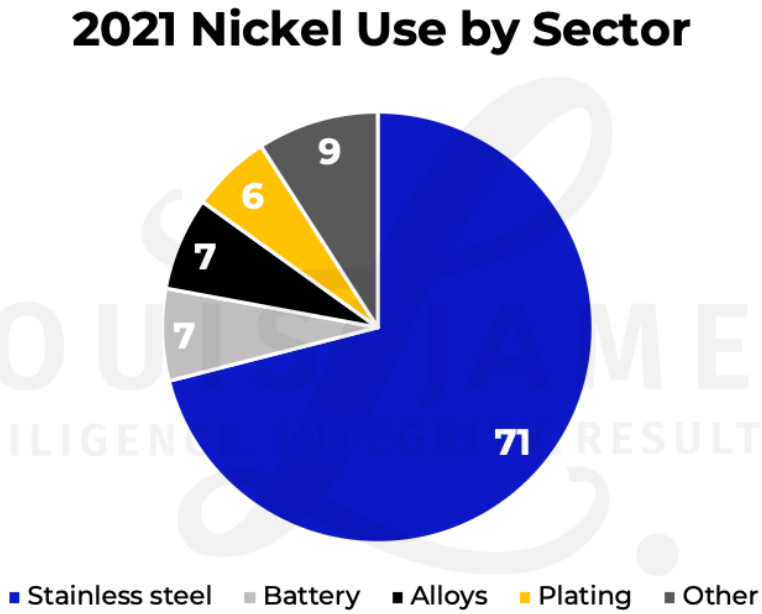
The Independent Speculator
Special Report

Why I'm Not a Nickel Bull

We keep hearing about EVs bringing on a nickel shortage. When a short squeeze doubled nickel prices in march of 2022, bulls said it was nickel's time to soar, but prices crash back down again.

What's going on?
Is nickel a good basis for speculation or not?

With or without the green agenda, nickel is a key industrial metal. About 70% of the nickel mined today is used to make stainless steel, and it has many other uses.



What's creating so much excitement—and risk—is that nickel is an essential ingredient in most of today's lithium-ion batteries used in electric vehicles (EVs).

We project EV sales to grow at a compounded annual growth rate of 24% from 2021 to 2030. This rapid growth will clearly increase demand for nickel—but by how much? And will supply keep up?

But first, let's have a look at ...

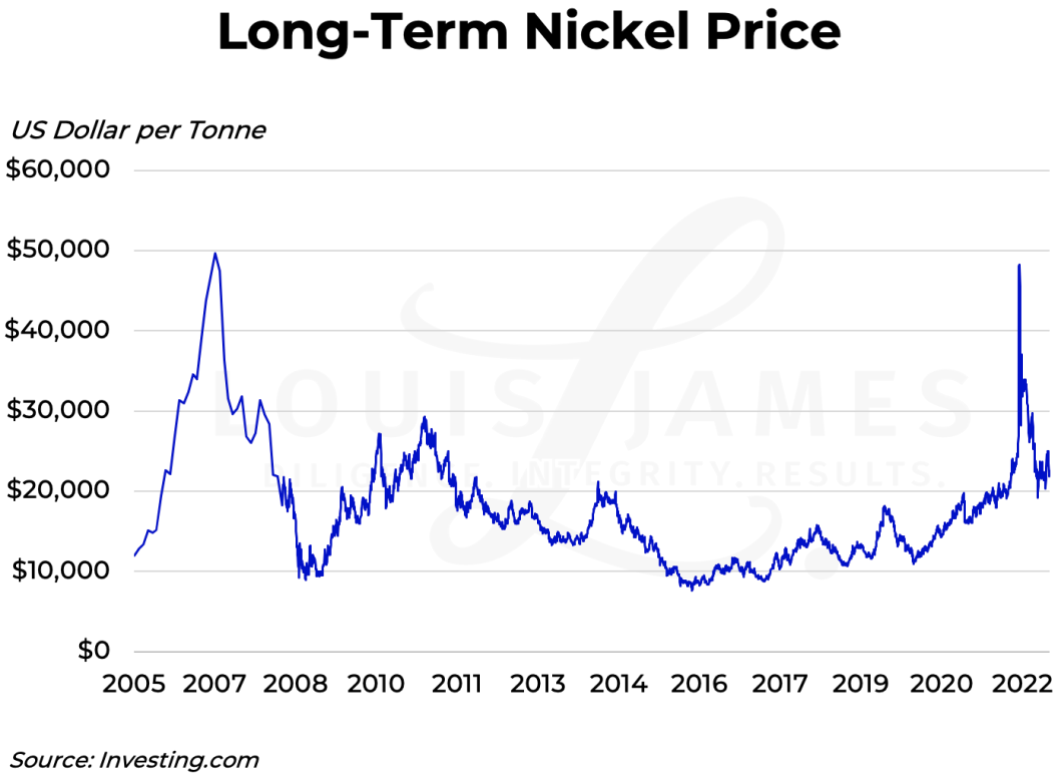
Nickel Market Basics

Nickel futures contracts trade on the London Metal Exchange (LME) and the Shanghai Futures Exchange (SHFE). Only Class 1 nickel (>99.8% Ni) is deliverable to the LME. This includes nickel cathodes, briquettes, pellets, and nickel powder.

Nickel is also available in other forms not traded on the LME: nickel pig iron (NPI); ferronickel; intermediates such as mixed

hydroxide precipitate (MHP); mixed sulfide precipitate (MSP); and basic nickel carbonate (BNC). All these forms are cheaper than Class 1 nickel. MHP and MSP are the main intermediates.

The chart below shows LME spot nickel prices in recent decades. As you can see, they've risen to historically high—but not record high—levels over the last six years.



The recent spike was driven by fear of sanctions on Russian nickel. This triggered a short squeeze, which saw nickel hit $100,000/tonne. These prices are not shown because the LME canceled those trades. It remains to be seen where prices will settle.

Remember that the intermediates that battery manufacturers use aren't traded on the LME. These are sold via contracts with producers at rates that are set, and are generally impervious to spot market fluctuations.

Expert consensus is that EVs can match ICE cars at a battery cost of around $100/kWh. This is not going to be possible if batteries with nickel in them continue to dominate and prices are higher.

A key point to the future price of nickel—and the fate of nickel mining stocks—is that nickel is the second-most expensive element in EV batteries after cobalt. This presents not just a risk of substitution, but an active process of substitution already well underway.

If EVs stand any chance of competing with internal combustion engine (ICE) cars, the battery cost has to come down. Expert consensus is that EVs can match ICE cars at a battery cost of around $100/kWh. This is not going to be possible if batteries with nickel in them continue to dominate and prices are higher.

Supply and Demand

According to the International Nickel Study Group, 6% of nickel demand went into making batteries in 2020. It was 7% in 2021. How much this percentage will increase depends on the assumptions one makes about battery composition going forward. The trend, however, is currently upward—and it's on top of other industrial demand for this basic raw material. More on this in a moment.

As for supply, it's notable that large chunks of it come from the "wrong" side of the New Iron Curtain, from a Western perspective.

Major players include:

- Nornickel. This Russian mining company is the world's largest producer of palladium and refined nickel. In 2021, the company produced 235,700 tonnes of nickel—about 9% of global supply that year. The company operates high-grade nickel sulfide mines in Norilsk and the Kola peninsula in Russia, and another in Finland.

- Tsingshan. This is a Chinese stainless steelmaker that became the world's top nickel producer in 2018. This was based on low-grade nickel pig iron (NPI) from its Indonesian production centers (Morowali and Weda Bay). Tsingshan expects to produce 850,000 tonnes of nickel equivalent in 2022 and 1.1 million in 2023. In 2021, the company announced that it would produce nickel matte—which is a precursor to battery-grade nickel—from NPI. This caused nickel prices to drop substantially at that time.

- Jinchuan. This is a Chinese nonferrous metals producer in which the Chinese government is the majority stakeholder. The company mainly produces copper, cobalt, and nickel. In 2020, the company produced 200,000 tonnes of nickel, making it the third-largest producer in the world.

- BHP, Vale, and Glencore are some of the other major Western miners that produce battery-grade nickel from sulfide ore. Together, these three companies produced about 17% of the total nickel produced in 2021.

As for the balance of these two forces, many sources have published projections. The majority of these (if not all), predict that nickel demand will overtake supply in the latter part of this decade. This is based on booming demand for EVs—and assumptions about the nickel content of the batteries in those cars as well as where the nickel that goes into them needs to come from.

It's just not possible to say with certainty which projects will become mines by then, so we left them all out. That means that ***supply is likely understated*** *toward the later years in our chart—and that's bearish for nickel prices.*

We take issue with both.

- Assumptions for the nickel content of the batteries are suspect because most studies seem to ignore or dismiss the growing adoption of lithium iron phosphate (LFP) battery chemistry—which includes no nickel or cobalt at all. LFP batteries have, in the past, made for cars with shorter driving ranges and temperature vulnerabilities. They are, however, cheaper and safer, and they charge faster. Adoption is surging. Notably, Tesla recently reported that 50% of the cars it sold had LFP batteries.

- The assumption that only Class 1 sulfide nickel can be used for batteries can't hold. If it were so, there's no way EV adoption could proceed at the projected rates, thereby undermining the "coming nickel shortage" thesis. There have been too few nickel sulfide ores discovered in the last two decades. There's just not enough of it—at any price. Fortunately, there are processes for converting other types of nickel to that needed for batteries, such as the one pioneered by Tsingshan.

Rather than presume that we know how these two key variables will play out, we've constructed a chart showing our

projections for supply and demand, depending on which types of supply can be used (solid areas) and the degree of LFP adoption in the EV battery market.

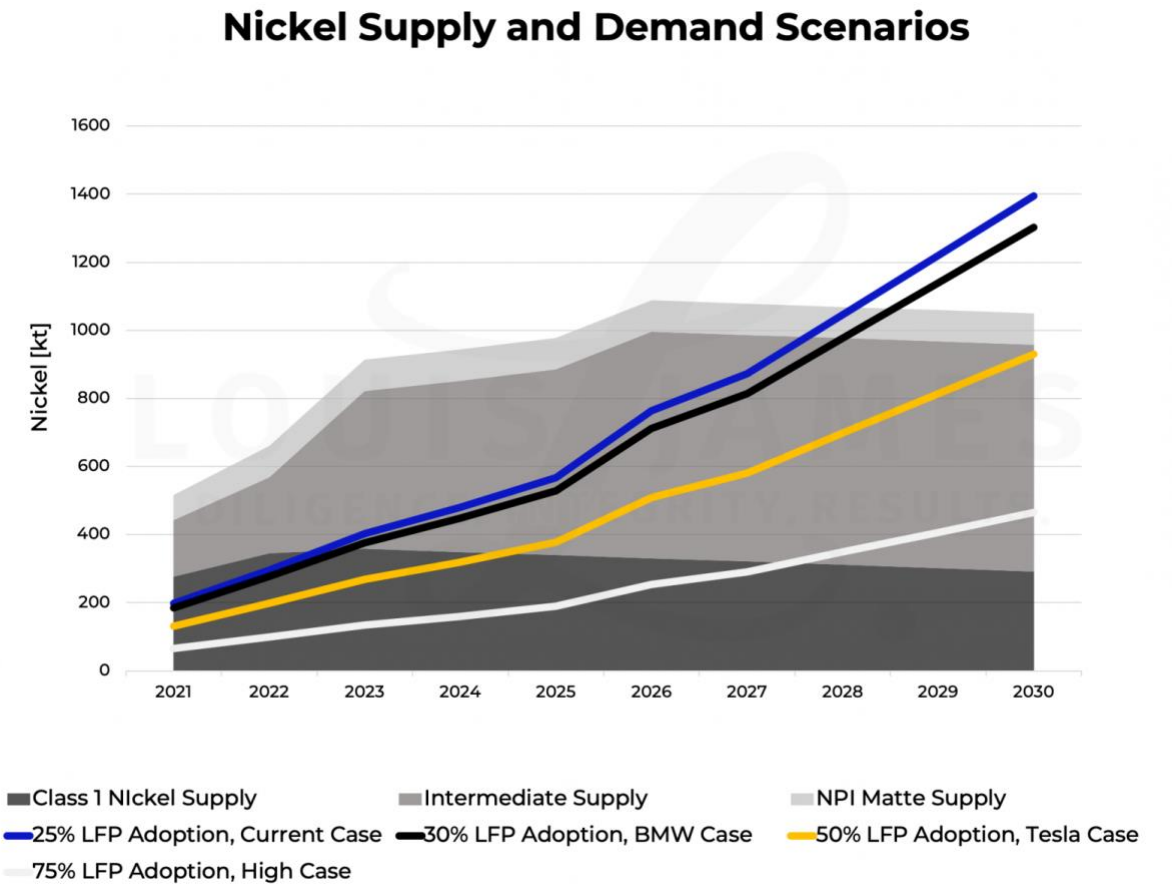


Figure 1: Nickel supply vs. demand estimates for the battery market, 2021–2030

First, please note that the model charted above assumes that Russian supply won't go away. But even if it does become unavailable to the West, we're sure Chinese EV makers will buy all they can. It therefore can't be left out of the supply model.

We also assume no new supply after 2026. This is unlikely to be true. It's just not possible to say with certainty which projects will become mines by then, so we left them all out. That means that supply is likely understated toward the later years in our chart—and that's bearish for nickel prices.

As for the LFP adoption rates, 25% is a reasonable minimum, as that's the current rate. BMW and Volkswagen say they expect about 30% of their cars to be LFP-based, so that's another very conservative case. The 50% assumption is based on what Tesla is already reporting, so this seems conservative to us as well. The 75% rate is a high-adoption case. (We don't bother with a 100% scenario, as that's not in the cards; batteries with nickel in them are better for some special cases.)

*If we assume a 75% LFP adoption rate and include nickel intermediates, there's no shortage of nickel—**ever**.*

Now, consider these scenarios:

- If only Class 1 nickel can be used for batteries and LFP adoption remains low (25–30%), there will be a shortage starting next year.
- If nickel intermediates can be used as well but LFP adoption remains low (25–30%), there will be shortages by 2028 or 2029.
- If we assume a 50% LFP adoption rate—what Tesla is already doing—there's no shortage of even Class 1 nickel until 2025.
- If we assume the 50% "Tesla" LFP adoption rate but include nickel intermediates, there's no shortage until 2030.
- If we assume a 75% LFP adoption rate, there's no shortage of even Class 1 nickel until 2028 (by which time there could be new supplies we haven't modeled).
- If we assume a 75% LFP adoption rate and include nickel intermediates, there's no shortage of nickel—ever.

We understand that a 75% LFP adoption rate may seem unrealistic, given that these batteries currently result in cars that can create "range anxiety." We think this anxiety is already less than it once was and will continue to diminish as charging stations proliferate. (Just recently, the Pilot gas station/truck stop chain announced that it's putting in charging stations across the US.)

What's more, there are other new battery designs headed to the market besides LFP that don't use nickel or cobalt, like sodium-ion batteries. Even hydrogen fuel-cell cars are relevant to the question of nickel demand, as those wouldn't use big batteries full of nickel either.

Batteries with nickel (and cobalt) may long remain in use in specialty, high-performance EVs, but we just don't think it's realistic to think that the current, nickel-heavy designs will maintain their dominance.

The IP right expires this year in the US and in 2023 in Europe. Once battery manufacturers don't have to pay the royalty, we expect LPF adoption to accelerate in the US and EU.

So, if we see the "75% LFP" adoption rate as a "75% anything that doesn't use nickel" adoption rate, we think it's actually quite conservative. That's especially so toward the end of this decade, before which there's no risk of a nickel shortage at all… unless conversion of nickel intermediates turns out to be harder than expected.

Is that likely to be a problem? We're not chemical engineers, but battery makers are already signing deals for procuring nickel intermediates.

In short, despite the mad scramble for nickel we've seen in recent months, it's not actually in short supply yet—and it may never be.

It could be that various players along the nickel supply chain, metals merchants, and speculators making the unreasonable assumptions we've called into question have created a nickel price bubble that won't last.

The Rest of the Story: LFP Adoption Looks Poised to Soar

For those who want more detail on our "LFP is going to eat nickel's lunch" thesis, here are some of our findings that went into our model, our chart, and our conclusions.

The first key point is that LFP adoption has really picked up in the last couple years, especially in China. That's not just because the Chinese are famously frugal. There's an intellectual property (IP) right on this technology. The IP is held by a consortium called LiFePO4+C AG (LiFePO). China had a deal with the consortium, waiving the royalty for LFP batteries produced and sold only in China. The IP right expires this year in the US and in 2023 in Europe. Once battery manufacturers don't have to pay the royalty, we expect LPF adoption to accelerate in the US and EU.

Another key point is that LFP technology is improving in energy density—that's what's needed to increase EV range and reduce range anxiety.

No surprise then that Tesla, Volkswagen, BMW, and other EV makers have already announced that their entry-level cars will use LFP batteries—and those are high-volume models.

LFP batteries used to have about 30% lower energy density than nickel-based batteries. This has changed. Energy density in the current generation of LFP batteries is almost on par with nickel-manganese-cobalt (NMC) batteries. LFP cells saw a

426% growth (in watt-hours) in the second half of 2021 compared to the same period in 2020. This large growth in LFP has resulted in an average drop in the usage of nickel and cobalt by 2% and 9% respectively per EV sold.

The chart below shows how LFP energy density from several manufacturers has improved, with nickel-cobalt batteries (NCM and NCA) thrown in as yardsticks.

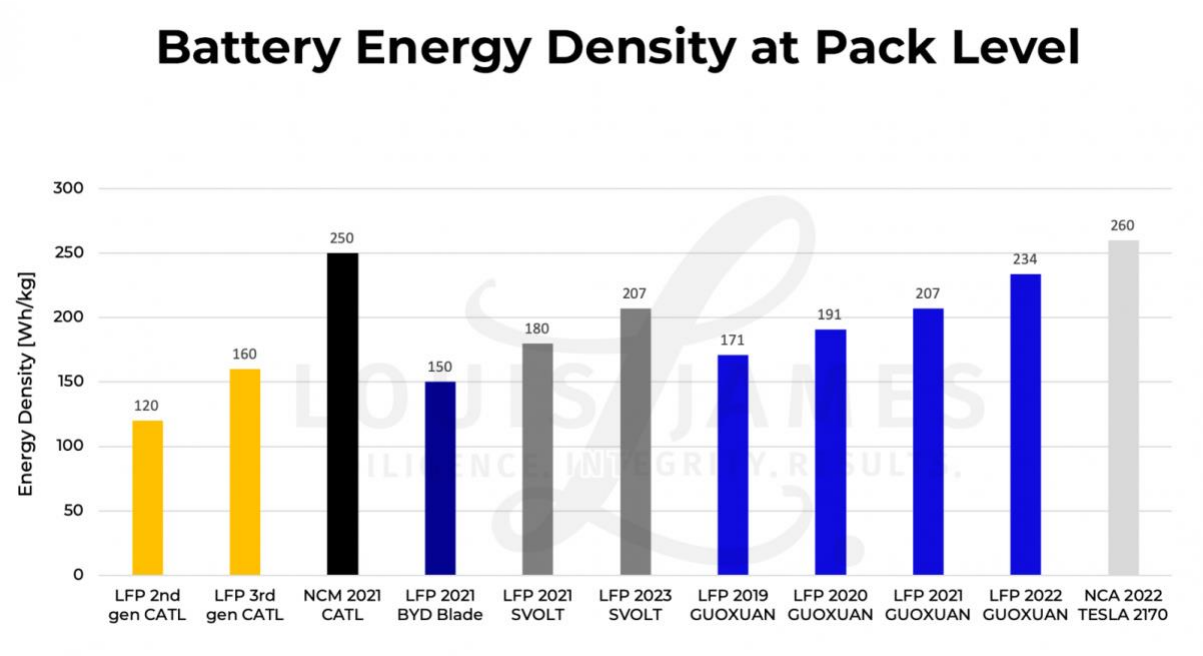


Figure 2: Improvements in energy density at pack level for different battery chemistries over the years.

Other key points that make us think LFP will largely displace NCM include:

- They're cheaper. Lithium and iron are abundant. (Nickel and cobalt are much more expensive—and a lot of them come from "scary" parts of the world. Let's just say the supply chains look better.) Currently, LFP batteries cost around $100/kWh—the price that competes with ICE cars.

- They're safer. Have you seen those dramatic YouTube videos of Teslas burning and firefighters unable to quench

the flames? Not a problem with LFPs.

- They charge faster.
- They last longer. An LFP can last more than 5,000 charging cycles, while nickel-based batteries typically last for about 1,000 cycles.
- LFP production creates significantly lower CO2 emissions than that of nickel-based batteries. CO2-equivalent emissions per tonne of nickel produced are 1,200 times more than for iron, even when considering the cleanest source of nickel (sulfide ore + hydropower for processing). Most research fails to address this point.

In short, unless the intermediate nickel supply fails to work out in a major way, it seems unlikely that we'll see a nickel shortage this decade, if ever.

"Cheaper" is critical. The BYD blade LFP battery, for instance, is about 43% cheaper than an NCM-811 battery. For a passenger car with 60 kWh of battery capacity, this translates to about $3,000 in savings. BYD recently announced that it will be supplying its BLADE LFP batteries to Tesla.

No surprise then that Tesla, Volkswagen, BMW, and other EV makers have already announced that their entry-level cars will use LFP batteries—and those are high-volume models.

Bottom Line

We're aware that many studies forecast extremely bullish cases for nickel, based on EV adoption. We're skeptical of these forecasts, as the studies we've seen assume that only Class 1 nickel will be used to make EVs, considering ESG mandates. We don't agree, for these reasons:

1. There just isn't enough Class 1 nickel to meet the nickel demand. If EV makers stick to using only Class 1 nickel, their cars will be just too expensive for mass adoption. That would put an end to a central pillar of the green agenda.

2. Using intermediates is the only way to meet the demand—and there's enough of that to oversupply the market.

3. Tesla signed a deal with Prony Resources to be a technical advisor on their nickel project. The product is a battery precursor, MHP. This shows that EV makers are already planning to work with intermediates.

4. We think LFP will become the battery chemistry for the majority of the EVs sold, at least for some time, but there are other non-nickel solutions on the way as well. High prices are already becoming the cure for high prices.

In short, unless the intermediate nickel supply fails to work out in a major way, it seems unlikely that we'll see a nickel shortage this decade, if ever.

Even if intermediates don't help as much as hoped (there are issues with CO2 emission in the conversion processes), the new LFP batteries with higher energy densities are arguably just a better solution for EVs.

With this in mind, I'm not looking to speculate on nickel miners any time soon.

For company-specific guidance on how to speculate on trends like this, *My Take* can help.

Try **My Take**

Sources

1. State of Charge: EVs, Batteries and Battery Materials, Adamas Intelligence, 2021 H2
2. https://tesla-cdn.thron.com/static/IOSHZZ_TSLA_Q1_2022_Update_G9MOZE.pdf?xseo=&response-content-disposition=inline%3Bfilename%3D%22TSLA-Q1-2022-Update.pdf%22
3. EVERBIRIGHT SECURITIES
4. https://about.bnef.com/blog/battery-pack-prices-fall-to-an-average-of-132-kwh-but-rising-commodity-prices-start-to-bite/
5. https://www.cnbc.com/2022/06/08/shares-of-china-ev-maker-byd-jump-after-exec-announces-tesla-battery-deal.html
6. https://www.reuters.com/business/energy/prony-resources-says-tesla-has-agreed-multi-year-nickel-purchasing-deal-2021-10-13/
7. https://www.bhp.com/-/media/documents/investors/annual-reports/2021/210914_bhpannualreport2021.pdf?sc_lang=en&hash=15F0B58BC27ADFA860F0BE29B61E199D
8. Trading Economics.

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