

NICKEL ENERGIZING BATTERIES

Concern over climate change, the drive towards energy efficiency and the adoption of carbon dioxide emissions targets by governments are all helping to increase interest in renewable energy technologies involving batteries and energy storage. While nickel is not always in the name, its presence in many battery technologies is helping to reduce greenhouse gas emissions - enabling clean energy solutions to be a central part of our effort to tackle global warming.

LI-ION BATTERIES

Nickel plays a crucial role in lithium-ion battery chemistries used to power electric vehicles, medical devices and cordless power tools as well as store renewable energy.



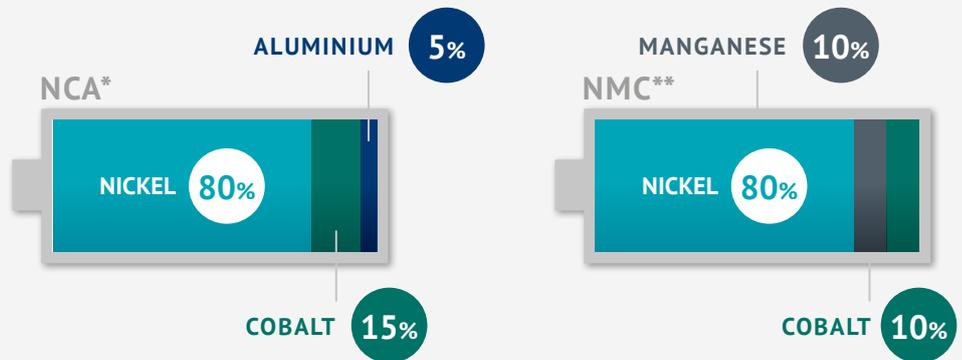
TODAY'S BATTERY OPTIONS

Lithium compounds are combined with other materials in order to create Li-ion batteries.

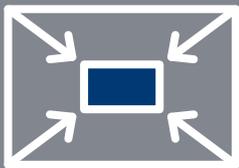
Two of the commonly used Li-ion battery chemistries contain nickel.

*NCA: Nickel Cobalt Aluminium
**NMC: Nickel Manganese Cobalt

CATHODE COMPOSITION:



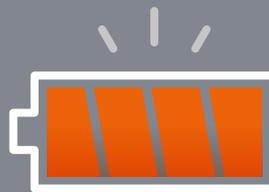
ADVANTAGES



LESS SPACE



LONGER LIFE

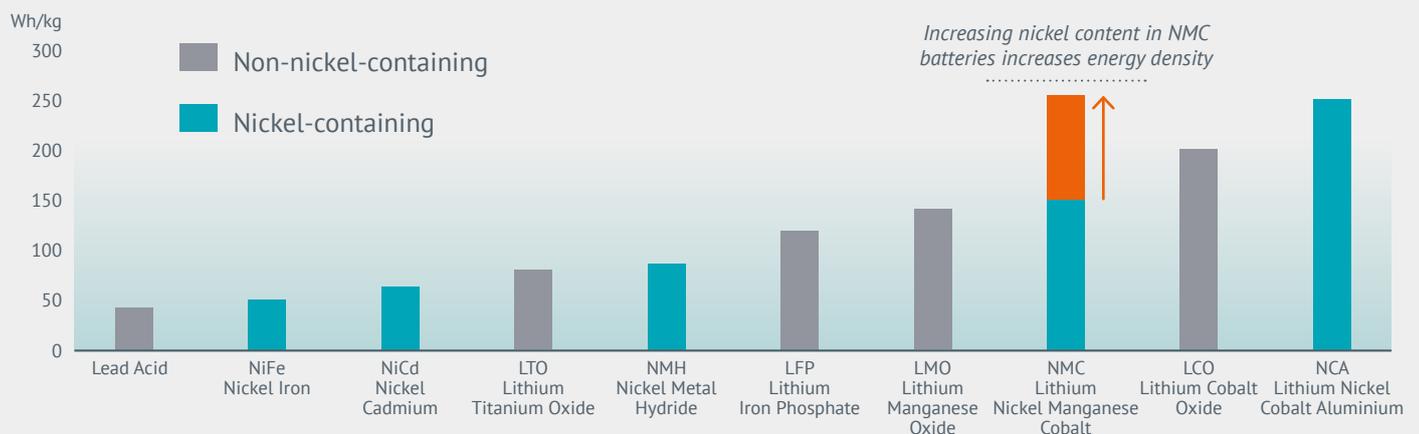


ENERGY STORAGE



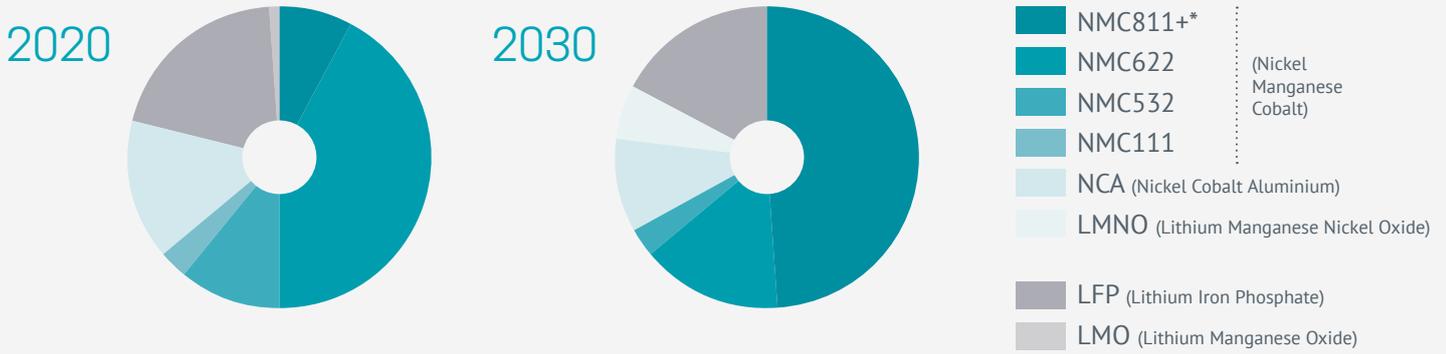
LIGHTER

NICKEL-CONTAINING BATTERIES COME IN MANY CHEMISTRIES AND OFFER THE HIGHEST ENERGY DENSITY ON THE MARKET



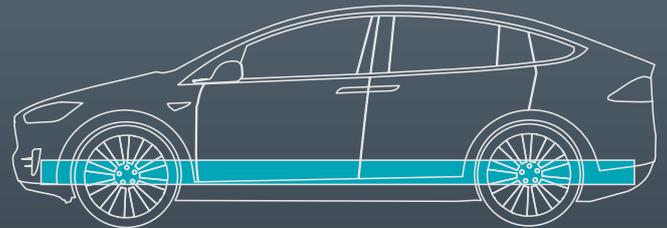
GROWING SHARE OF NICKEL-CONTAINING LITHIUM ION BATTERIES IN EVs

The lithium-ion battery sector will continue to grow towards high nickel NMC (greater than 80% nickel cathode) in electric vehicles. Currently 8% of lithium-ion batteries are high nickel NMC batteries. This is expected to rise to nearly 50% by 2030.



POWERING THE FUTURE OF TRANSPORT

Companies and governments around the world are asking for increased capacity and energy at lower cost to achieve greenhouse gas reductions. This is leading to major investment in R&D and new production facilities in the lithium battery sector, directly linked to the development of electric vehicles (EVs). Nickel-containing cathodes make batteries lighter, smaller and provide higher energy density, resulting in a more efficient EV. It's clear that future EV batteries will employ more nickel.



“Our cells should be called Nickel-Graphite, because primarily the cathode is nickel and the anode side is graphite with silicon oxide... [there’s] a little bit of lithium in there, but it’s like the salt on the salad” - Elon Musk, CEO Tesla



NICKEL IS PART OF THE SOLUTION FOR A MORE SUSTAINABLE SOCIETY

Nickel in the battery provides higher energy density and storage at lower cost. And crucially it contributes to a longer drive range. New battery developments are helping to make each kWh of battery storage more cost competitive so that intermittent renewable energy sources such as wind and solar can replace fossil fuels for energy production.



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* NMC811+ includes high nickel chemistries such as NMC9.5.5; NCMA

- Sources:**
- Nickel Institute Member companies
 - Rho Motion
 - <http://batteryuniversity.com/>

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