CRU

Data, Insight, Strategy & Communities

Can lead turn its *resilience* into *brilliance* in the seismic energy shift underway ?

CRU. Independent *expert* intelligence

Reliable *insight* in an uncertain world

In a world which changes at pace, making evidence-based decisions using reliable data and market insight becomes ever more important. Responding with agility to mitigate risk, unearth opportunities and maximise operational efficiency whilst navigating a rapidly evolving sustainability landscape is paramount.

CRU's market data, analysis and expertise equip clients to deal with the big issues facing them so they can:

Navigate volatile marketplaces with greater confidence

Find and validate new markets and identify opportunities

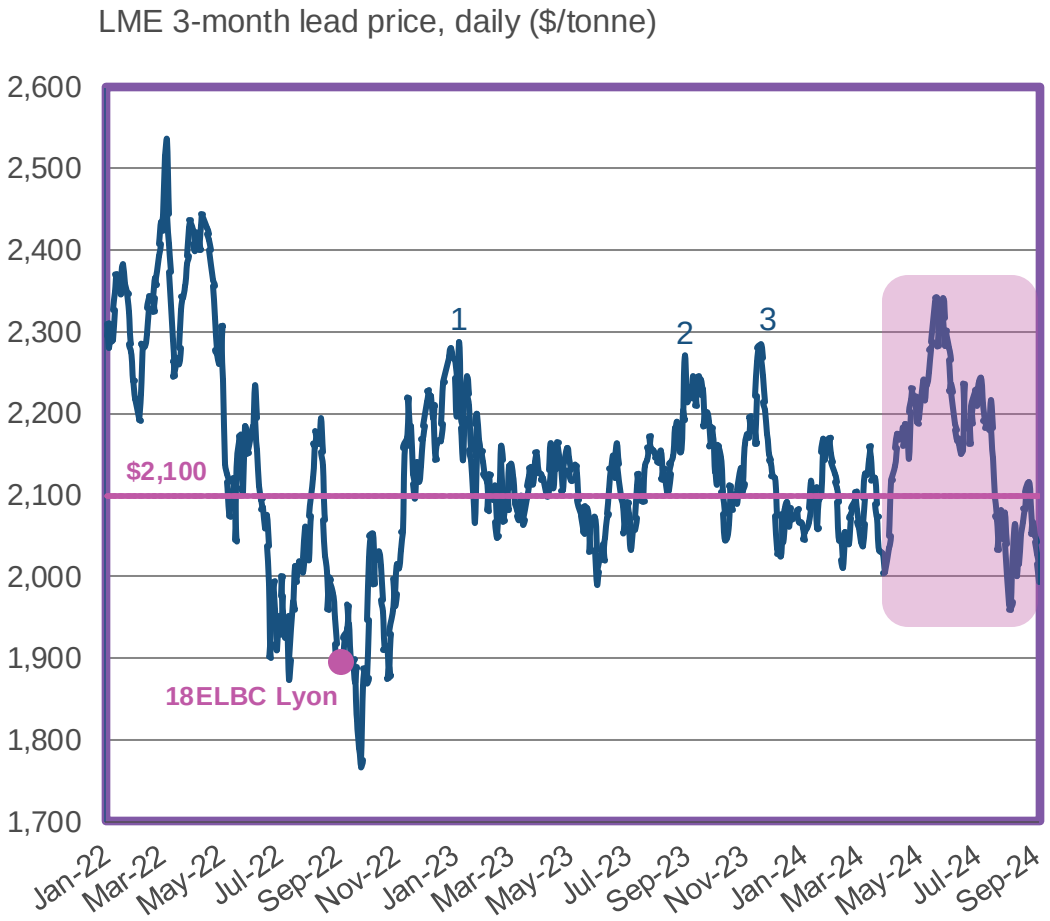
Effectively manage operations in the face of an evolving regulatory landscape

Decarbonise production and manufacturing processes and supply chains

Outline

1. Recent lead market developments
2. Battery metal lead's role in the 'green' energy transition (GET)

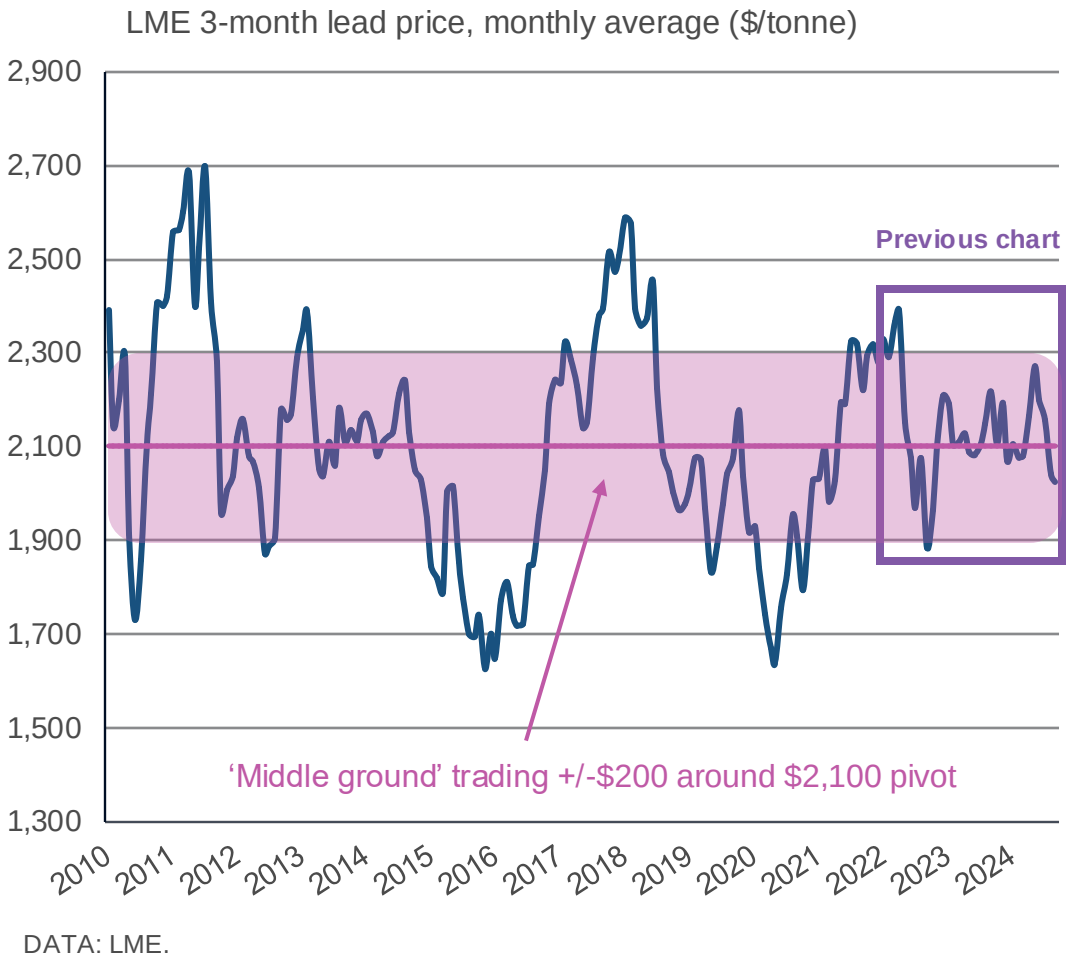
Spring rally, summer retreat



DATA: LME.

- **Price struggling around $1,900 /t at 18ELBC in Lyon in early September, briefly dipping below $1,800 /t in late September.**
- Sentiment souring on greater downside demand risk than upside supply risk from multi-decade high inflation after start of war in Ukraine in February 2022.
- **Three upside tests above $2,200 /t on Port Pirie smelter shut (1) and technical tightness and stock reshuffling (2 and 3).**
- Ultimately all three attempts failed due to no enduring fundamental support.
- **After quiet start to this year, price shaken out of its slumber this spring.**
- Broke above $2,300 /t in May 2024 to highest since April 2022 when it was coming down from initial Ukraine war peak above $2,500 /t in March 2022.
- **But price pulled higher by copper-led fund buying rather than any big tightening in the global lead market picture.**
- Metals demand and broader macro picture too weak to sustain LME metal rallies driven more by anticipation of future ‘green’ energy transition demand strength ahead rather than weak current demand, particularly in copper.
- **Price duly retreated this summer and struggling to settle again closer to more familiar trading territory around $2,100 /t pivot point.**

Price still stuck in longer-term sideways path



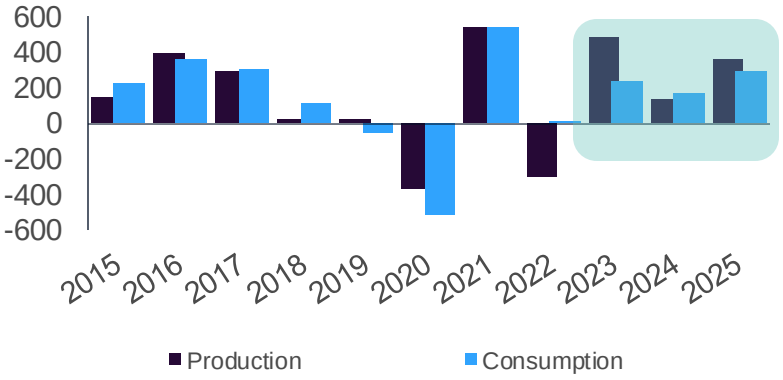
DATA: LME.

- Spring spike above $2,300 /t the latest in a series of upside tests that have failed to break and hold in higher ground.
- **Through this and the last decade prices continue to swing around $2,100 /t pivot point.**
- Only brief breaks above and below long-established 'middle ground' trading range of $1,900-2,300 /t.
- 2010-2023 average of around $2,100 /t. 2023 average of $2,129 /t. 2024 H1 average of $2,148 /t. July-August 2024 average of $2,100 /t.
- **No sign yet of a sustained break out from this sideways price path.**

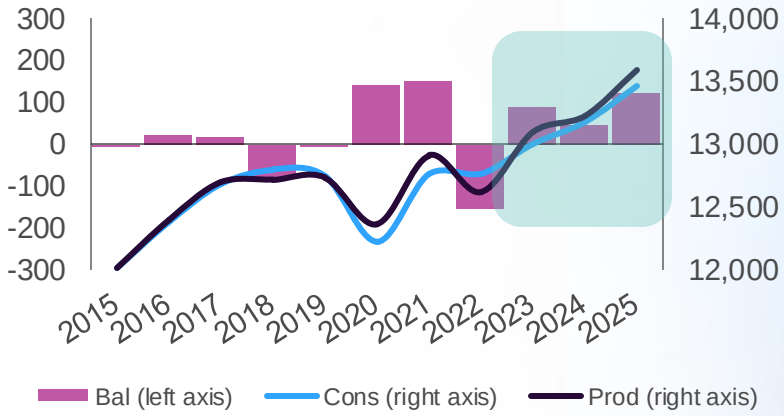
Global imbalance masks larger regional contrasts

- Big Covid-19 2020-2021 swing into surplus on greater suppression of demand over supply then unleashing of both variables in pandemic exit.
- Pronounced move into deficit in 2022 on primary-led production dip while demand held up.
- **Move back into small surplus in 2023-2024 as well-fed smelters perform better just as demand slows and normalises.**
- Post-pandemic exit, lead's 'closed loop' cycle is reimposing itself in reining in scale and swings in market imbalances.
- **However, smaller global imbalance masks larger regional imbalances – Asian surplus contrasts American shortfall.**
- Trade flows between flooded (Asia) and drought (America) regions are key in determining 'real' balances in each region.

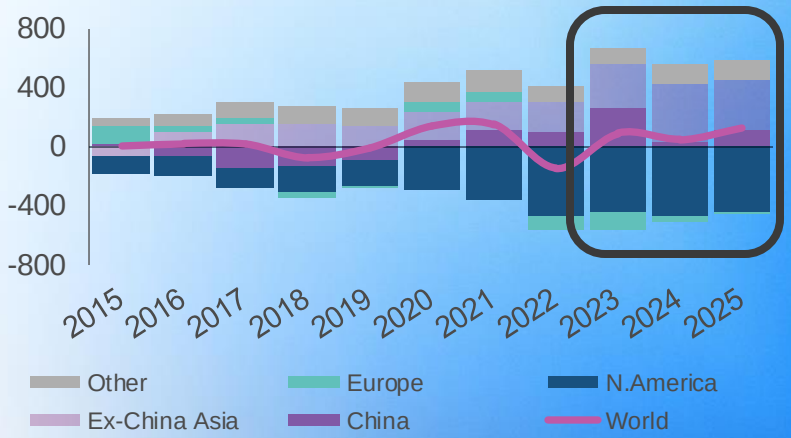
Refined lead production/consumption, world (y/y change, '000 tonnes)



Refined lead balance*, world ('000 tonnes)



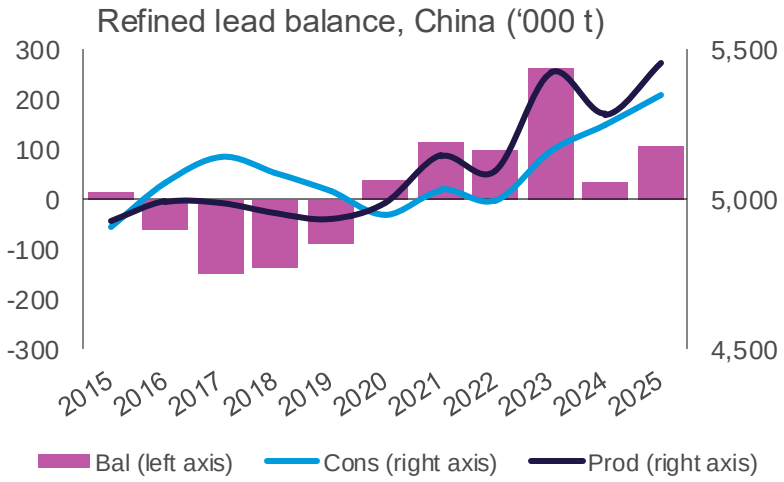
Refined lead balances* ('000 tonnes)

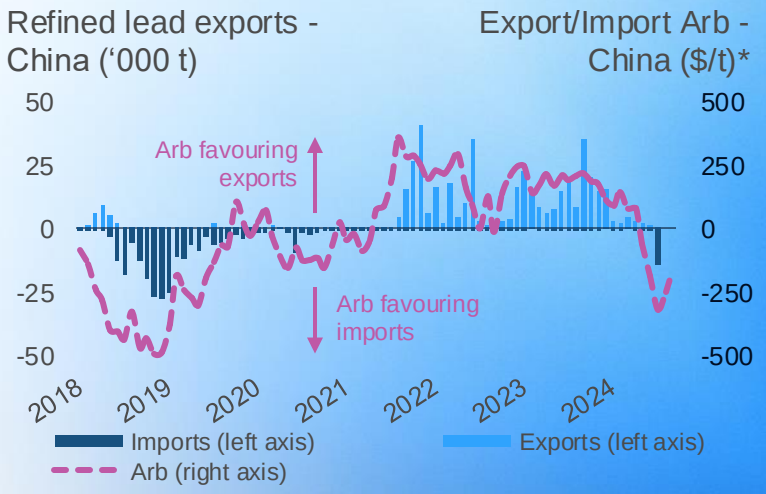


DATA: CRU. NOTE: * Balance is the difference between production and consumption.

Chinese export renaissance stutters

- **Chinese lead market switched from late 2010s deficit to early 2020s surplus on higher output and initially flatter demand.**
- **Export arb opened in mid-2021, with 2023 exports (188 kt) highest since 2007 (236 kt).**
- More Chinese exports staying in Asia, including deliveries into LME warehouses. USA and Europe taking more lead from other Asian countries.
- **Chinese excess available for export reduced sharply this year on production dip, with demand growth holding up.**
- **2024 exports sharply down from 2023 high as export arb has closed.**
- In 2024H1 China exported only 16 kt, down from 74kt in 2023 H1, with vast majority staying in Asia.
- **Import arb opened, initially attracting more lead concentrate and bullion, but now seeing first big inflow of refined lead since late 2010s.**
- China imported 14 kt in July and August expected to be higher. SHFE squeeze pulling in ex.China Asian excess, including from swollen LME stocks.
- **This year set to post lowest annual ebb in 2020s Chinese export renaissance.**

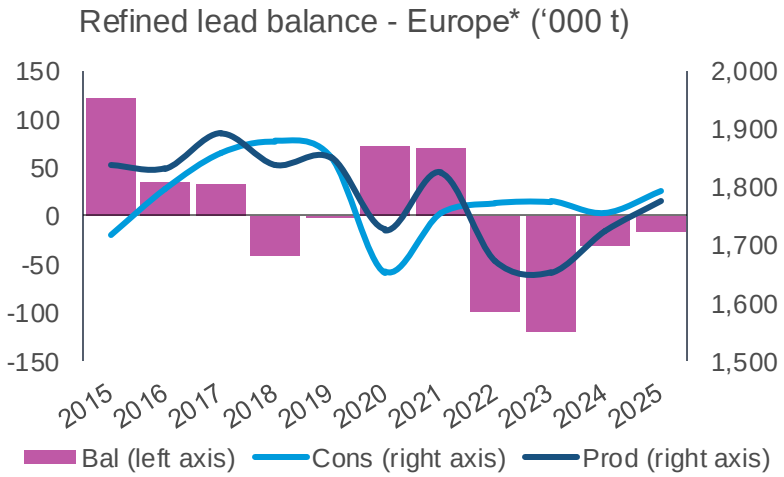


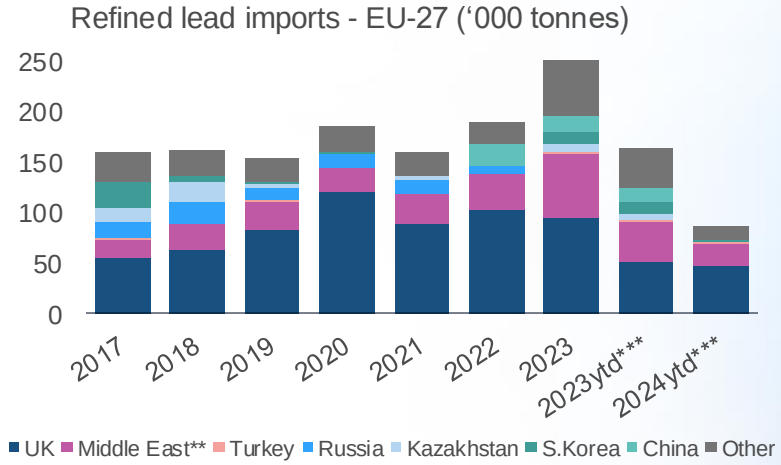


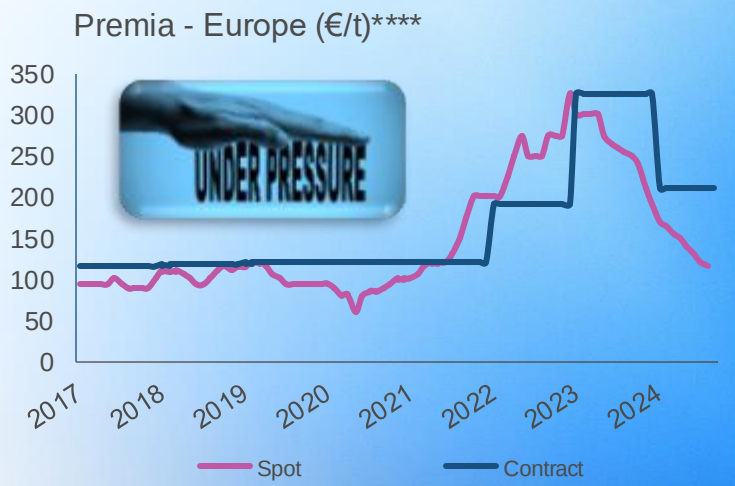
DATA: GTT, SHFE, CRU. NOTES: * Arb is the difference between local SHFE price and international LME price, including adjustments for trade tariffs.

Easier Europe puts downward pressure on premia

- **After two years of decline, local production is rising again this year to close the gap on a third year of slow demand.**
- EU imports are down this year from 2023 highs, with January-July 2024 down by 47% (-77 kt) y/y, with notable drops from Asia.
- **Last year's urgent need for 'top-up' imports has dissipated this year, resulting in a more subdued spot market.**
- Spot premia are residing in the low €100s /t, down sharply since the start of this year and notably below 2024 contract premia in the low €200s.
- 2025 contract talks are taking centre stage, with ELBC in Milan providing the first focal point for signs of progress.
- **CRU sees 2025 contract premia under downward pressure again, moving closer to spot premia and levels that prevailed before the 2022-2023 step up as the European market continues to ease and energy costs calm down.**







DATA: GTT, CRU. NOTES: * 'Basic' balance is the difference between production and consumption. Excludes Russia. ** Includes Lebanon, Saudi Arabia, Israel, Jordan and UAE. *** Year to July. **** Basis is ex-works mainland Europe for secondary lead.

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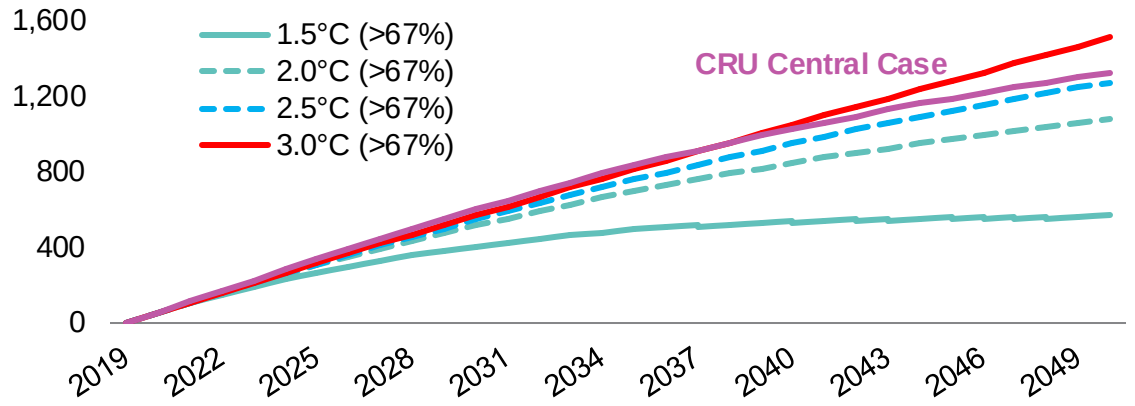
Outline

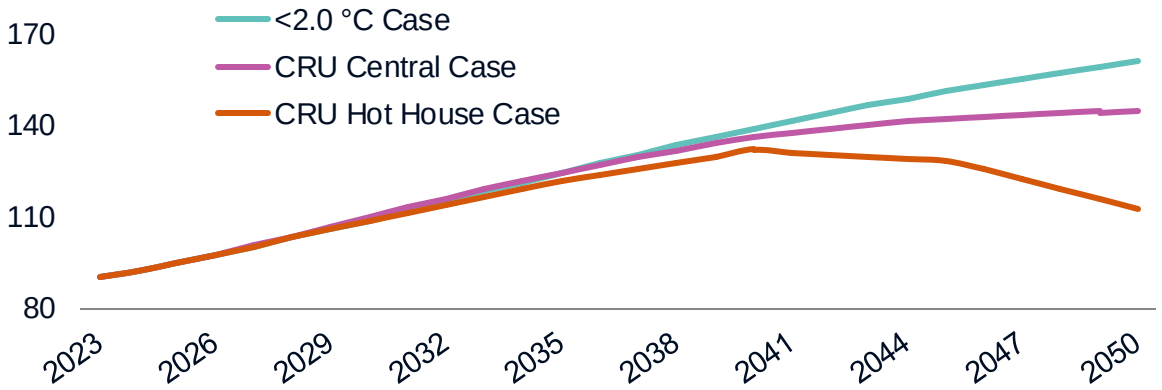
1. Recent lead market developments
2. Battery metal lead's role in the 'green' energy transition (GET)

Mind the GET gap – no net zero by 2050

Cumulative emissions (billion tonnes CO_2)



GDP in climate change scenarios ($ trillion, constant prices)



- **Is there the political will to reach net zero emissions globally and limit temperature rise to less than 2ºC from pre-industrial levels* by 2050 ?**
- CRU analyses a number of sectors** that are big GreenHouse Gas (GHG) emitters – CRU-covered commodities together account for ~75% of global industrial and power GHG emissions.
- None of these sectors is yet on a path consistent with cutting emissions quickly and deep enough to limit temperature rise to <2ºC by 2050. Only light vehicle industry on a path below 2°C.
- **Even with bigger emission cuts beyond 2030, cumulative emissions still in danger of exceeding +2.5ºC by 2050, but for now this rise is CRU's most likely 'central case' scenario.**
- Little impact on global GDP to 2040, then damage from physical risk to human/industrial activity grows significantly in 2040s out to 2050.
- By 2050, global GDP growth slows to zero amid higher inflation and a reshuffling of labour markets and resources across economies.

DATA: CRU Sustainability and Emissions Service (July 2024). NOTES: >67% refers to probability (more likely than not) of limiting temperatures to a given rise. Net Zero Case is <2ºC above pre-industrial levels by 2050. CRU Central Case is ~2.5ºC, CRU Hot House Case is >3ºC. See next slide for more details. *1850-1900. **Steel, Power and Light Vehicle sectors.

CRU's 3 climate change scenarios

- <2 °C Case:
  - Emissions fall rapidly.
  - Temperature increases are limited to 2°C above pre-industrial levels.
  - Physical risks are limited.
  - The level of GDP in the early part of the horizon (up to 2035) is slightly lower to account for transition costs.
  - Still risks - even +2°C of warming could result in severe impacts or triggering of tipping points.

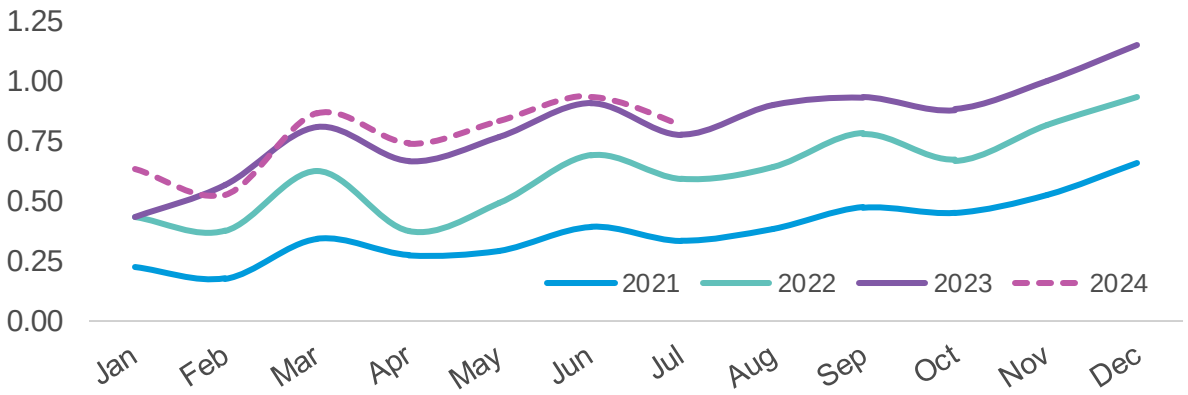
- CRU Central Case:
  - This 'most likely' scenario is consistent with CRU's central case on emissions, based on bottom-up analysis of the sectors we cover.
  - ~2.5°C above pre-industrial levels.
  - Likely impact of climate change on the level of real global GDP in 2050 in our base-case for emissions is -12.5%.
  - This impact was determined based on a critical assessment of the evidence.

- CRU Hot House Case:
  - >3°C above pre-industrial levels.
  - This scenario is not modelled in the same detail as the two other scenarios.
  - Designed to be illustrative of the downside risks if:
    - Action on emissions is delayed.
    - Tipping points are reached.
    - The relationship between emissions and climate is stronger and faster than expected.

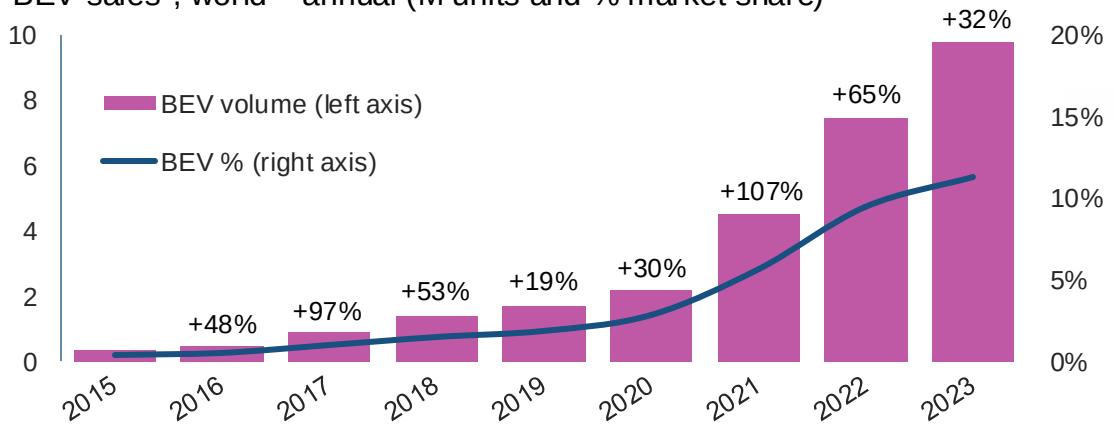
DATA: CRU Sustainability and Emissions Service (July 2024).

BEV growth slowing

BEV sales*, world (M units)



BEV sales*, world – annual (M units and % market share)

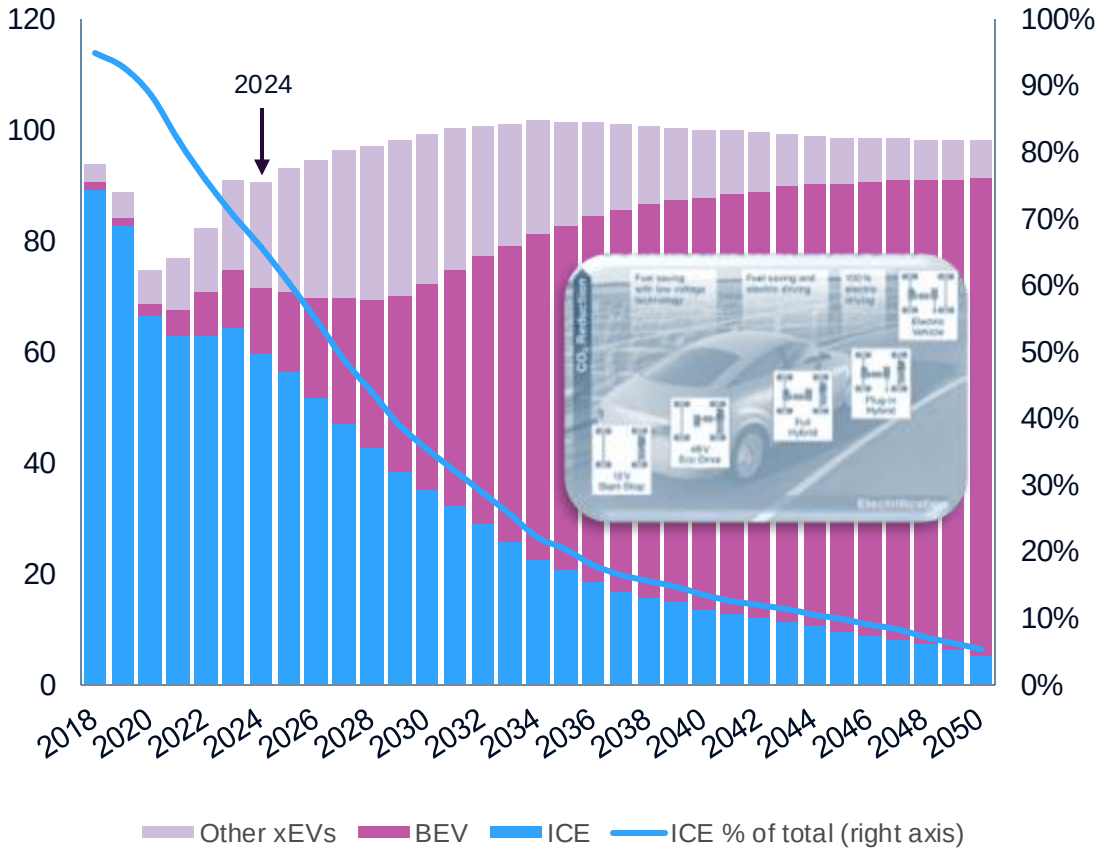


- **Global BEV sales growth slowing again this year to +9% y/y to July 2024.**
- **Double-digit annual BEV sales y/y growth halved from 65% in 2022 to 32% in 2023.**
- BEV share of world total still rising to over 10% in 2023.
- But growth slowing in most regions, including USA, Europe and even China.
- **Drivers behind BEV slowdown:**
  - As BEV sales penetration rates rise, **early rapid growth naturally slows**.
  - **Lower government subsidies**. Financial support more expensive as BEV market share rises.
  - Customer appetite for BEVs dampened by **lower affordability** and high interest rates.
  - **Customer range and charging anxiety**. Readiness of BEV charging infrastructure and (renewable rather than fossil fuel) energy supplies.
  - Car companies delaying/diluting BEV switchover rates/targets, **moving to more balanced portfolio of powertrains**.
  - **Stronger 2024 growth in HEV and PHEV sales** are better for LAB usage.
  - **Political will** to push more expensive energy transition options on voters, including BEVs. One key national election is in the USA on 5 November.

DATA: GlobalData, CRU Battery Value Chain Service. NOTE: *Light Vehicle (LV) data. BEV = Battery Electric Vehicle. HEV = Hybrid Electric Vehicle. PHEV = Plug-in Hybrid Electric Vehicle.

But merely a bump in longer road to vehicle electrification

Light vehicle (LV) production by powertrain - world (M units)



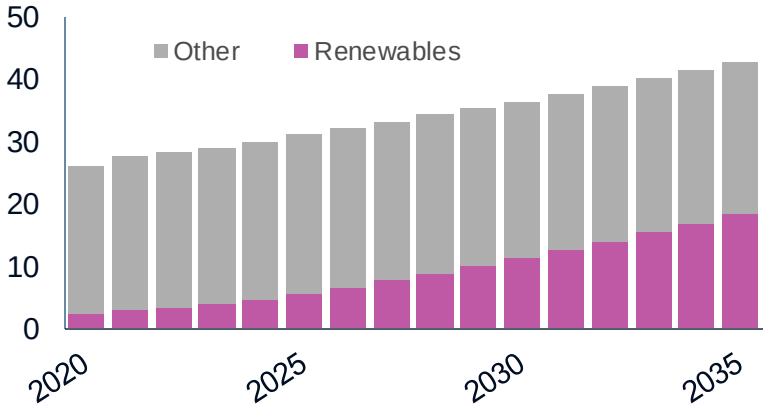
- **Swayed more by political risk than environmental peril, more governments slowing ICE to BEV transition in the shorter-term.**
- **However, relentless rise in global temperatures and more frequent extreme weather events will ensure longer-term path in vehicle electrification remains in place. Just maybe at a slower pace than before.**
- Global LV ICE share already down from over 90% in late 2010s. Sliding from 66% in 2024 to 35% in 2030, to 13% in 2040, to 5% in 2050.
- **Big rise in BEV-led xEVs means big rise in OE LIB demand for required extra voltage.**
- **But no consequent big drop in OE LAB demand due to low (12V) voltage use in starter and auxiliary functions.**
- **However more Chinese car makers switching from 12V LABs to 12V LIBs, e.g. BYD, Li Auto, NIO, Xiaomi Auto.**
- **Vehicle population trumps production so replacing existing batteries on the road is bigger lead demand driver.**
- LAB typically replaced 2-3 times in a LV's 10-15-year lifetime, so **long tail of replacement auto lead battery demand stretching decades rather than years beyond ICE ban deadlines ahead.**

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.

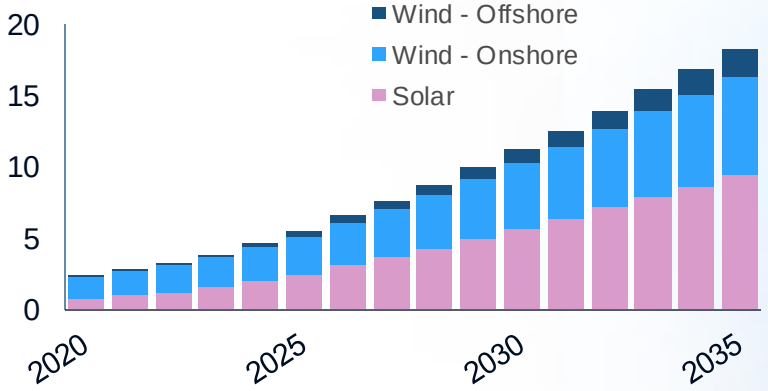
Room for lead to benefit from BESS boom?

- Renewable share of electricity generation rising from 15% in 2024 to over 30% by 2030 and to over 40% by 2035.
- **BESS* demand starting to soar to address intermittency in local and national power grids, on greater contribution from renewables.**
- Already up from 23 GWh/y in 2020 to 203 GWh/y in 2024, BESS demand to surge to above 1,000 GWh/y in 2030 to over 1,600 GWh/y in 2035
- BESS growth mostly driven by larger front-of-meter utility-scale uses than smaller behind-the-meter residential, commercial and industrial applications.
- **Big opportunity for small LAB share in BESS to grow, even a little in such a rapidly expanding sector.**
- China is further along the energy transition path than most other countries and is pushing LIB use in motive power applications.
- China is also looking to use more LABs in stationary/reserve power BESS applications, but LAB's small (1-2%) share is expected to remain minimal.
- **LABs seem set to mostly miss out to surging LFP*** and emerging sodium battery use, as they offer better TCO**** options.**

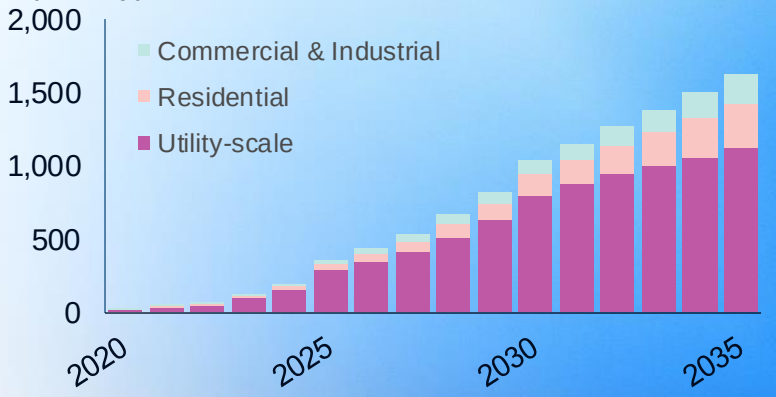
Gross electricity generation, world (TWh)



Gross electricity generation – renewables, world (TWh)



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

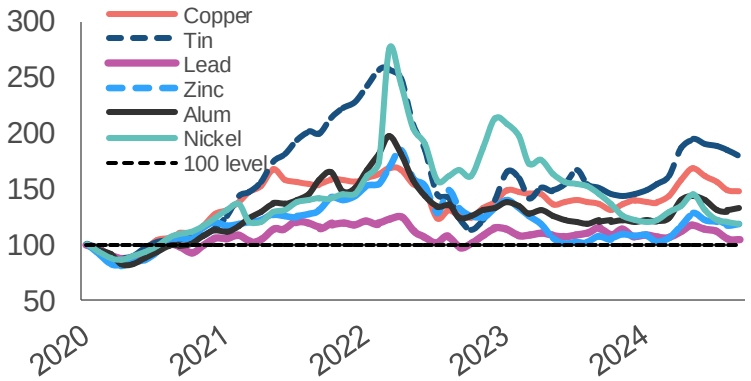


DATA: CRU Energy Storage and Costs (ESTAC) and CRU Power Transition services. NOTES: * BESS = Battery Energy Storage System. ** Solar, wind and standalone storage. *** LFP = Lithium iron phosphate batteries. **** Total Cost of Ownership.

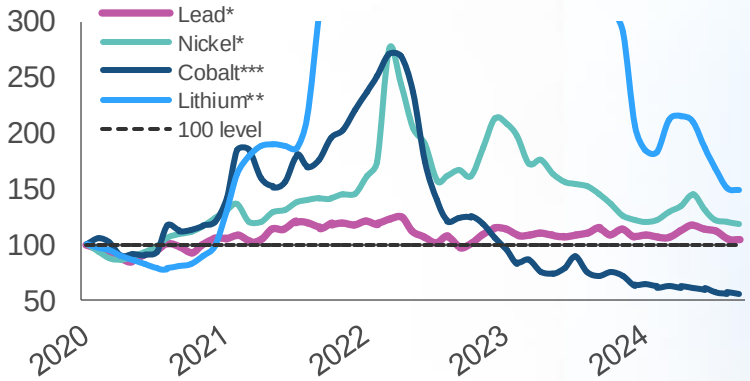
Steadier lead price path than other LME & battery metals

- **Steadier lead price path than in other LME and battery metals due to:**
  - Importance of 'closed loop' cycle - economic cycle resilient replacement battery demand and dominance of recycling on supply side limits lead market imbalances.
  - In contrast to other LME and battery metals driven more by the global economic cycle and GET on the demand side and by primary mining on the supply side.
  - Investor perception of battery metal lead's limited energy storage role in GET restricts relative lead price volatility.
  - Sometimes 'contrarian' lead simply ignored by investors.
- **More volatile price performance in other battery metals - all retreating from previous highs:**
  - Multi-year price highs and market deficits in lithium, nickel and cobalt in 2022, driven by Chinese BEV demand surge and Russian supply concerns.
  - Subsequent sharp price retreats on switch to surplus:
    - Lithium - strong mine response just as BEV growth slows.
    - Nickel - higher low-cost HPAL supply and higher LFP Chinese BEV adoption.
    - Cobalt – higher by-product mine supply (DRC copper and Indonesian HPAL nickel) alongside slowing demand (LFP rise in China and weaker portable electronics demand).

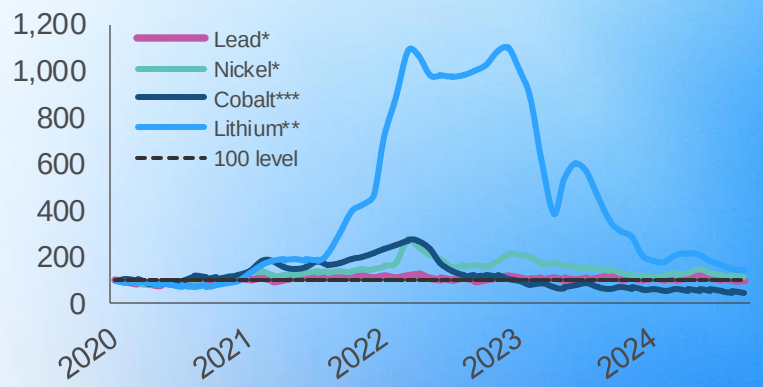
LME metal prices*, monthly average, index to Jan 2020 = 100



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



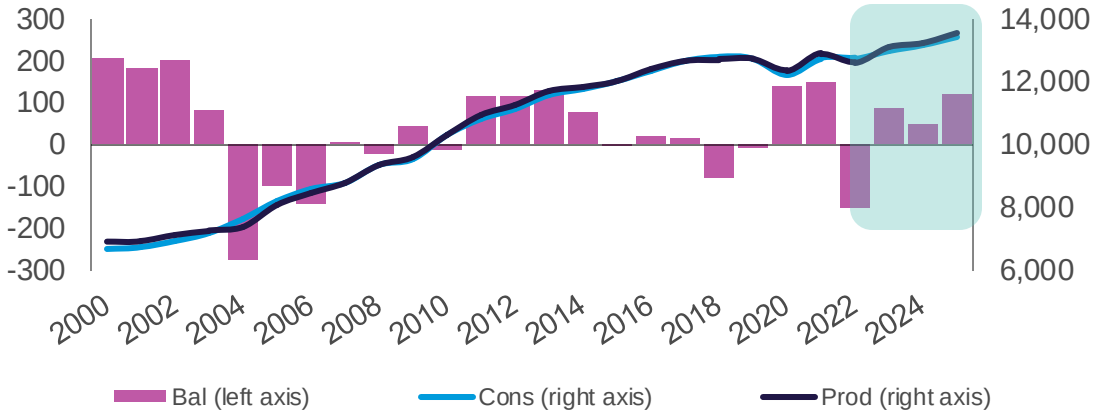
Battery metal prices, monthly average, index to Jan 2020 = 100



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.

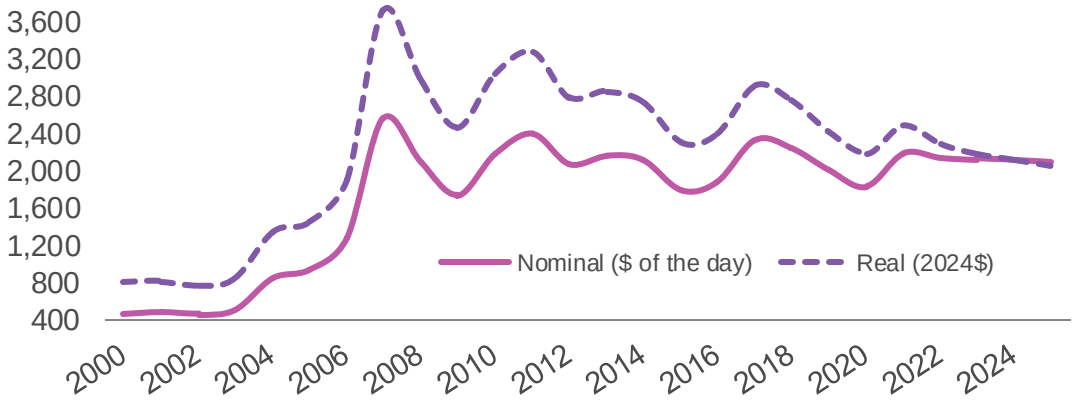
Can lead turn resilience into brilliance ?

Lead balance, world ('000 tonnes)



- **Like other battery metals, lead also switching into surplus.**
- **'Closed loop' cycle keeping lead on steadier 'nominal' price path.**
- **However, 'real' lead price in long-term decline since 2007 record high.**
- **Investors 'neutral' on lead battery's role in GET, limiting price upside ahead.**
- **Yet lead demand resilience also limiting price downside ahead.**
- **Lead has strong ESG 'cradle-to-grave' credentials - more recycling/less mining, wide geographical spread of supply.**
- **Lithium battery supply chain has weaker ESG 'cradle-to-grave' credentials – more mining/less recycling, inter-regional bottlenecks and safety issues.**
- **BUT…cheaper lithium battery raw materials lowering lithium battery costs.**
- **AND…cheaper LFP chemistry moving closer to parity with lead battery costs in China. LFP going global beyond China ?**

Lead price, nominal/real terms ($/tonne)



- **GET still happening, but maybe moving on to a slower transition path as hard reality of this big change hits home.**
- **LIBs cannot be the only choice for this huge energy shift.**
- **Multi-battery energy storage solution needed.**
- **LABs must be part of the solution and not part of the problem.**
- **However, LABs are facing big challenges, not least from LFPs.**
- **Still big question if resilient lead can break free and shine soon.**
- **But in the absence of brilliance, resilience set to continue for lead.**
- **And resilience has served lead well in all the 35 years I have been covering it !**

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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