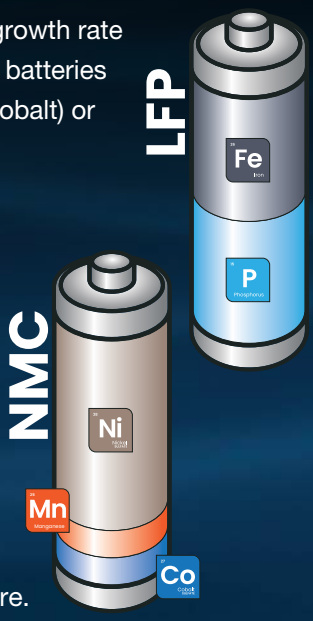
NMC Could Be Cheaper Than LFP

The EV Battery Situation

Demand for lithium-ion batteries is growing at greater than 25% compound annual growth rate (CAGR)[1], driven by the growing demand for electric vehicles (EV). The majority of EV batteries use cathodes with nickel and cobalt in a chemistry called NMC (nickel manganese cobalt) or NCA (nickel cobalt aluminum). A cathode called LFP that uses iron and phosphorus instead of nickel or cobalt is gaining traction with many automobile manufacturers.



There are many challenges with LFP-based cathodes, including:

- ► Approximately 33% less range due to worse energy density than NMC
- ► Shorter range in cold temperatures
- ► Issues with reading the remaining range of the EV
- ► Scarcity—today all of the supply volume is committed for the next few years

The perceived risk of sourcing nickel, cobalt and the expected costs of these materials is driving automobile manufacturers to contemplate a move to LFP in the 2026+ timeframe when supply volume from new manufacturing may become mature.

The True Cost of LFP vs NMC Batteries

Typically the cathode makes up 40% of the cost of a LFP battery and 59% of the cost of a NMC811 battery[2].

At first glance,the price delta between LFP and NMC811 batteries is approximately $12 per kWh[2]. However, this price delta doesn't take into account the recycle value of the used battery at the end of its life. In a used LFP battery the iron and phosphorus are not cost effective to recycle, reducing the cost effectiveness of lithium recovery. On the other hand the nickel and cobalt in an NMC battery are valuable and easily recycled. In fact, 60% of nickel and 32% of cobalt are already end of life recycled today[3]. Each used NMC811 battery contains over $12 per kWh of recycled nickel and cobalt. When a full life cycle analysis is performed on the cost of NMC it is less expensive than LFP.

Deep Seabed Minerals

Deep seabed minerals are the world's biggest global resource of nickel and cobalt. Polymetallic nodules are potato sized rocks which form over millions of years and are lying on the deep ocean seabed. Impossible Metals is using Autonomous Underwater Vehicles (AUV) with Image sensing technology to identify and select only nodules free of megafauna and avoid sediment plumes.

[1]Benchmark Mineral Intelligence 2022
[2]Roland Berger 2022
[3]IEA 2022

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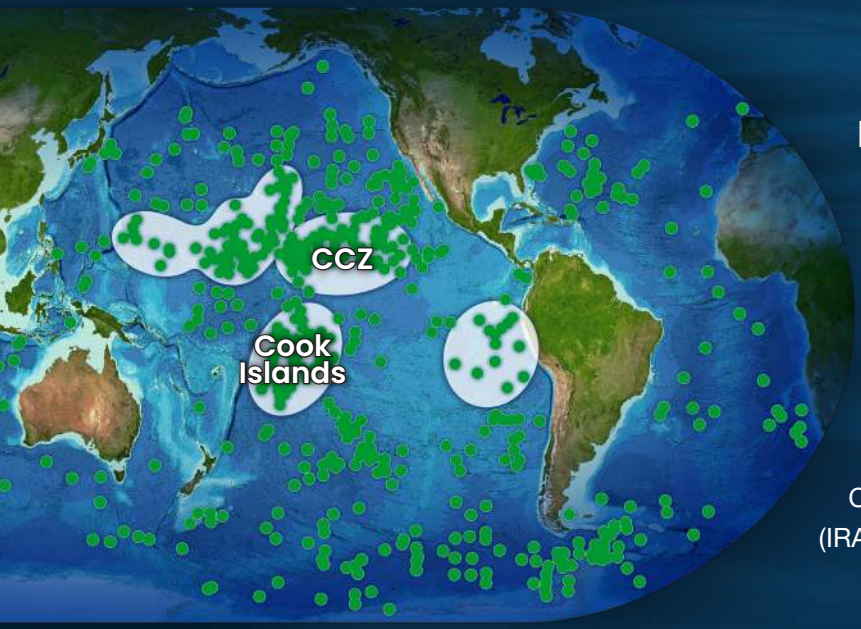

Locations of known Seabed Nodule Fields

Exploration Permits Granted

The Clarion Clipperton Zone (CCZ) in the Pacific Ocean contains three times the world's reserves of nickel and six times the world's reserves of cobalt. Vast quantities of polymetallic nodules have been found in all of the world's oceans. To date, 22 exploration permits have been granted and over $2 billion as been spent researching the resource. This resource is not controlled by Foreign Entities of Concern and should meet the Inflation Reduction Act (IRA) criteria of domestic critical minerals.

Why Seabed Minerals (Polymetallic Nodules)?

Compared to new land-based nickel and cobalt mines the Impossible Metals' solution has significantly lower costs and risks.

► High-Grade Resource

The nickel grade in CCZ nodules is ~1.3% compared to new terrestrial mines (often as low as 0.4%). Less waste material to be extracted and processed significantly affects the unit economics.

► Four Metals In One Resource

Polymetallic nodules contain economic volumes of copper, nickel, manganese and cobalt. The nickel equivalent grade is 3.2% for CCZ nodules.

► Significantly Lower Infrastructure Cost and Risk

Unlike the majority of new terrestrial mines, seabed mining operations require little new infrastructure (e.g. villages, highways, train lines and power plants).This offers a vastly superior economic outcome, and reduces permitting risk.

► No Rehabilitation Mine Site Costs

At the end of mine life, terrestrial mines require comprehensive rehabilitation which often costs in excess of hundreds of millions of dollars, incurred at the end of the mine's production cycle. Often governments require this money upfront in a bond. The mining of seabed nodules using selective harvesting will not require rehabilitation, as the habitat and ecosystem will be left fully functioning. This is a significant cost benefit as well as an environmentally superior outcome.

► Lower Environmental Impacts Reduce Permitting Risk

The approach to metals harvesting and processing Impossible Metals is developing will have significantly lower social and environmental impacts, and risks. Seabed mining does not displace communities, or pose a significant risk to communities in downstream areas. Lowering these impacts and risks will significantly reduce permitting risk, and the risk of legal action by opponents.

Learn More at ImpossibleMetals.com/bmw

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