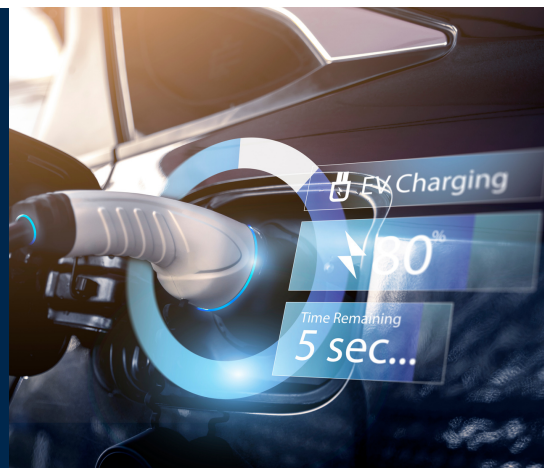


EV Battery Market

Soaring Nickel Prices Russia Sanctions

BY MAXIMO BLANDON, MANAGING DIRECTOR



The rechargeable electric vehicle (EV) battery market is preparing for two great unknowns: the extent of U.S. and European Union sanctions against Russia for its war in Ukraine, and the long-term trajectory of nickel prices that recently hit record highs in response to the conflict.

Russia is among the world's leading producers^[1] of nickel, behind only the Philippines and Indonesia, with China acting as the leading importer. As long as nickel remains an essential component for achieving high-energy density in certain types of lithium-ion (Li-ion) EV batteries, these X-factors may impact both battery manufacturers and vehicle manufacturers.

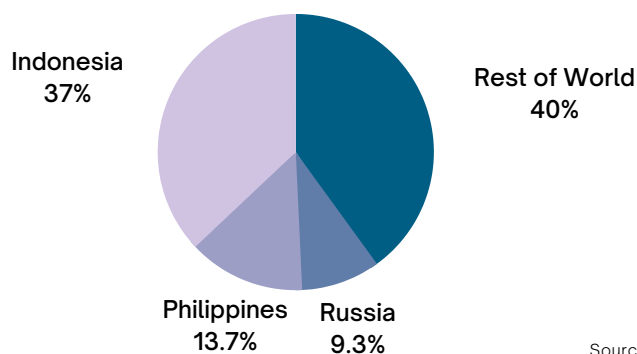
These companies are likely to seek ways of offsetting potential material cost increases and supply constraints, such as passing costs onto customers

or forging partnerships with foreign entities to access required resources. Companies also may pursue capital raising and M&A strategies for securing access to nickel, or investing more in EV batteries not reliant upon nickel.

Between Feb. 23 and March 8, the price of nickel jumped^[2] from \$24,950 per ton to \$100,000 on the London Metal Exchange; it has since fallen back under \$50,000. The same day nickel reached its high, President Joe Biden announced a U.S. ban on Russian energy imports^[3] of oil, natural gas, and coal.

Although the primary driver of demand for nickel is its usage in stainless steel^[4] production, and rechargeable batteries account for less than a fourth of nickel consumption, within the EV market nickel plays a crucial role. Most Li-ion

Global Nickel Mine Production (2021 Estimates)



Source: U.S. Geological Survey, January 2022

NO-NICKEL CATHODES MAY GAIN TRACTION

batteries rely upon nickel, according to the Nickel Institute[5], and the composition of both nickel cobalt aluminum (NCA) and nickel manganese cobalt (NMC) battery cathodes is approximately 80% nickel.

Last year, 54% of global EV battery capacity deployed on roads used in new plug-in electric vehicles contained such high-nickel cathode chemistry, according to Adamas Intelligence[6].

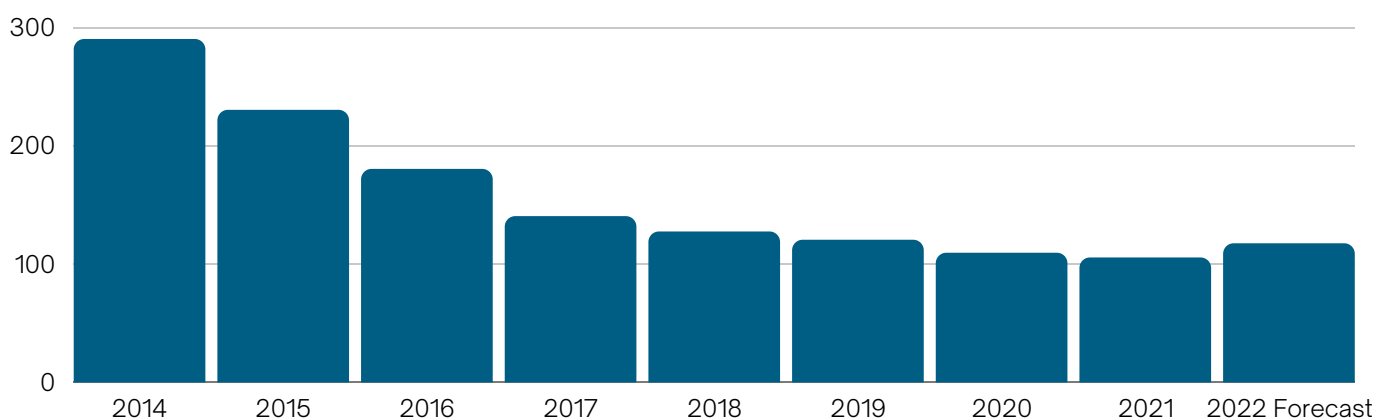
80%

Nickel in NCA and NMC EV battery cathodes

95%

World's LFP-based EV batteries made in China

EV NMC Li-ion Battery Cell Prices \$/kWh



Source: Benchmark Mineral Intelligence

In 2021, high-nickel chemistry EV batteries prevailed throughout the U.S. and Europe. Across Asia-Pacific, there was nearly equal usage of high-nickel, low-nickel, and no-nickel chemistries, according to Adamas.

Lithium ion battery cell prices fell steeply between 2014 and 2021, but availability concerns and raw material prices had led to forecasts, even before[7] Russia invaded Ukraine, that battery cell prices would rise this year. The current nickel market disruptions could accelerate interest in adoption of no-nickel EV batteries, such as those with lithium iron phosphate (LFP) cathodes, which can be less expensive to produce than nickel-based batteries.

As of 2021, China manufactured 95%[8] of

the world's LFP-based batteries. However, last year, major U.S. and European automakers announced plans to ramp up[9] usage of LFP-based batteries, and President Biden has urged U.S. carmakers to relocate more of their battery supply chain[10] back to domestic factories.

Yet the nickel-based EV battery market might avoid long-term headwinds, especially if Indonesia and the Philippines increase nickel production or China agrees to absorb Russia's nickel exports. Manufacturers seeking to assess how these factors could impact their capital and M&A strategies may benefit from the perspective of objective experts in renewable energy.

[1] [Mineral Commodity Summaries 2022 - Nickel \(usgs.gov\)](#)

[2] [LME Nickel | London Metal Exchange](#)

[3] [Biden announces ban on Russian energy imports - CNNPolitics](#)

[4] [Mineral Commodity Summaries 2022 - Nickel \(usgs.gov\)](#)

[5] [Nickel in batteries | Nickel Institute](#)

[6] [High Nickel Battery Chemistries Led the Pack in 2021 - Adamas Intelligence](#)

[7] [Explainer: Costs of nickel and cobalt used in electric vehicle batteries | Reuters](#)

[8] [Tesla looks to pave the way for Chinese battery makers to come to U.S. | Reuters](#)

[9] [Ford, VW and Tesla are investing in LFP battery technology for EV \(environmentalleader.com\)](#)

[10] [Carmakers Race to Control Next-Generation Battery Technology - The New York Times \(nytimes.com\)](#)

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