increasing sustained demand for platforms and munitions with high copper content.[19]

Europe is rebuilding stockpiles and industry

The EU's ASAP mobilises finance and permitting to expand ammunition/missile capacity—multi-year factory and tooling cycles with heavy electrical content.[20]

The U.S. is scaling munitions output

The Army is on a path to ~100k 155mm shells per month by 2026, with new facilities ramping—clear, programmatic demand for copper-rich components and plant power systems.[21]

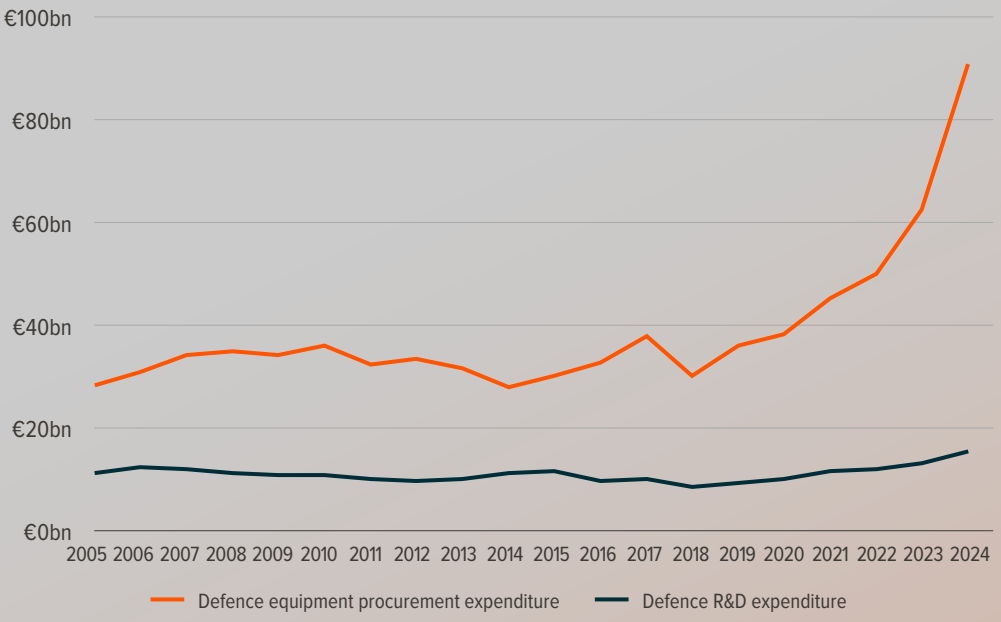
Persistence of Demand

Rearmament is policy-driven and multi-year; once appropriated and contracted, spend tends to execute through cycles.[22]

02 Defence rearmament

FIGURE 5: DEFENCE SPENDING IS INCREASINGLY FLOWING INTO PHYSICAL PROCUREMENT RATHER THAN R&D

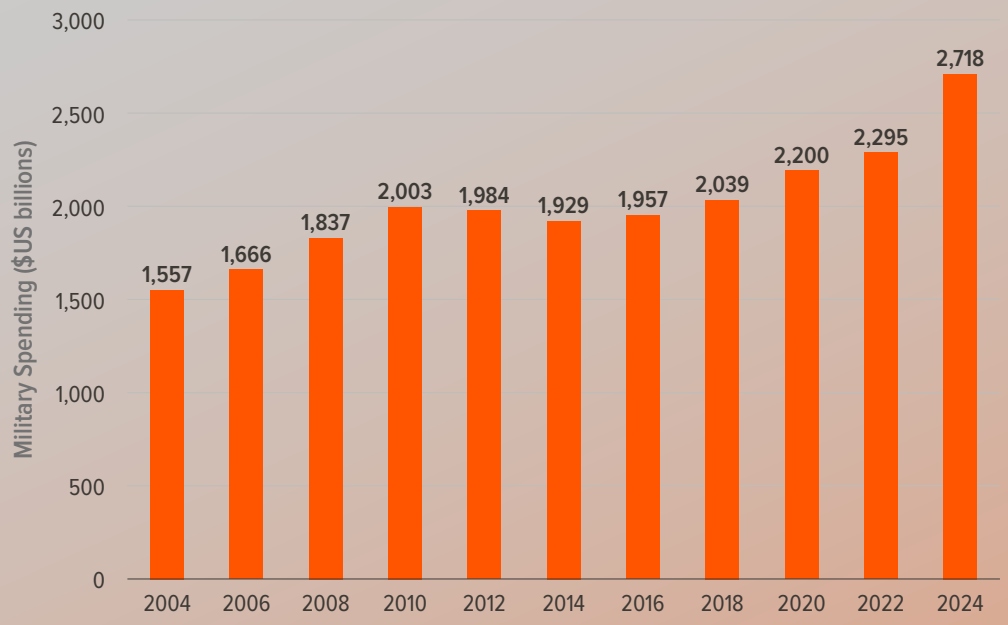
COMPOSITION OF EU DEFENCE INVESTMENTS



Source: Global X illustration with information derived from the European Defence Agency (2025). There is no guarantee that any trends observed in this material will continue. Any views and opinions are based on current market conditions and are subject to change.

FIGURE 6: MILITARY SPENDING ROSE FOR 10TH CONSECUTIVE YEAR IN 2024

GLOBAL MILITARY SPENDING OVER LAST TWO DECADES



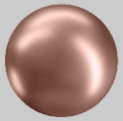
Source: Global X illustration with information derived from SIPRI (April 2025) *Trends in World Military Expenditure, 2024*. There is no guarantee that any trends observed in this material will continue. Any views and opinions are based on current market conditions and are subject to change.

03 Power grids, transformers and HV equipment

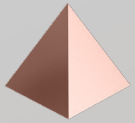
How copper is used here

AT A GLANCE

Conductors and cables: overhead, underground, and HVDC transmission lines.[23]



Transformer windings and substation busbars: key in energy conversion and distribution.[24]



Grounding and connectors: substations, distribution upgrades, and urban electrification.[25]

SEE ALL →

Investment in grids is stepping up and copper intensive

Grid investment has seen a resurgence after decades of flat investment

Grid investment across Americas, EMEA and APAC saw no investment within 'transition' budgets until 2020, since which there's been a 46% increase.[26]

Lead times and prices reset higher

Since 2019, cable prices nearly doubled; transformer prices rose ~75%; delivery times for HVDC cables and large transformers stretch years—smoothing order books.[27]

Materials price sensitivity is real policy risk

Copper and aluminium are ~20% of grid investment costs, so planners pre-commit to secure packages and timelines—another anchor for demand.[28]

Investment momentum is broad-based

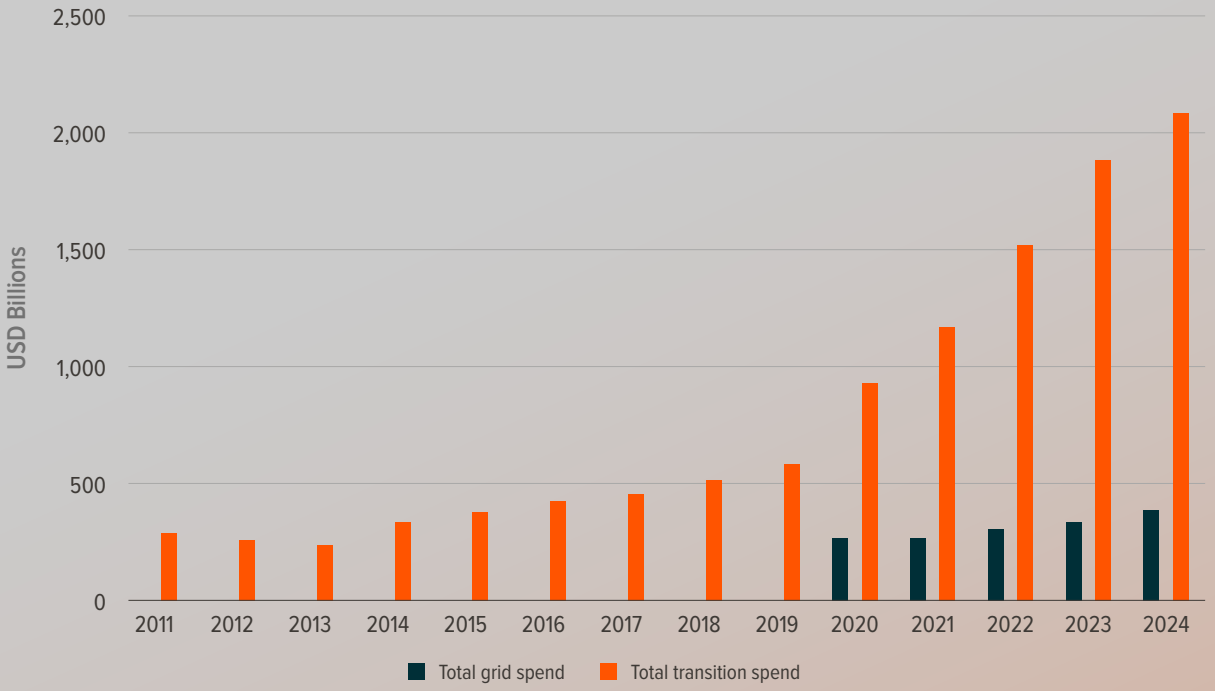
Global grid capex set new records and continues to rise as governments prioritise reliability and decarbonisation, sustaining copper pull even through macro noise.[29]

Persistence of Demand

Regulated utilities build to mandated reliability and connection targets; once procurement starts, packages typically run to completion.[30]

03 Power grids, transformers and HV equipment

FIGURE 7: TOTAL TRANSITION INVESTMENT WITH GRID AS A CATEGORY, ACROSS AMERICAS, EMEA & APAC



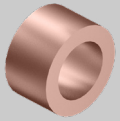
Source: BloombergNEF (2025), Energy Transition Investment Trends 2025. There is no guarantee that any trends observed in this material will continue. Any views and opinions are based on current market conditions and are subject to change.

04 EVs and fast-charging

How copper is used here

AT A GLANCE

Vehicle electrics: harnesses, motors, inverters, and battery interconnects.[31]



Charging infrastructure: DC fast-charger cables, connectors, and depot busbars.[32]

Thermal and power electronics: copper cooling and laminations in on-board chargers.[33]

SEE ALL →

Transition to EVs and fast charging uses incrementally more copper

Vehicle copper intensity steps up structurally

A battery-electric car uses roughly three to four times as much copper as an ICE—compounding fleet-wide demand as EV share grows.[34]

Charging is copper-hungry on the power side

A DC fast-charger can require about an order of magnitude more copper than a typical Level-2 AC charger—small units add up fast, but it's fast-charging that really loads the grid.[35]

Policy programmes keep the pipeline moving

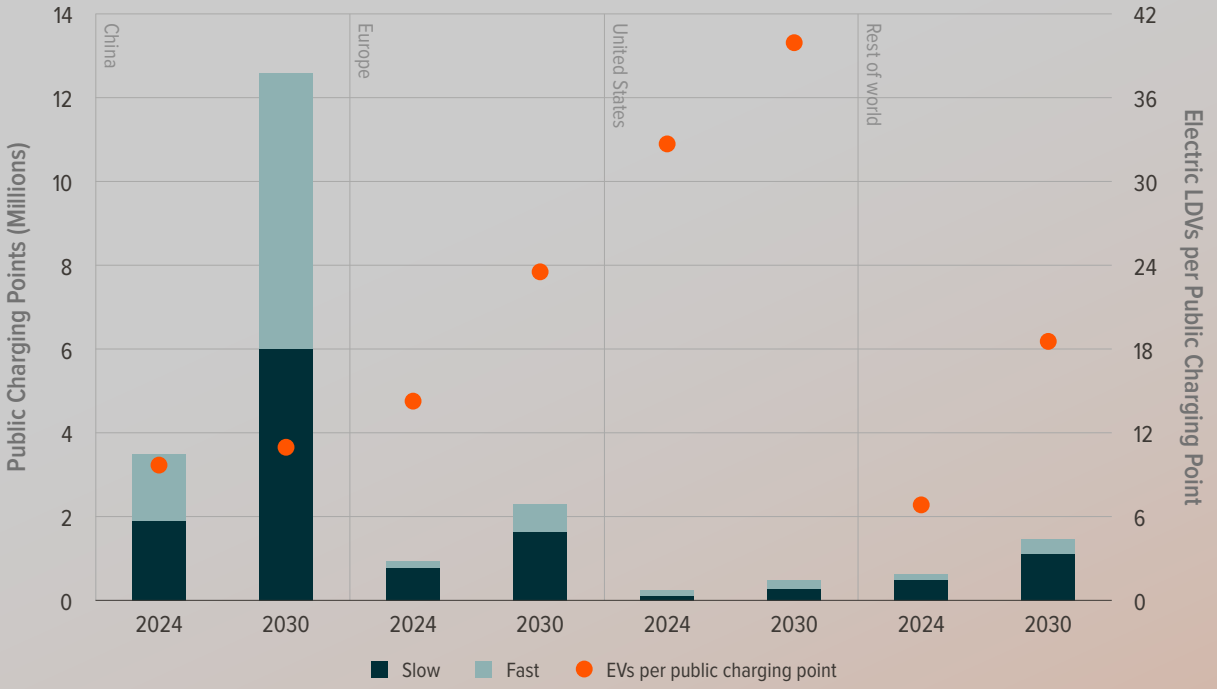
In the U.S., revised NEVI guidance (Aug-2025) restarts and streamlines deployments—fueling multi-year sitework and electrical buys despite near-term swings in EV sales.[36]

Persistence of Demand

National network targets and OEM model pipelines shape a steady cadence of chargers and copper-heavy power upgrades.[37]

04 EVs and fast-charging

FIGURE 8: EV CHARGING POINTS ACROSS REGIONS SHOW GROWTH IN AGGREGATE



Source: IEA (2025), Number of public light-duty vehicle charging points by region in the Stated Policies Scenario, 2024–2030. There is no guarantee that any trends observed in this material will continue. Any views and opinions are based on current market conditions and are subject to change.

05 Buildings and industrial electrification

How copper is used here

AT A GLANCE

Electrical wiring and switchgear: rewires, distribution boards, and circuit protection.[38]

Motors, drives, and process equipment: industrial electrification and automation.[39]

HVAC and heat pumps: copper tubing and coils for heat transfer and refrigerant circuits.[40]

SEE ALL →

Industrial electrification continues, and requires more power

Efficiency standards are tightening

Only about three in five industrial motors are covered by minimum standards today—policy catch-up drives replacement/retrofit cycles that are copper-intensive.[41]

Heat-pump adoption wobbled, but policies persist

After a 2023–24 dip in Europe, signals point to a policy-supported rebound and continued U.S. growth—keeping the medium-term electrification trend intact.[42]

Electrification is a productivity play, not just climate

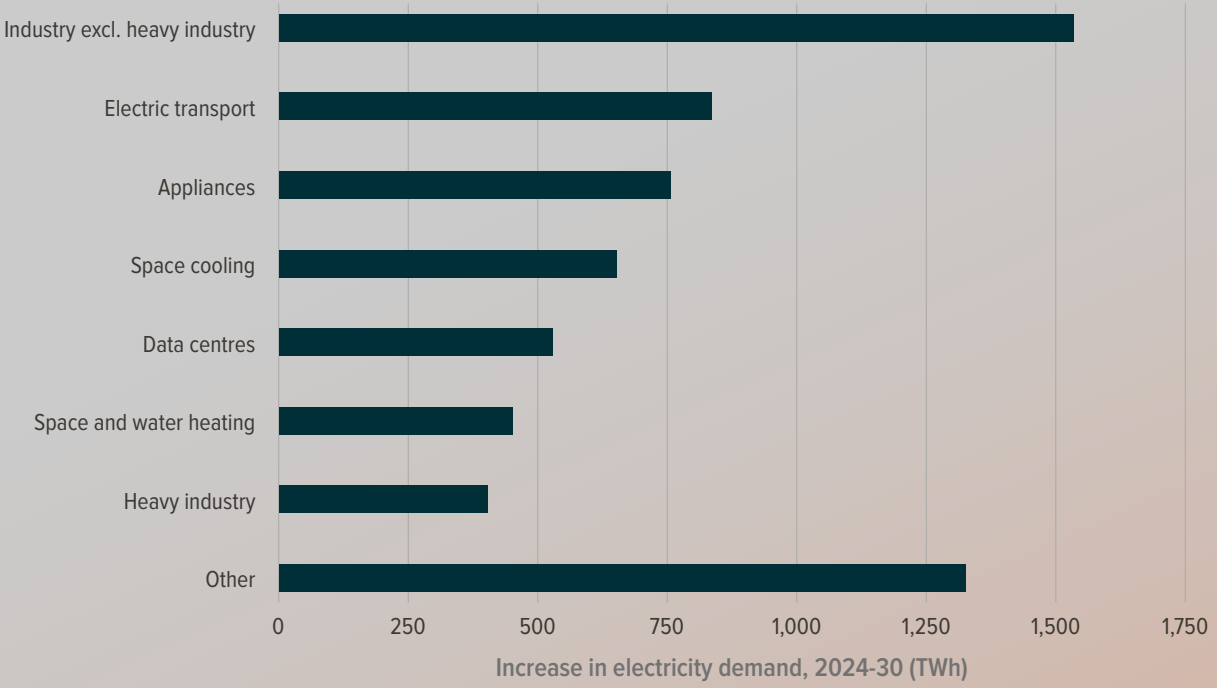
Upgrades improve reliability and operating costs, so projects tend to proceed once financed—tempering macro cyclicality.[43]

Persistence of Demand

Regulatory ratchets and corporate energy-cost logic underpin steady retrofit cycles rather than stop-start spending.[44]

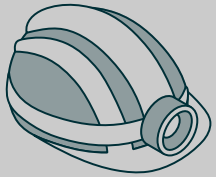
05 Buildings and industrial electrification

FIGURE 9: INCREASE IN ELECTRICITY DEMAND BY SECTOR – IEA BASE CASE



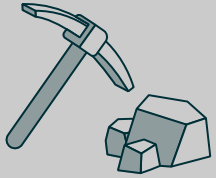
Source: IEA (2025), Increase in electricity demand by sector, Base Case, 2024-2030. There is no guarantee that any trends observed in this material will continue. Any views and opinions are based on current market conditions and are subject to change.

06 What this means **for miners**



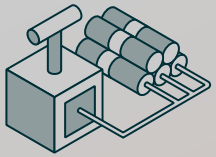
Demand is likely less cyclical than it used to be

With utilities, hyperscalers, EV infrastructure and defence driving a larger share of copper use, miners can plan production and marketing against more “scheduled” demand rather than volatile construction and discretionary goods.[45]



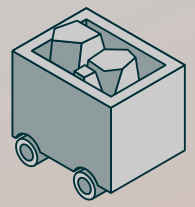
Long lead times favour incumbents and brownfield projects

Average mine lead times have stretched toward ~18 years globally; expansions and debottlenecks at existing complexes are advantaged as markets tighten.[46]



Structural tightness argues for discipline, not volume at any cost

On today’s pipeline, announced mines meet only ~70% of 2035 needs; capital is best deployed where geology, power and water are de-risked, with offtake optionality into data-centre grids, EVs and defence.[47]



Consolidation signals strategy, not exuberance

Recent deals point to “buy quality copper optionality” rather than invest in production – healthy capital discipline for the cycle ahead.[48]

Demand sources and uses

Data centres and digital infrastructure

READ MORE →

- Power backbone: busbars/busways, switchgear, PDUs/UPS, grounding.[7]
- Thermal management systems and interconnects within servers/racks.[8]
- High-reliability cabling where PoE/short-run performance matters.[9]

Defence rearmament

READ MORE →

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Power grids, transformers and HV equipment

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EVs and fast-charging

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Buildings and industrial electrification

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- HVAC and heat pumps: copper tubing and coils for heat transfer and refrigerant circuits.[39]

Footnotes

1 International Copper Study Group (2025) ***World Copper Factbook 2024***

2 International Energy Agency (IEA) (10/04/2025) ***AI is set to drive surging electricity demand from data centres while offering the potential to transform how the energy sector works***

3 Shanghai Metal Market (29/04/2025) ***ICSG: Global copper cathode market is expected to see a surplus of 289,000 mt and 209,000 mt this year and next year, respectively***

4 International Energy Agency (IEA) (2025) ***Overview of outlook for key minerals***

5 AngloAmerican (09/09/2025) ***Anglo American and Teck to combine through a merger of equals to form a global critical minerals champion***

6 BHP (02/05/2023) ***Completion of OZ Minerals acquisition***

7 Wood Mackenzie (02/04/2025) ***Copper production to become a growth driver in 2025 as capital allocation strategies diverge in mining***

8 Copper Development Association Inc. (21/10/2024) ***Driving Data Center Equipment Performance with Copper***

9 BHP (20/01/2025) ***Why AI tools and data centres are driving copper demand***

10 New York Cables (15/05/2024) ***Why Copper Cables are still an integral part of Data Centers?***

11 Ibid

12 Dell'Oro Group (06/07/2025) ***Data Center Capex to Grow at 21 Percent CAGR Through 2029, According to Dell'Oro Group***

13 Synergy Research Group (19/03/2025) ***Hyperscale Data Center Count Hits 1,136; Average Size Increases; US Accounts for 54% of Total Capacity***

14 International Energy Agency (2025) ***Invest in grids today or face gridlock tomorrow***

15 Atlantic Council (01/07/2025) ***A US framework for assessing risk in critical mineral supply chains***

16 National Mining Association (28/10/2024) ***Copper for National Defense***

17 The Oregon Group (2024) ***Military rearmament is just getting started — without enough critical minerals***

18 NATO (25/06/2025) ***The Hague Summit Declaration***

19 Reuters (27/08/2025) ***All NATO members hit old spending target, only three meet new goal***

20 European Commission (15/03/2024) ***ASAP Results Factsheet***

21 U.S. Army (20/02/2025) ***Army seeks to expand and accelerate 155 mm production***

22 Ibid

23 Reuters (31/07/2025) ***Global power grid expansion fuels fresh copper demand surge***

24 International Energy Agency (30/09/2024) ***Building grids faster***

25 International Energy Agency (2025) ***Electricity Grids and Secure Energy Transitions***

26 BloombergNEG (30/01/2025) ***Energy Transition Investment Trends 2025***

27 Ibid

28 Ibid

29 Reuters (31/07/2025) ***Global power grid expansion fuels fresh copper demand surge***

30 Ibid

31 Copper Development Association (2017) ***The Electric Vehicle Market and Copper Demand***

32 Benchmark Minerals (2025) ***EV copper demand to grow despite efficiency-driven content reductions***

33 International Copper Association (2025) ***Copper: The Material of Choice for Vehicle Manufacturers***

34 Ibid

35 Ibid

36 Federal Register (13/08/2025) ***National Electric Vehicle Infrastructure Formula Program Guidance***

37 Ibid

38 EPRI (2025) ***Copper-Rotor Motor: Improved Efficiency***

39 Copper Development Association / International Copper Association (2022) ***Why No Copper, No Net Zero?***

41 International Energy Agency (IEA) (2024) ***Energy Efficiency 2024***

41 Ibid

42 International Energy Agency (IEA) (07/02/2025) ***Is a turnaround in sight for heat pump markets?***

43 Ibid

44 Ibid

45 Ibid

46 S&P Global (11/04/2025) ***From 6 years to 18 years: The increasing trend of mine lead times***

47 Ibid

48 Ibid

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