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Climate change, new battery technologies and AI – will the world still need lead?

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The good news!

- The lead industry has overcome many challenges and changes affecting both production and consumption over the past 50 years
- There has been the loss of significant end-use markets principally in the chemicals sector, but demand for batteries has continued to expand
- The global vehicle fleet, now numbering over 1.8 billion, is almost 4.5 times larger than it was in 1980, with most vehicles using a lead-acid battery
- CHR Metals' data spanning 35 years from 1990 show lead consumption in SLI batteries increasing from 2.8 million tonnes to over 7.9 million tonnes
- Lead consumption in industrial batteries has increased at an even faster rate, from 570 thousand tonnes in 1980 to an estimate of more than 6 million tonnes today

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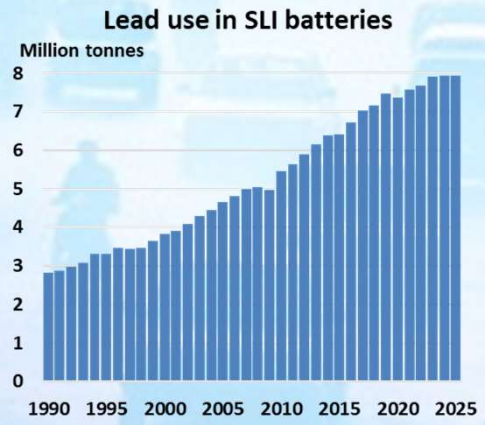

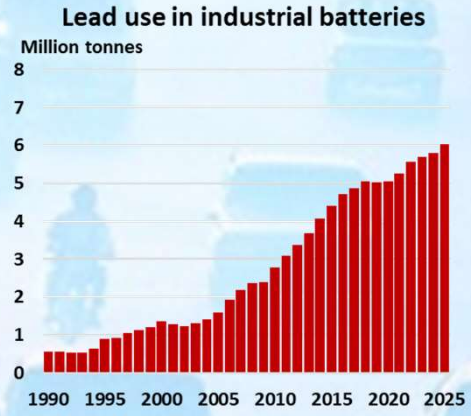

- Batteries account for 92% of lead demand in 2025
- Battery demand split 57% SLI and 43% industrial

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Electric vehicles – key to carbon reduction

- Eventual elimination of ICE vehicles will make a significant contribution to achieving Net Zero at some point in the future
- Projections for ending sales of ICE vehicles have been downgraded for most markets except China
- China's NEV sales have grown faster than forecast offsetting slower growth elsewhere

"Global EV sales are growing, but the national picture is more varied than ever" – Bloomberg NEF

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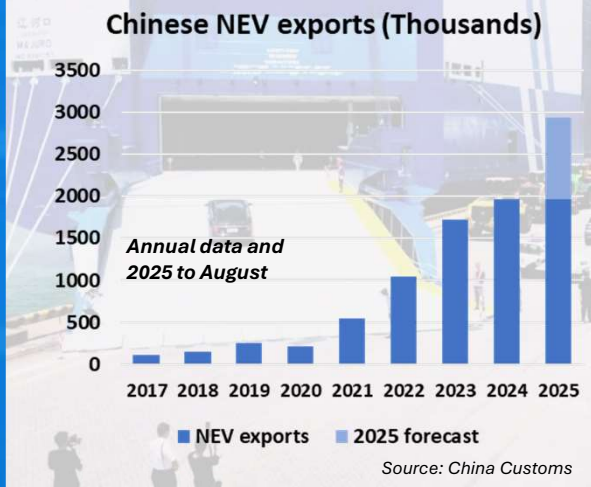
China's NEV exports expanding



Source: China Customs

- China's NEV vehicle exports likely to be three times higher in 2025 than in 2022
- Lower cost Chinese EVs are accelerating EV take-up
- China shipped more than 100,000 NEVs to each of five countries in the year to August; Belgium, Philippines, UK, Brazil and Mexico
- Exports to European countries almost 575,000 in first eight months of 2025
- Chinese manufacturers are establishing auto distribution and dealer networks around the world

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EV light vehicle sales near 30% of market in 2025

- 21 million electric vehicles (BEV and PHEV) out of a total market of 70 million
- Chinese manufacturers account for two-thirds of global EV output in 2025 supplying both domestic and export markets
- 17% of global EV sales (3.5 million) in Europe although some risk of double counting due to Chinese imports
- No double counting in the USA where tariffs of 100% or more block imports of electric vehicles from China
- US market 7% of global EV sales in 2025 but share likely to fall with withdrawal of subsidies and pressure to weaken EV mandates
- Rapid growth in EV sales in Korea, some ASEAN countries, Brazil and Mexico although imports from China are significant in all these countries

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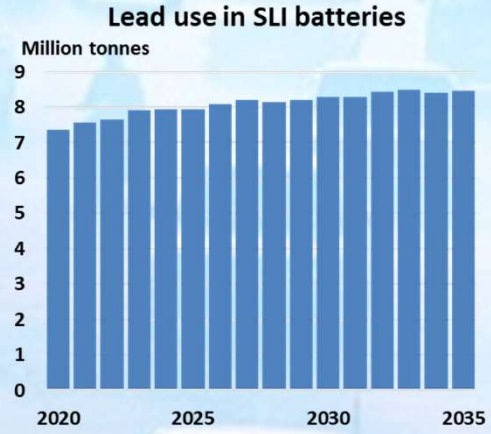
Still room for SLI demand to grow



- CHR Metals' forecasts limited growth in lead use in SLI batteries over the next two years
- Major risks are (1) more rapid take-up of electric vehicles and (2) substitution by lithium batteries
- Substitution is happening in electric vehicles with some auto manufacturers preferring lithium batteries in low voltage systems
- Substitution in low voltage systems, both EV and ICE, poses greater near-term threat to SLI lead batteries than adoption of electric vehicles

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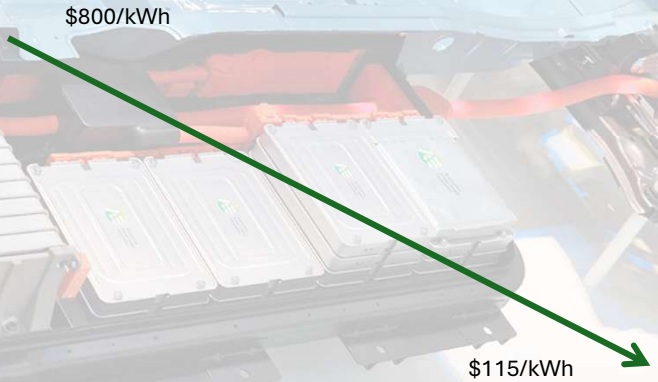
Falling cost of lithium batteries are a threat to lead batteries

Volume-weighted average lithium–ion battery pack and cell price split, 2013-2024



- Lower cost lithium batteries reflect several factors;
  - Overcapacity – 2.5 times annual demand at the end of 2024
  - Economies of scale
  - Lower metal and component prices
  - Greater adoption of LFP batteries

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Drive to Net Zero offers opportunities for lead batteries – but not in all applications

- Greater reliance on renewable energy, especially solar and wind, will require a very significant increase in power storage
- China Energy Storage Alliance reports that at the end of 2024 global "new energy storage" – power storage excluding pumped hydro and molten salt thermal facilities – reached 165GW, an annual increase of over 80% of which
  - Lithium-ion batteries 97.5%
  - Lead batteries 0.5%, down from 1.5% at the end of 2022
- In absolute terms there was a 20% increase for lead batteries over two years in grid-scale power storage but limited opportunities for lead in this market sector
- Lead carbon batteries have been specified in a few Chinese installations
- Several technologies and alternative battery chemistries also competing for market share in so-called BESS (battery energy storage systems)

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Identifying opportunities for lead batteries

- Artificial intelligence (AI) and cloud computing fuelling a surge of investment in data centres around the world
- These installations are power hungry and require stable and uninterrupted power to operate with a high degree of reliability necessitating need for both UPS and, often, standby power supply
- Current power consumption still low, only 1.5% of global electricity use in 2024 – expected to rise to 3% by 2030 (IEA)
- Some data centres in China specifying lead batteries for UPS but majority of installations around the world currently use lithium batteries
- Misinformation about the performance of lead batteries, especially life-cycle, and lifecycle cost of ownership, which is often unchallenged

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Mini, micro and nano grids

- South Asia leads the world in terms of the number of mini grids installed and planned
- Significant growth is also planned in parts of Africa
- Cheap solar panels are encouraging development of community grids in regions where connection to the main grid is limited replacing or augmenting diesel or hydro generation
- Increasing use of solar generation requires batteries for storage
- Lead batteries dominated in rural micro grid installations in Asia and Africa up to 2016/2017 (World Bank)
- Since then, lithium batteries have taken a greater share helped by a dramatic fall in costs
- Opportunities are there for lead batteries, but manufacturers must improve marketing and offer fully integrated systems

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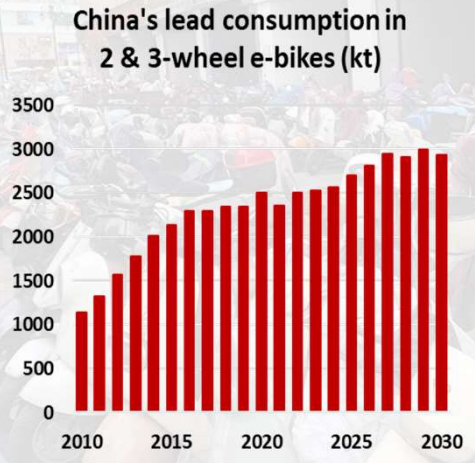
E-bikes and e-rickshaws



- Greater use of electric 2 and 3-wheelers in South Asian and ASEAN countries can help to reduce carbon emissions
- Highest level of adoption of 2 and 3-wheel e-bikes has been in China and predates the current focus on climate change
- Despite competition from lithium, lead batteries are still the principal source of power for e-bikes in China and estimated to account for around 2.7 million tonnes of lead consumption a year
- Rising number of electric rickshaws in India, Pakistan and Bangladesh using lead batteries
- Policy in India encouraging use of lithium batteries in electric scooters and motorcycles

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Will the world still need lead?

- Will the world still need zinc? Silver?
- Lead is typically mined as a co- or by-product of zinc and silver
- Lead's metallurgical properties mean it is essential for the recovery of many strategically important and critical metals
- Mitigating the impact of climate change implies a world dependent on renewable energy and significant capacity to store this energy
- There will also be a need for a power transmission and distribution network capable of delivering that power when and where it is needed
- Batteries of varying chemistries and technologies have attributes which make them more suited to some aspects of power storage and grid management than others
- The field is competitive

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Opportunities for lead

- Significant opportunities available for lead batteries in power backup, storage and motive power applications
- Roll out of data centres (cloud-based computing, AI, etc) offers a huge and expanding market for back-up power installations – but lithium dominating to date
- There remains potential for growth in motive power applications (forklifts, warehouse logistics, etc) but under threat from lithium
- Significant market for lead batteries in mobility remains under-exploited in many countries, with the exception of China
- Research is improving the performance of lead batteries, but more effort is needed to exploit the new opportunities in the market

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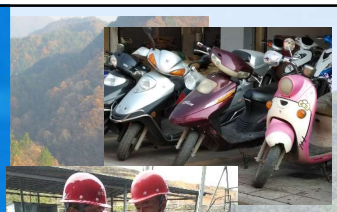

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- Providing independent, detailed analysis and forecasts of global lead and zinc industries
- Covering all aspects of mine and smelter supply and end-use consumption
- Data from original sources wherever possible
- A particular focus on Chinese market
- Offices in the UK and Xi'an
- Clients include producers, consumers, traders and hedge funds

For more information please contact Huw.Roberts@chrmetals.com

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