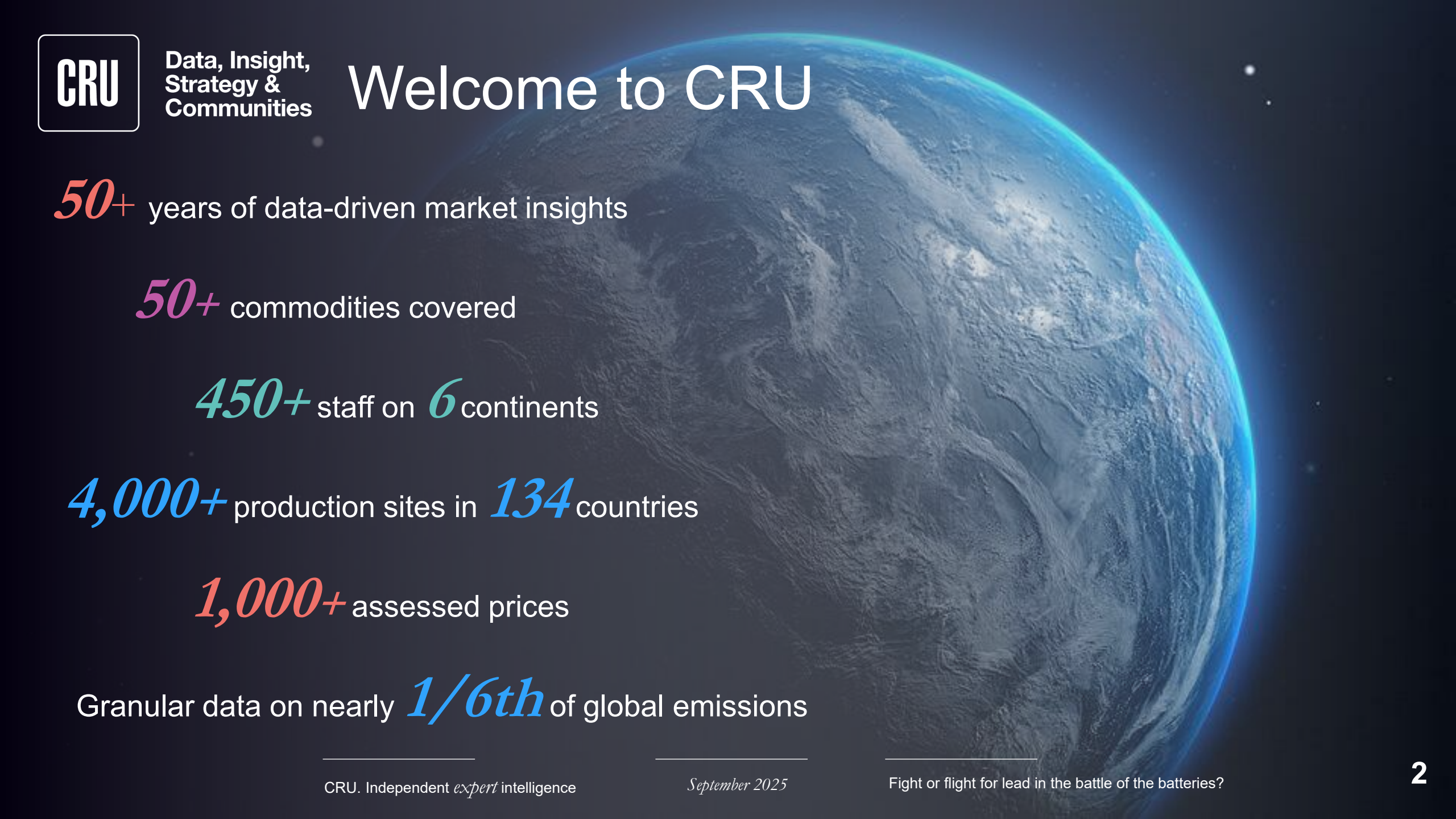
Data, Insight, Strategy & Communities

Fight or flight for lead in the battle of the batteries?

James Griffiths

21st Asian Battery Conference – Kota Kinabalu

CRU. Independent *expert* intelligence



CRU Data, Insight, Strategy & Communities

Welcome to CRU

50+ years of data-driven market insights

50+ commodities covered

450+ staff on *6* continents

4,000+ production sites in *134* countries

1,000+ assessed prices

Granular data on nearly *1/6th* of global emissions

CRU

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Agenda

1. **Recent lead market developments**
   - Unfolding US-led trade war
   - Price struggling amid tariff turmoil
   - Balances – global & China
2. **Battery metal lead's role in green energy transition**
   - Climate change and the green energy transition
   - Automotive powertrain story
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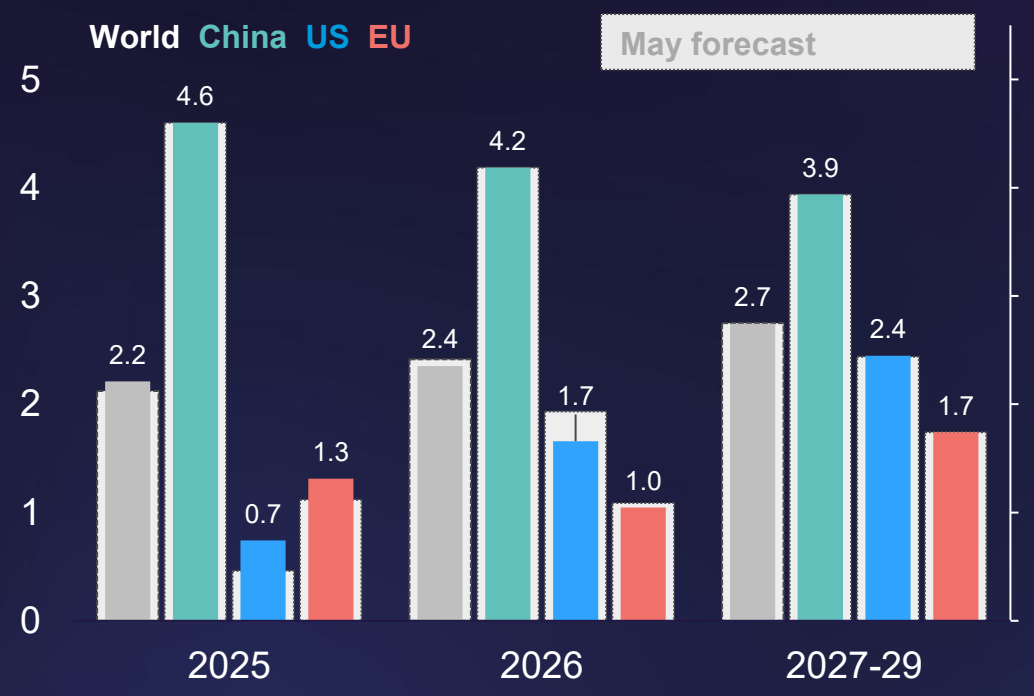
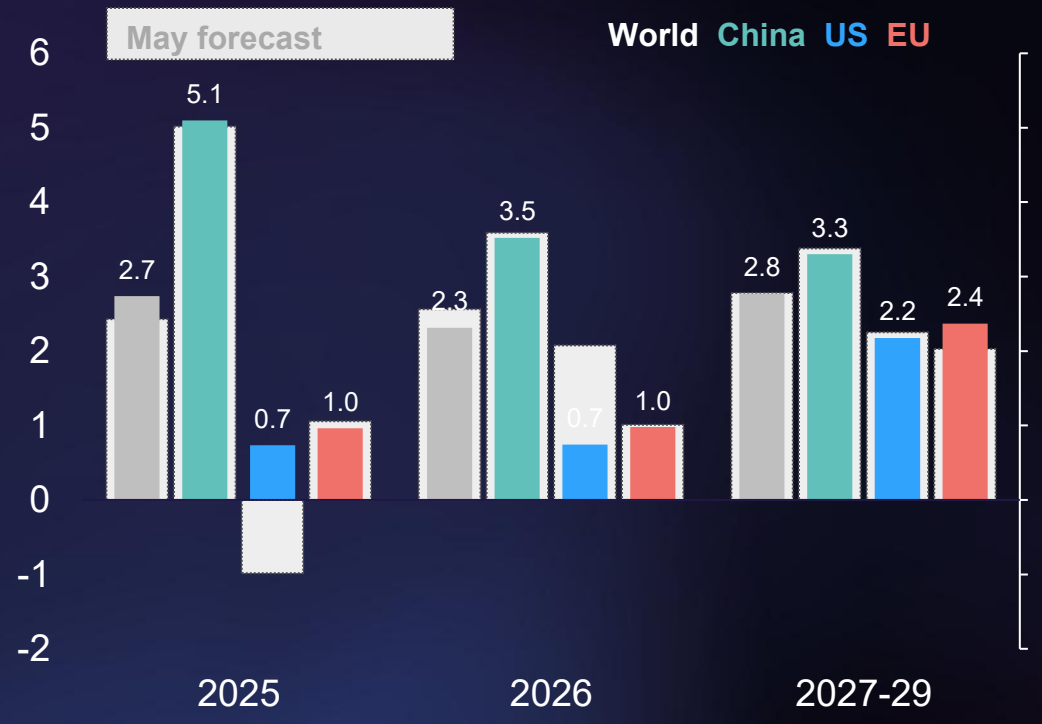
Trade war to damage the global economy

The US will suffer the most damage from the trade war

GDP growth, %



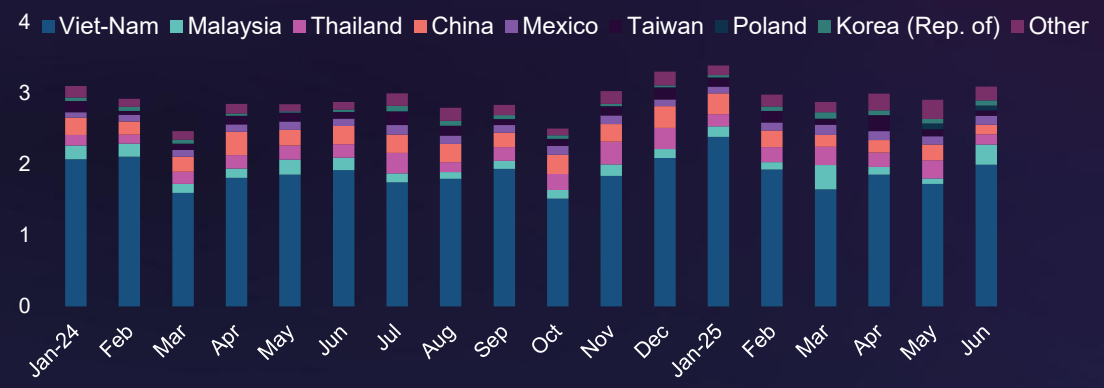
Growth in Industrial Production, %



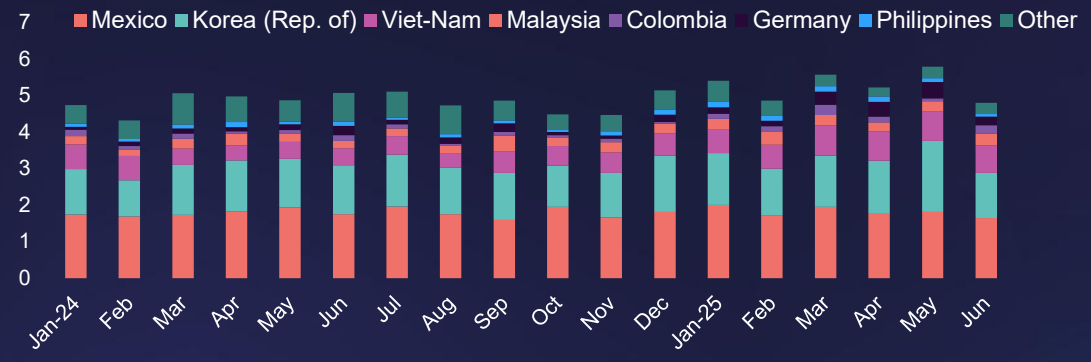
DATA: Oxford Economics, CRU; NOTE: World GDP and IP growth are weighted by market exchange rates

Automotive battery imports into US drop

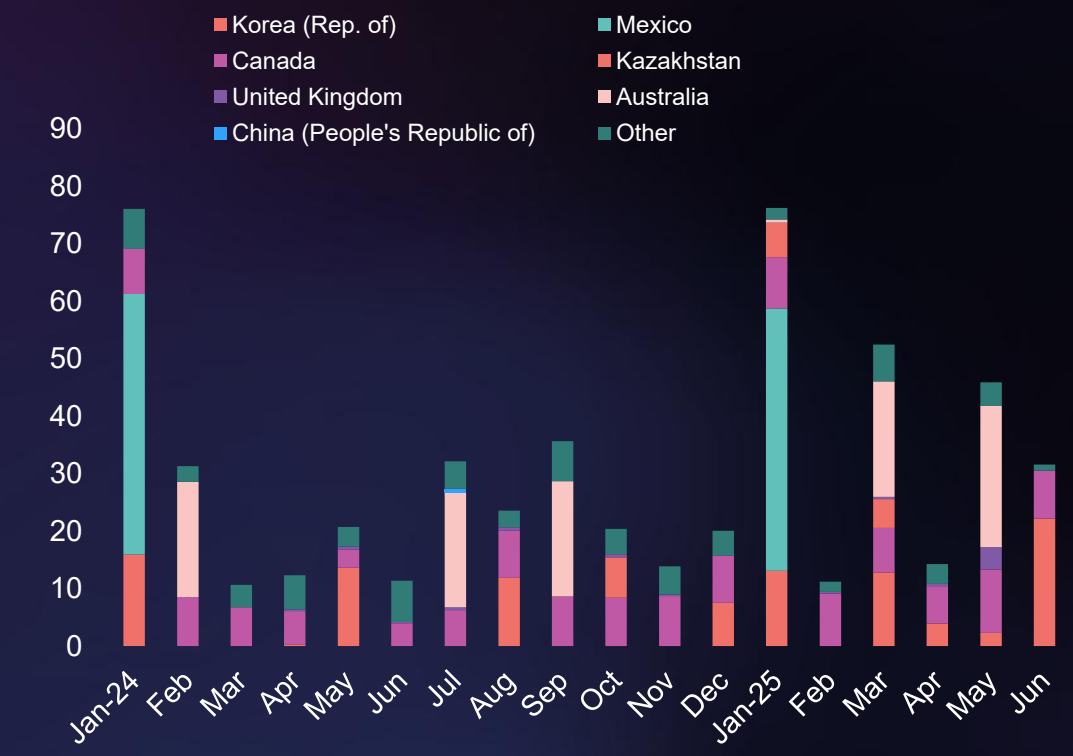
United States Imports of industrial batteries (Million units)



United States Imports of automotive batteries (Million units)



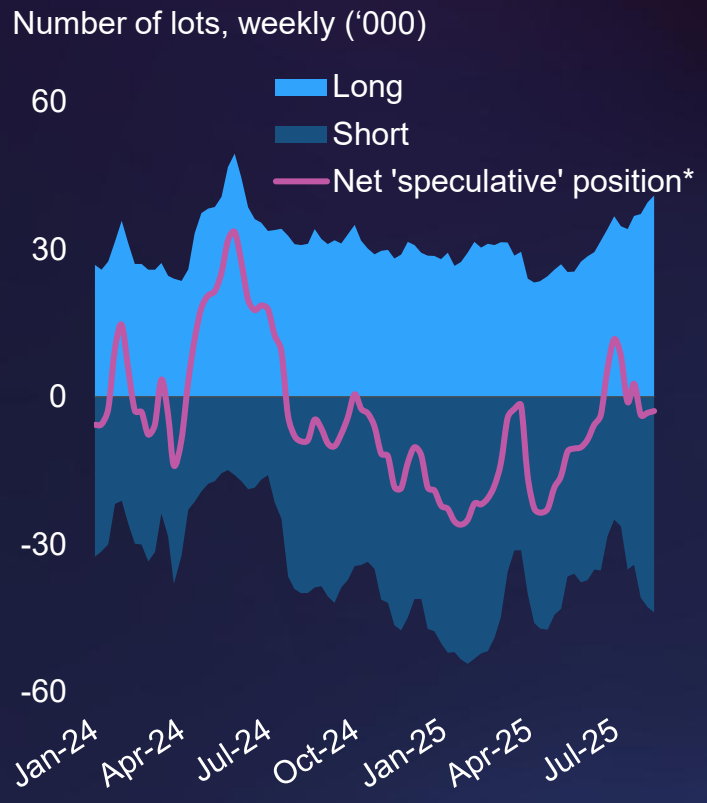
United States Imports of refined lead ('000 tonnes)



DATA: Global Trade Tracker

Price struggling amid tariff turmoil

Prices remain under $2,000 /t, net position improves and dollar weakens

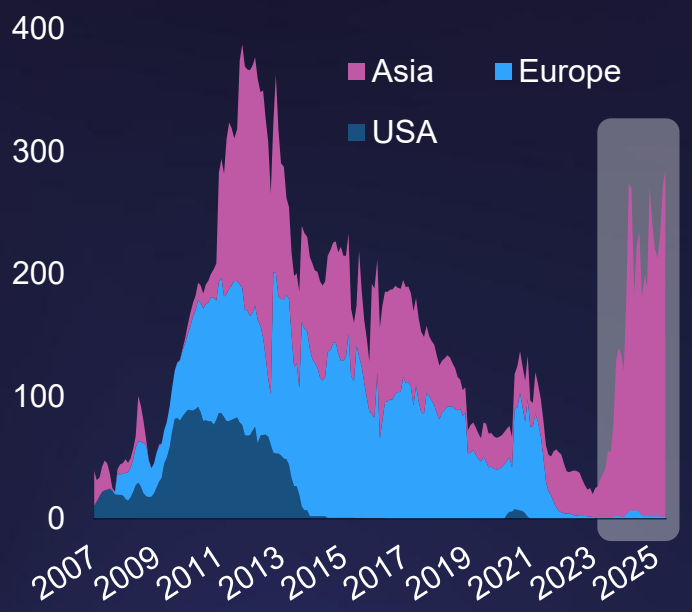


DATA: LME, Oxford Economics, CRU. NOTES: * Shorter-term speculative investor net position identified by CRU of long vs short positions held by Investment Funds (mutual, hedge and private equity) and Other Financial Institutions (pension and insurance funds) as defined in the LME's weekly Commitments of Traders Report (COTR)

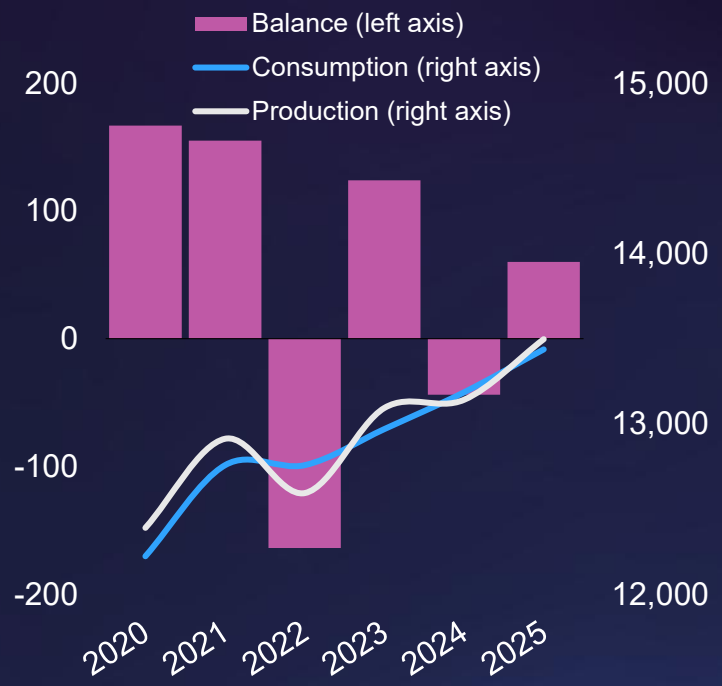
Small global imbalance masks larger regional contrasts

Historically high stocks overhang the market - Asia holds the metal

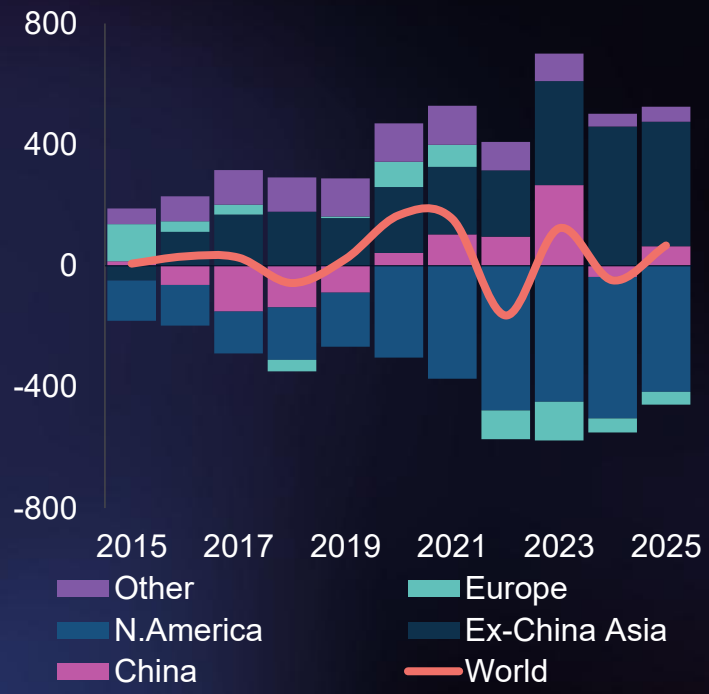
LME lead stocks, end-month ('000 tonnes)



Refined lead balance - world ('000 tonnes)



Refined lead balances* ('000 tonnes)



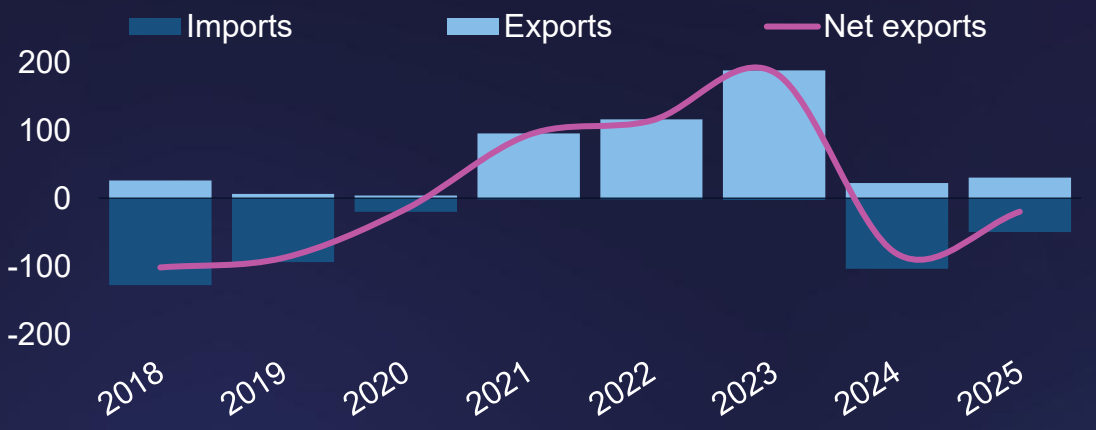
DATA: LME, CRU. NOTE: * Balance is the difference between production and consumption.

Chinese market expected to call for imports again in 2025

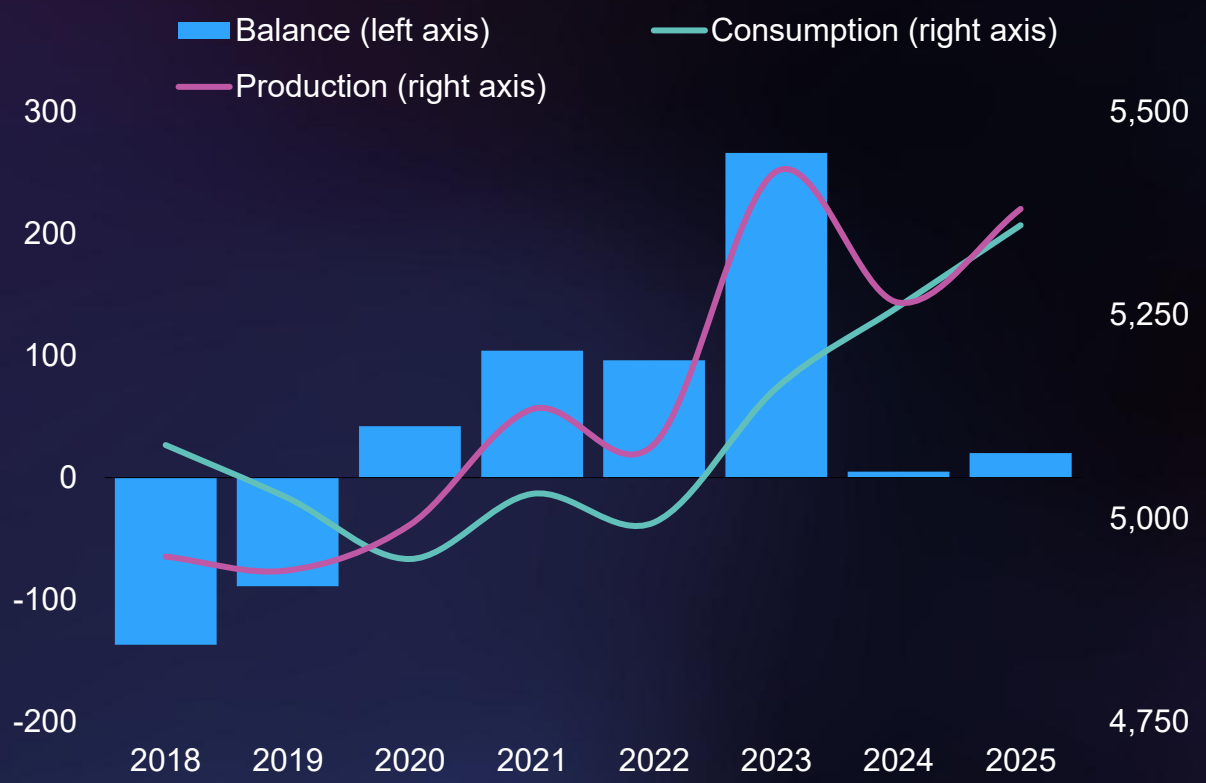
Refined lead exports - China ('000 t)

Export/Import Arb - China ($/t)**

Refined lead trade - China ('000 tonnes)



Refined lead balance* - China ('000 tonnes)



DATA: GTT, SHFE, CRU. NOTES: * Arb is the difference between local SHFE price and international LME price, including adjustments for trade tariffs.

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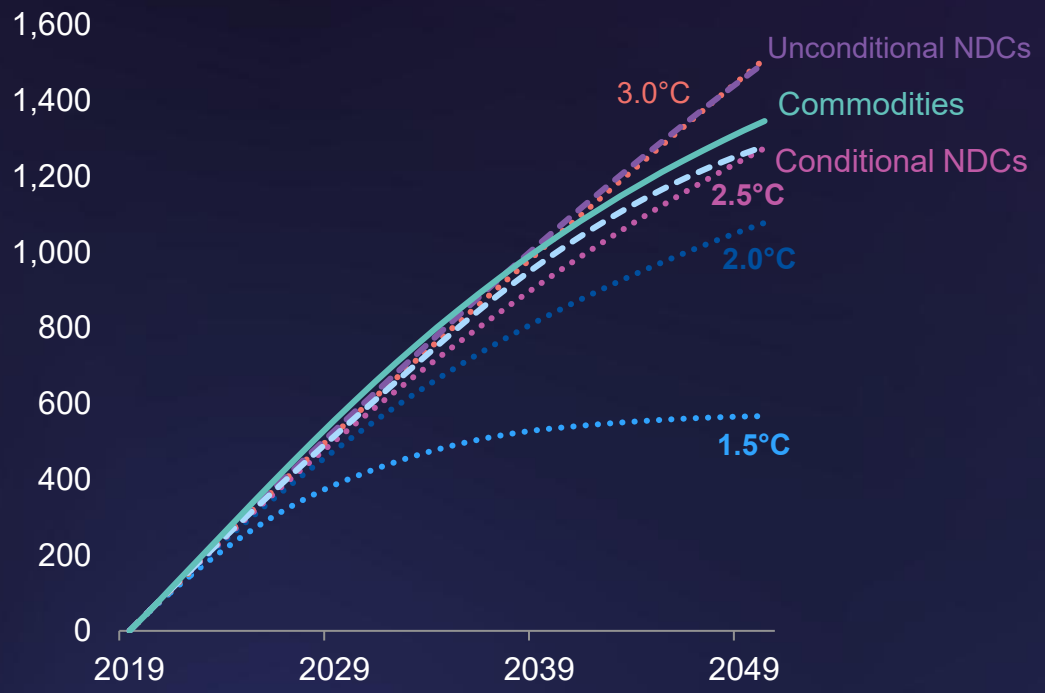
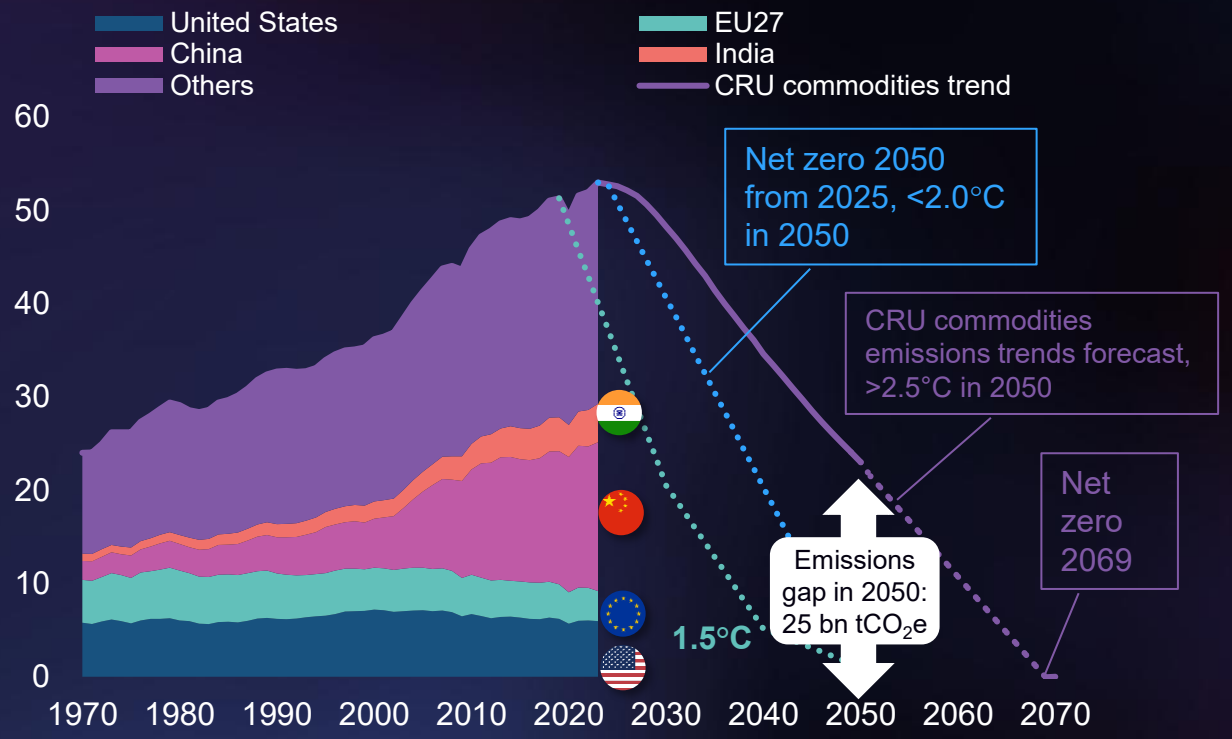
Climate change – no net zero until 2069

CRU sees emissions on a >2.5°C path to 2050

GHG emissions by scenario, normalised* to 2019 global GHG emissions, cumulative, bn tCO2e



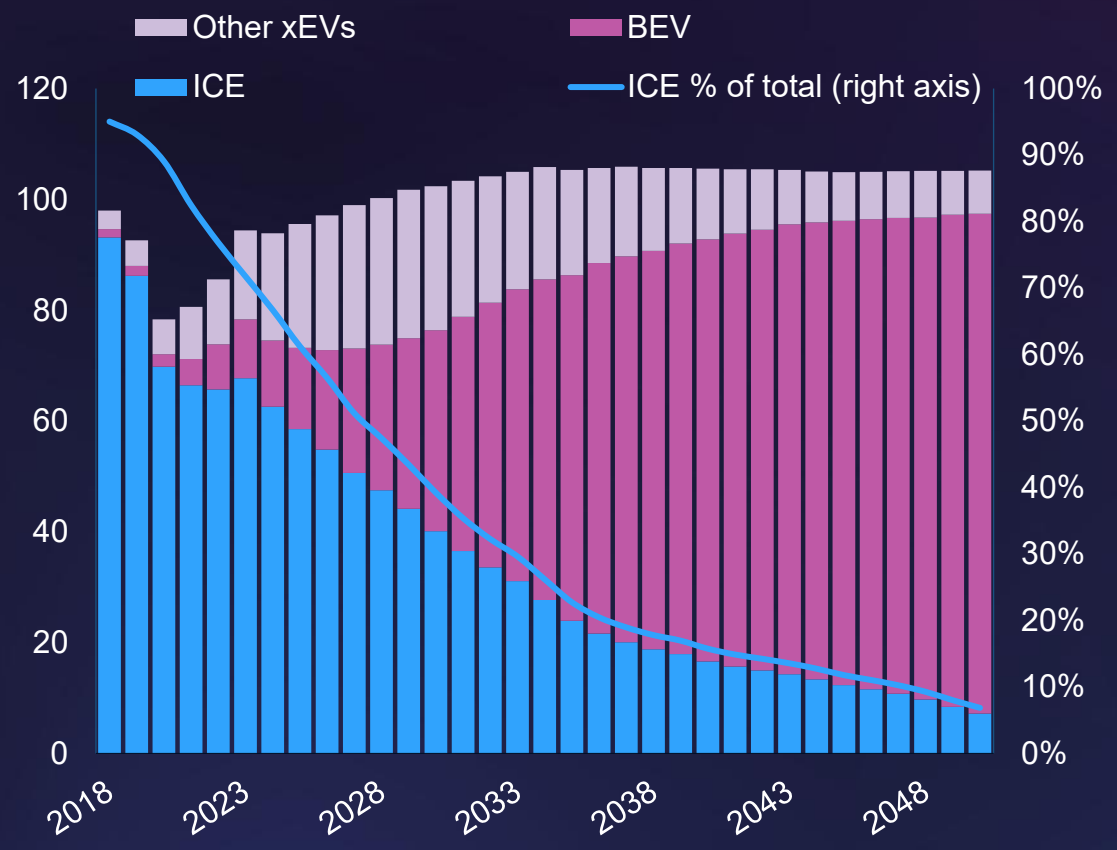
Annual global greenhouse gas emissions trend,1970–2070, bn tCO2e



DATA: CRU Emissions Analysis Tool, CRU Power Transition Service, CRU Long-term Steel Outlook, UNEP Emissions Gap Report 2024, The IPCC Sixth Assessment Report (AR6) – Longer Report and IPCC AR6 summary for policy makers; NOTES: * Commodity emissions have been normalised to 2019 global GHG emissions so that the emissions trajectories can be compared directly with each other and with the IPCC global heating scenarios that are also included in the chart. ** 1850-1900 *** Steel, Power and Light Vehicle sectors.

ICE still slowly melting away this decade

Vehicle production by powertrain - world (M units)



Global warming and extreme weather reinforce long-term EV transition.

BEV growth expected to rebound in 2025, aided by incentives, policies, and competition.

Geopolitical tensions and regulatory uncertainty may hinder progress.

ICE vehicle share declining: 67% in 2024 → 7% by 2050, though pace is slowing.

Political risks are delaying the ICE-to-BEV shift in many regions.

HEVs gaining popularity; ICE sales declining slower than anticipated.

Auto lead battery demand less affected by powertrain changes.

Vehicle stock matters more than new production for lead demand.

LABs often replaced multiple times per vehicle, sustaining demand for decades.

ICE bans are being delayed or weakened, further extending LAB demand.

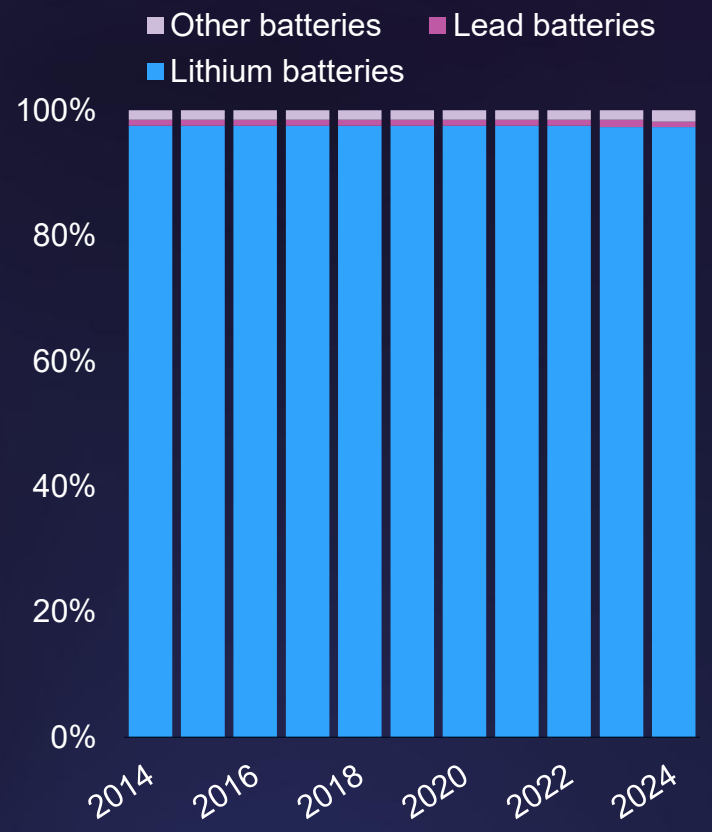
12V LABs remain standard outside China for starting and auxiliary roles.

In China, OEMs (e.g. BYD, NIO) shifting to 12V lithium-ion batteries.

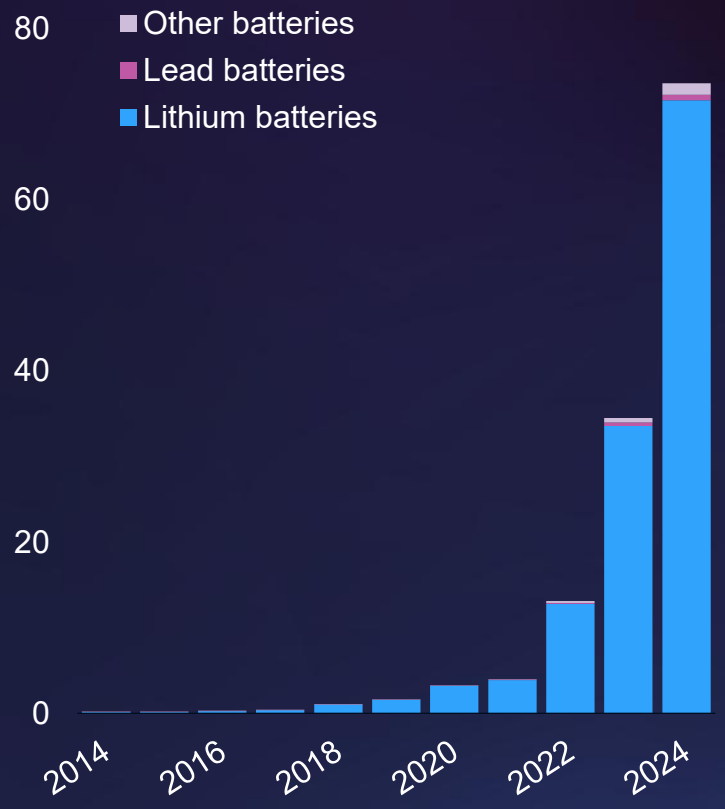
DATA: GlobalData, CRU Battery Value Chain Service. NOTES: ICE = Internal Combustion Engine vehicle. BEV = Battery Electric Vehicle. xEV = Electrified Vehicles. LAB = Lead Acid Battery. LIB = Lithium Ion Battery. Data is for light and heavy duty vehicles and buses.

Limited opportunities for lead in BESS boom

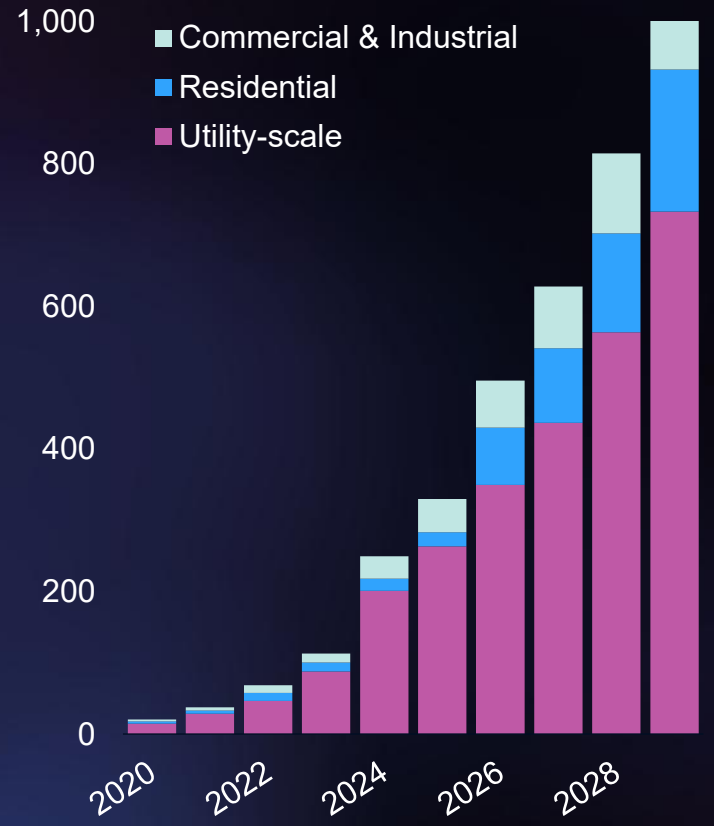
Non-hydro energy storage capacity, China (% share)



Non-hydro energy storage capacity, China (GW)



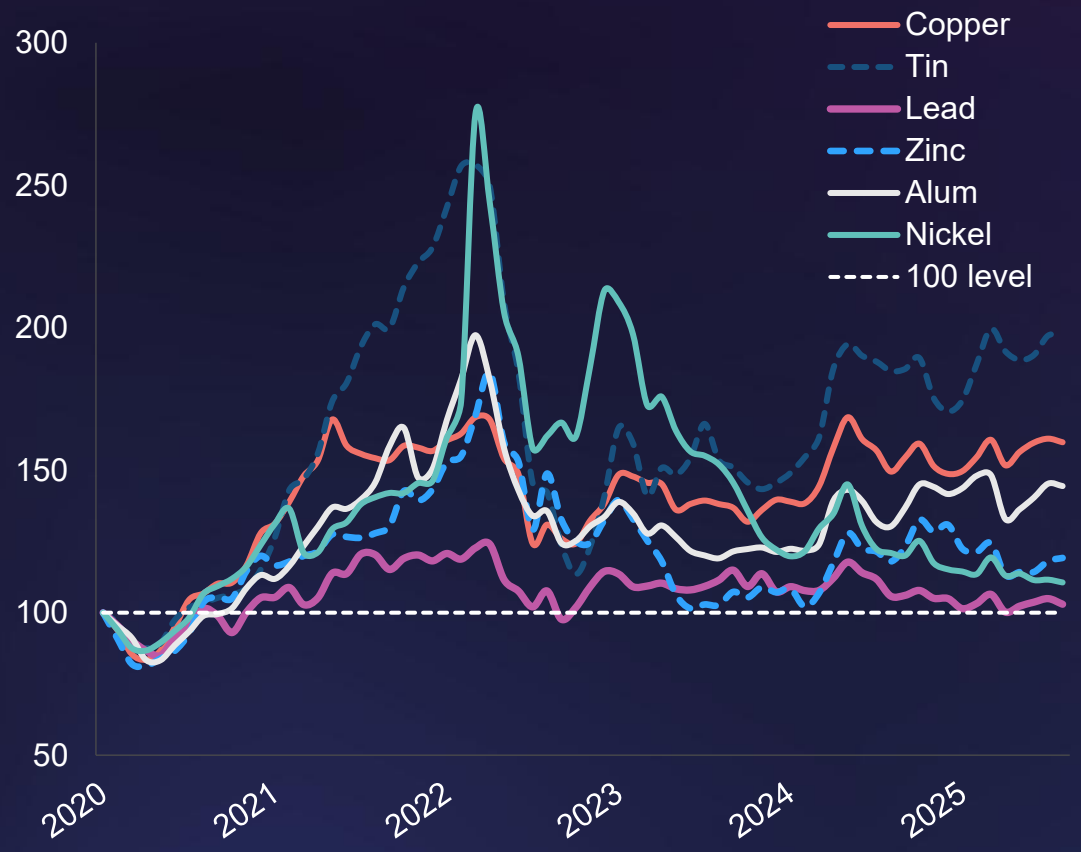
BESS demand for grid storage applications, world (GWh/y)



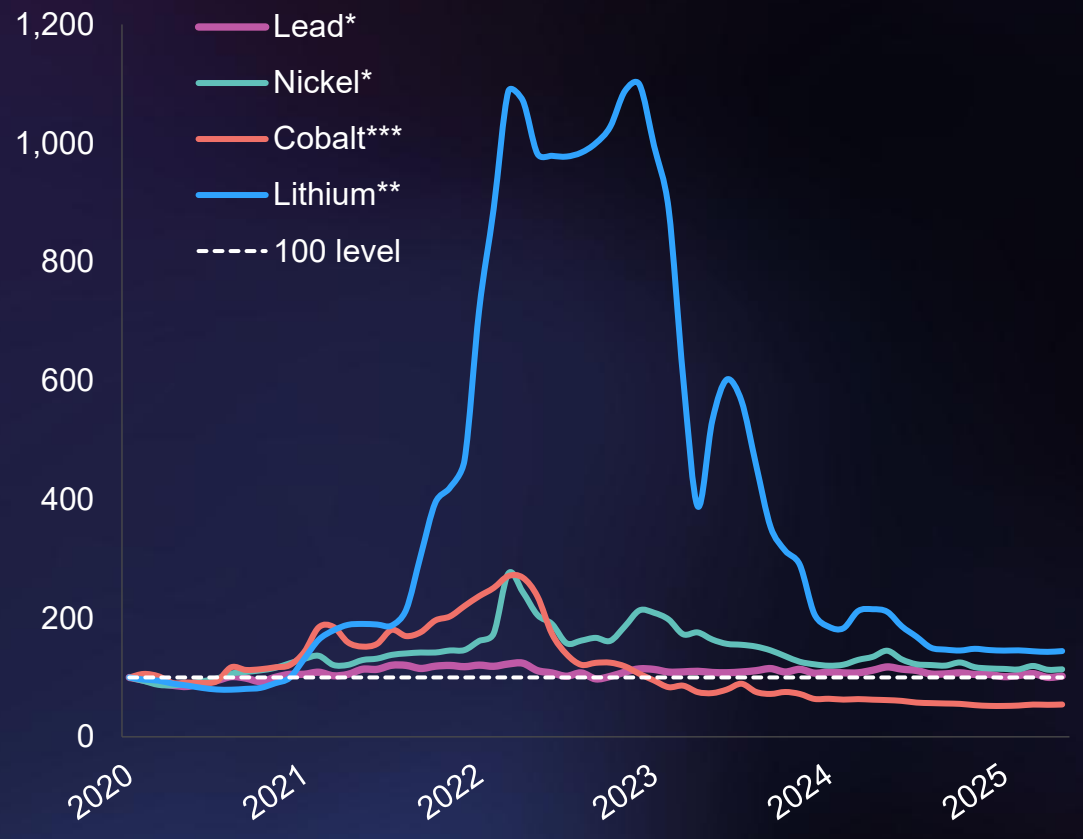
DATA: CNESA, CRU Energy Storage And Costs (ESTAC). NOTES: BESS = Battery Energy Storage System. FOM = Front-of-meter utility-scale applications. BTM = Behind-the-meter residential, commercial and industrial applications. TCO = Total Cost of Ownership. LFP = Lithium Iron Phosphate batteries.

Steadier lead price path than others

LME metal prices*, monthly average, index to Jan 2020 = 100



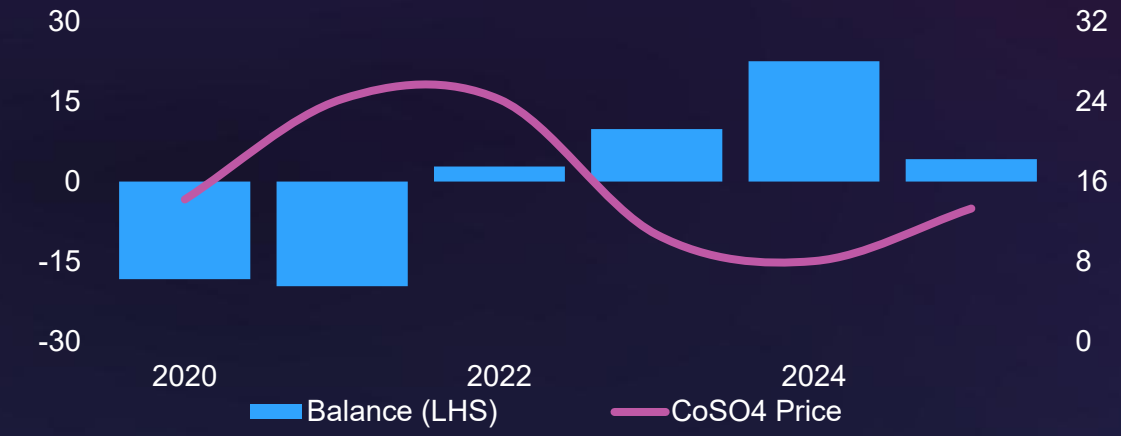
Battery metal prices, monthly average, index to Jan 2020 = 100



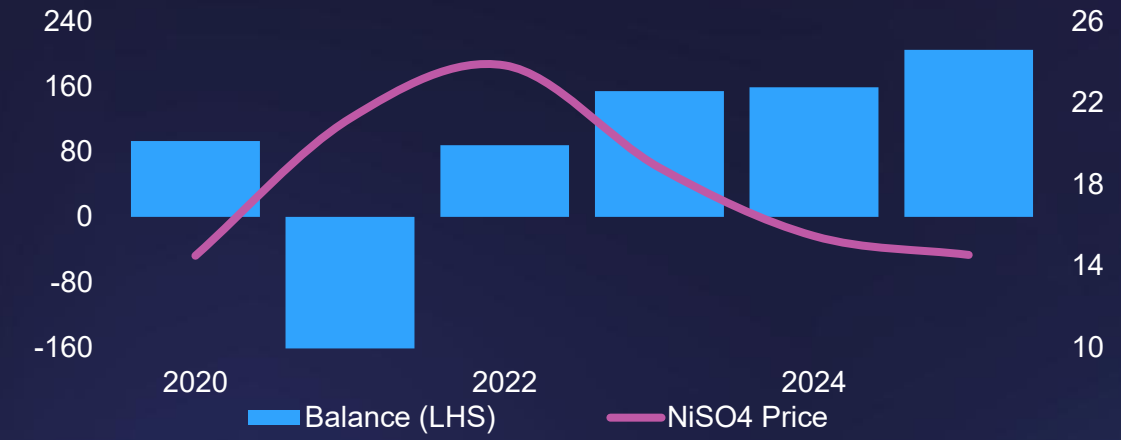
DATA: LME, CRU. NOTES: * LME 3-month prices, ** Lithium carbonate (99.5% battery grade, spot China), *** Cobalt sulphate (20.5% Cobalt, DAP China). GET = 'green' energy transition. HPAL = High-pressure acid leach, LFP = Lithium iron phosphate batteries.

Other battery metals switch to surplus

Refined **cobalt** market balance and price, kt and $/lb Co



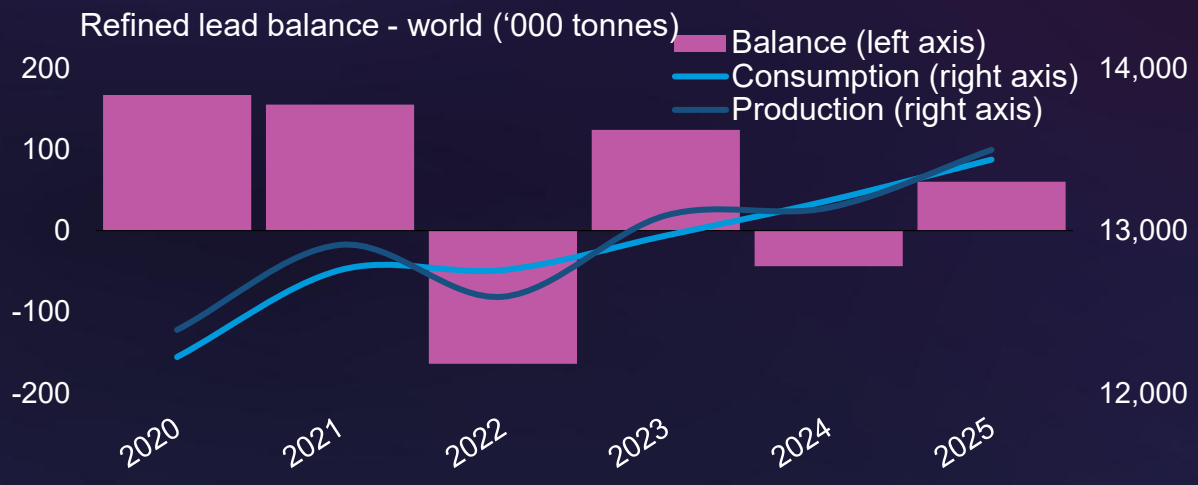
Refined **nickel** market balance and price, kt and $/t Ni

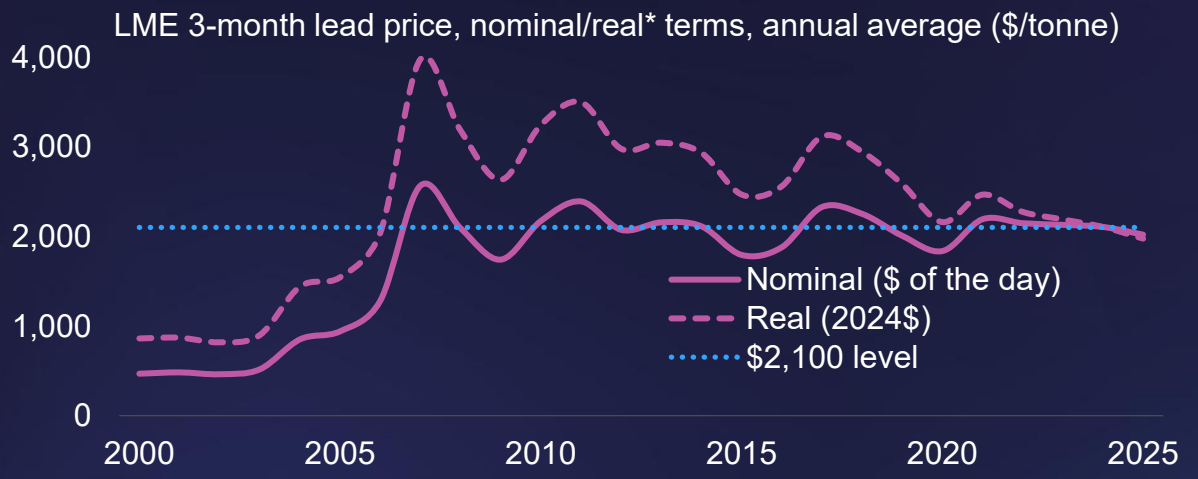


Lithium market balance and price, kt LCE and $/t

DATA: CRU

Lead to fight or take flight?





Lead is entering a surplus phase, similar to other battery metals.

Closed-loop recycling helps stabilize nominal lead prices, though real prices have declined since 2007.

Investor sentiment on lead batteries in the energy transition remains cautious, limiting price upside.

Steady demand and established infrastructure help reduce price downside risks.

Lead batteries have strong ESG credentials due to high recycling rates and a broad supply base.

Lithium batteries face more ESG challenges: intensive mining, lower recycling, and regional bottlenecks.

Lower lithium raw material costs and growth of LFP chemistry are increasing lithium battery competitiveness.

LFP batteries are taking share from lead batteries, especially in China, with potential global expansion.

The global energy transition is ongoing, though the pace may be slowing due to economic and logistical challenges.

Lithium batteries lead the transition, but multiple battery technologies will likely be needed.

Lead batteries may continue to play a role given their existing infrastructure and applications.

Growing competition, especially from LFPs, could challenge lead's market position.

The future role of lead will depend on market developments, technology shifts, and policy decisions.

Lead to fight or take flight?

DATA: LME, CRU. NOTES: Lead price is LME 3-month lead price. GET = 'green' energy transition. ESG = Environmental, Social and Governance.

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James Griffiths (Senior Analyst, Lead)
T +44 (0)20 7903 2095
E james.griffiths@crugroup.com
W www.crugroup.com

Thank you.

CRU London Head Office
1st Floor, MidCity Place
7 High Holborn
London WC1V 6EA
United Kingdom

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Developed exclusively through a partnership between CRU and Battery Council International (BCI), this first-of-its-kind report combines decades of metals market intelligence at CRU with proprietary data on battery sales and manufacturing from BCI. With more than 80 years of sales statistics and annual market forecasts provided directly by its member companies, BCI is the exclusive provider of real-world data for the North American battery industry. This trusted BCI data is partnered with CRU's best-in-class analysis and insights to offer the most comprehensive and reliable report available on lead battery market trends.

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