

Electric Vehicle Industry Insights:

Truflation EV Index uses electric vehicle
commodities for EV market predictions

Electric Vehicle Industry Insights

Truflation EV Index Analyzes Electric Vehicle Commodities for Market Insights

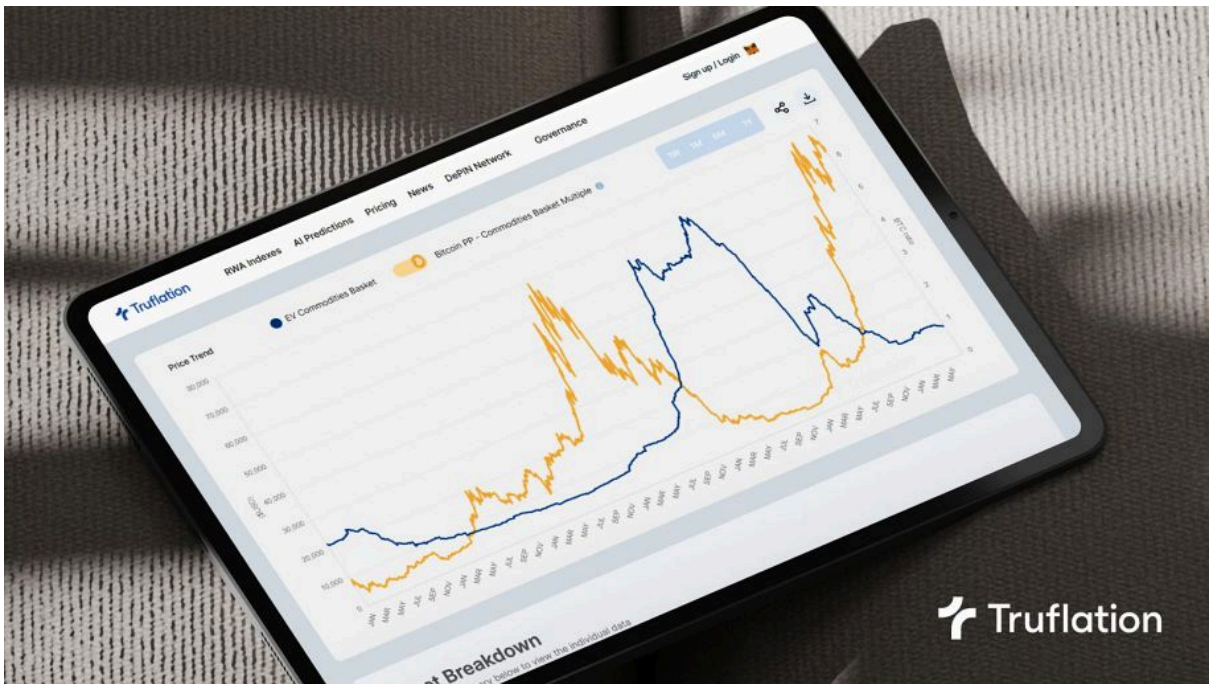
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Introduction

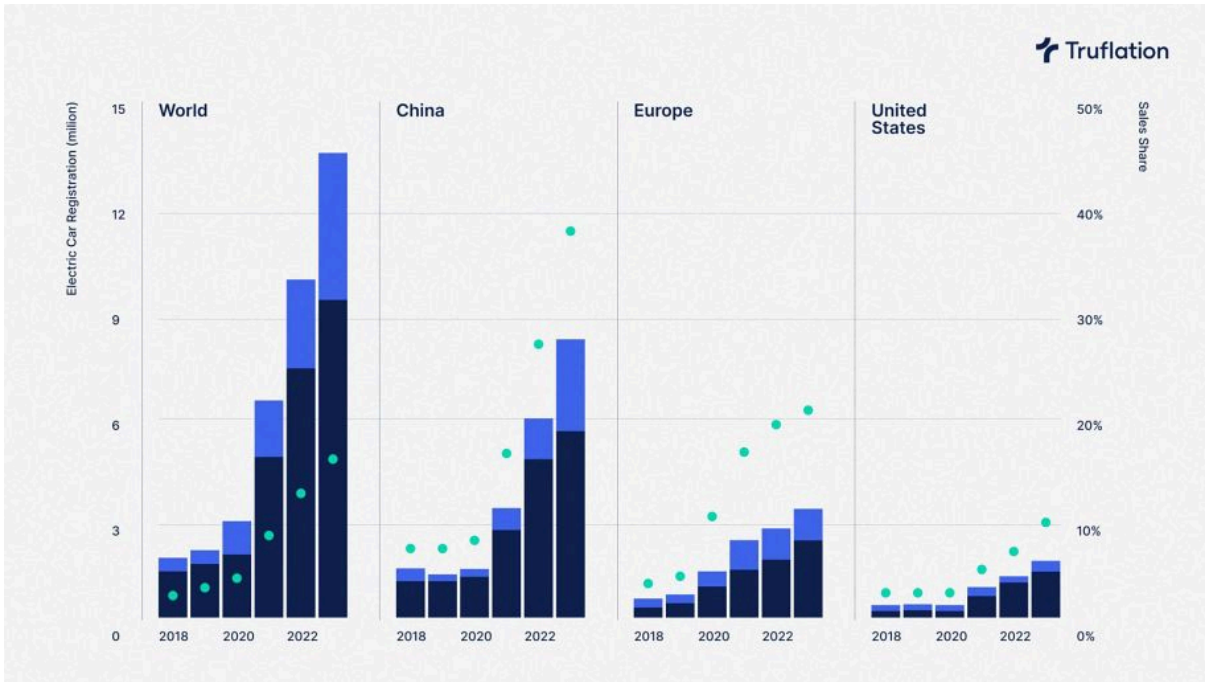
This article provides a dive into the electric vehicle industry insights for the past decade, including the 2024 EV market analysis across the main EV markets, including China, Europe, and the United States. This paper also discusses the latest electric vehicle trends: AI, energy, and edge computing, which could reshape the future of the electric vehicle market. We then analyze the role of electric vehicle commodities in the manufacturing and EV supply chains and how the EV commodity prices can be used for EV market predictions. Finally, we introduce the new EV Index designed by Truflation to offer invaluable EV market insights using real-time data for EV commodity prices.





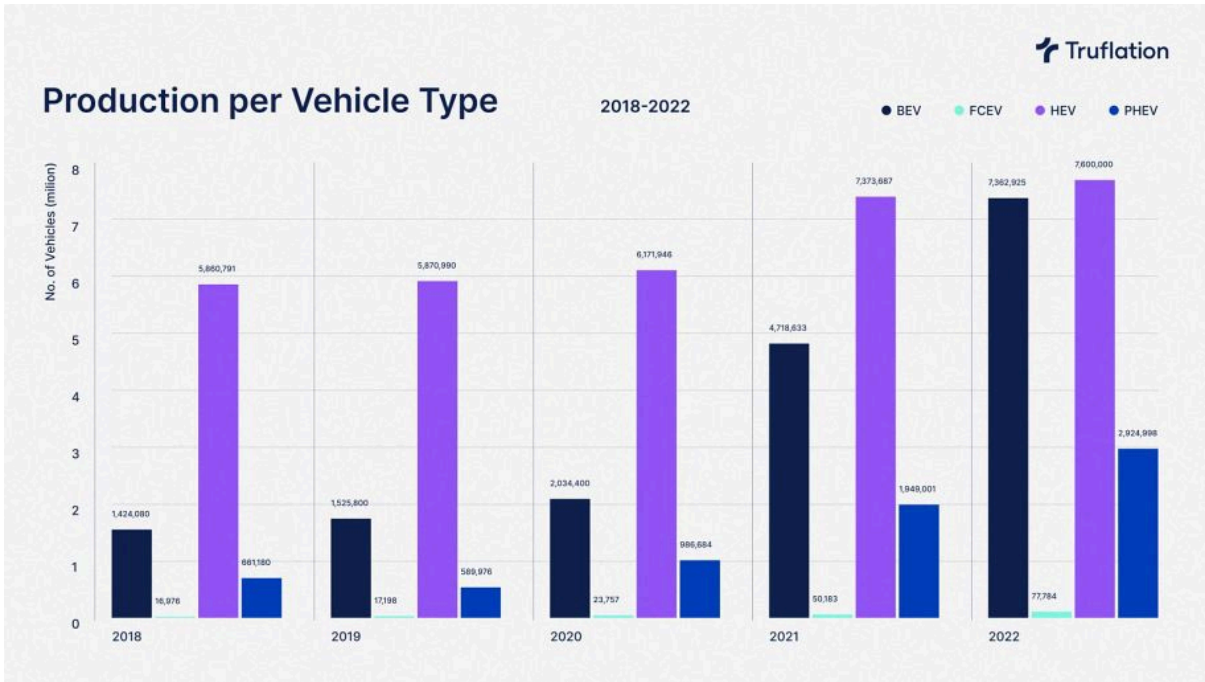
Electric Vehicle Trends

The last decade saw a boom in the electric vehicle market, supported by global sustainability efforts and environmental agreements on greenhouse gas emissions targets. Thanks to vast investment in disruptive innovation and green energy, China has acquired a strong lead in EV sector growth and market penetration. Europe came in second, and the US third in new EV sales. The pursuit of EV and renewable energy across China was aided by vital strategic advantages: large metal and rare earth metal deposits and China's metal refining capability, encompassing about 40% of global resources necessary for EV production.



EV market analysis by car type showed that the battery-only electric vehicles (BEV) continued to dominate EV sales over the last decade, showing exponential growth up till 2023, while the plug-in hybrid vehicles (PHEV) took about a third of the electric vehicle market, with an extra up-trend reported in 2024. The novel fuel cell electric vehicles (FCEVs) powered by hydrogen haven't gained a significant share of the market just yet.

In terms of production, battery manufacturing experienced exponential growth: plug-in EVs (PHEV) experienced substantial growth but remained at lower levels than battery-only EVs (BEVs) or hybrid EVs (HEVs). The hybrids maintained relatively high production levels but with limited growth over the years.



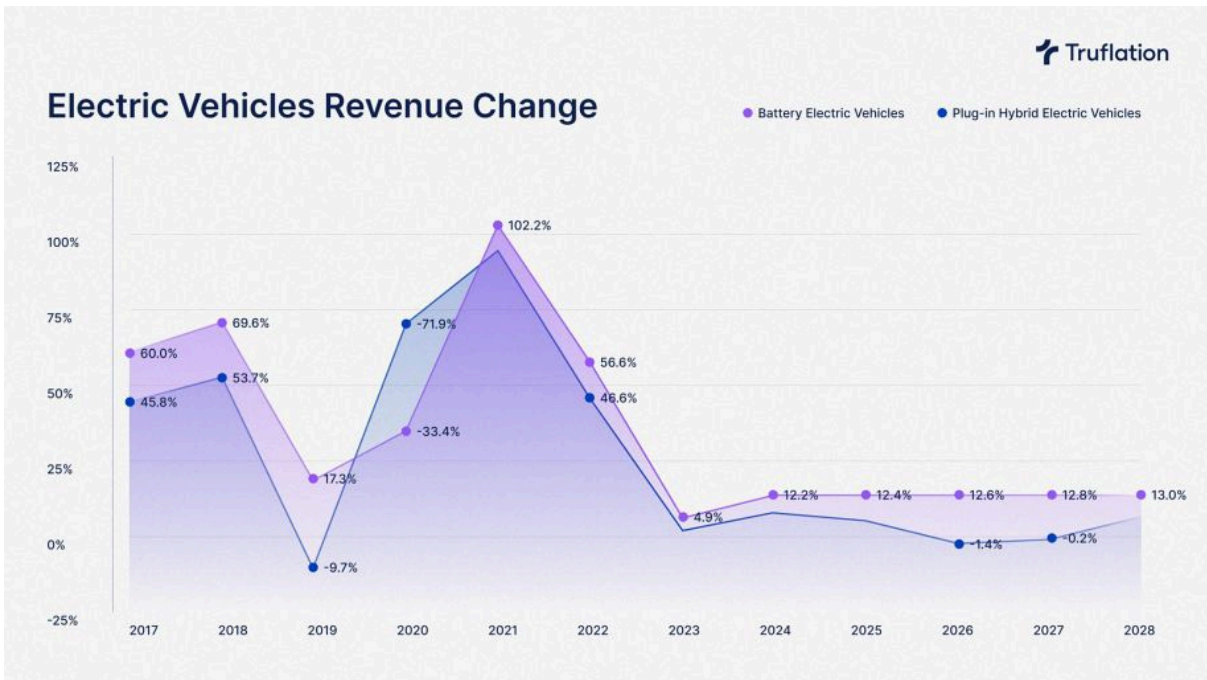
In 2024, the electric vehicle market experienced a long-anticipated pullback due to oversaturation and general economic slowdown across many target markets, especially China, Europe, and the US. Lower-than-anticipated growth in new car sales and guidance adjustments led to significant drops in the EV companies' stock prices. The slowdown could be connected to various geo-political factors ranging from the upcoming US elections, trade wars, and tariffs to a certain cultural push-back against the green rhetoric.



The EV market analysis of the global slowdown in new car sales also points to inflation and EVs. Many US and EU companies failed to launch sufficiently affordable EV models, which deterred consumers already suffering from inflation and rising costs of living. Uncertainty about governments' continuous subsidies on EVs and renewables saw both of those markets contract in 2024. The lower-than-expected prices on used EV models gave consumers pause about the real capital costs of EVs, and the worries about insufficient charging infrastructure and the EV's driving range pushed some consumers towards hybrid alternatives.



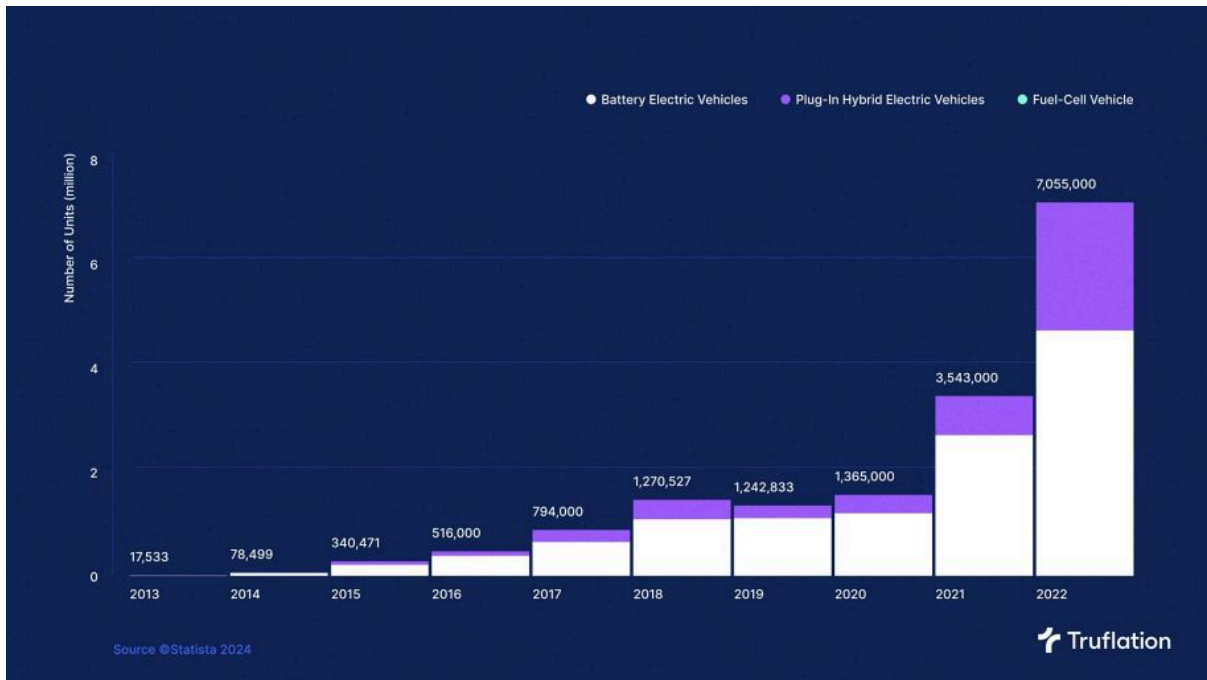
Price gap between the sales-weighted average price of conventional and electric cars in selected countries, before subsidy, by size, in 2018 and 2022.



China Electric Vehicle Trends

Thanks to an early and widespread green policy and large investments in innovation, China is now a global leader in the electric vehicle market. It boasts an

over 47% electric vehicle market penetration, and Chinese EV manufacturing is one of the most competitive and subsidized in the world, not only for passenger car EVs but also for electric buses and commercial vehicles. Chinese electric vehicles currently account for over 58% of global EV production.



The exponential growth in the annual production of new EVs in China by propulsion type.

China may have the upper hand when it comes to clean energy and EV manufacturing because a significant percentage of global EV commodities are refined in China. It also remains a leader in mining rare earth elements (REE), the necessary catalysts and components in the production of EV batteries and magnetic motors. In recent years, China's monopoly on metal commodities shrunk to some extent as the US and other countries sought out new metal deposits and mining opportunities in Hawaii and Scandinavia, amongst others.

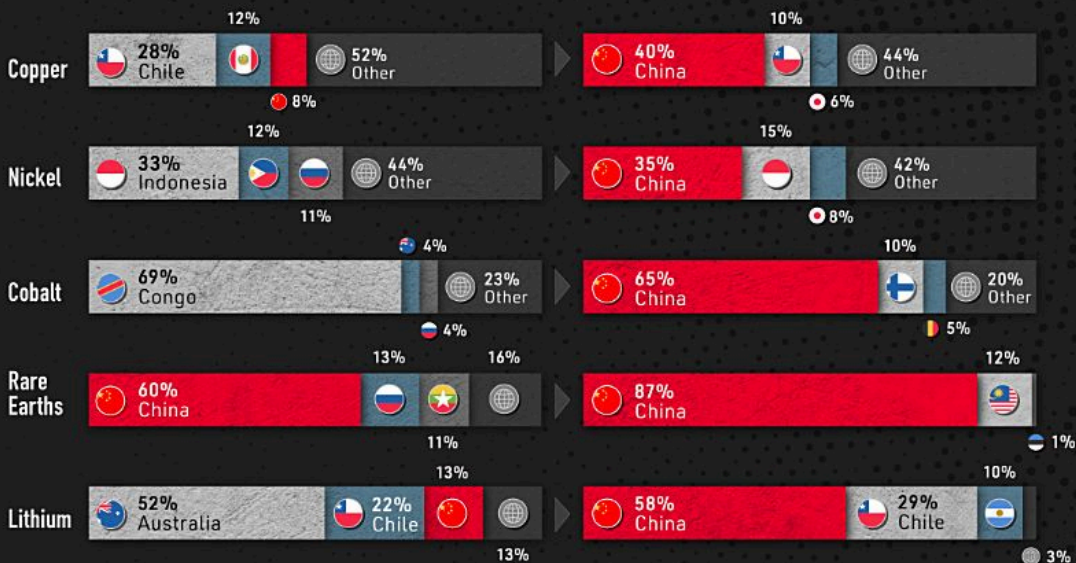
VISUALIZING CHINA'S DOMINANCE IN CLEAN ENERGY METALS

Renewable sources of energy are expected to replace fossil fuels in the next decades, as the world's economies try to reduce carbon emissions and mitigate climate change.

This graphic based on data from the International Energy Agency illustrates where the extraction and processing of key metals for the green revolution take place, and how China is leading the process.

Where Clean Energy Metals are Produced

Where Clean Energy Metals are Processed



World demand for lithium is forecast to more than double between 2020 and 2023 as global electric vehicle uptake rises.

The Biden administration has targeted rare earths among domestic supply chain priorities.

Of the 255,000 Congolese mining for cobalt, 40,000 are children.

Source: International Energy Agency



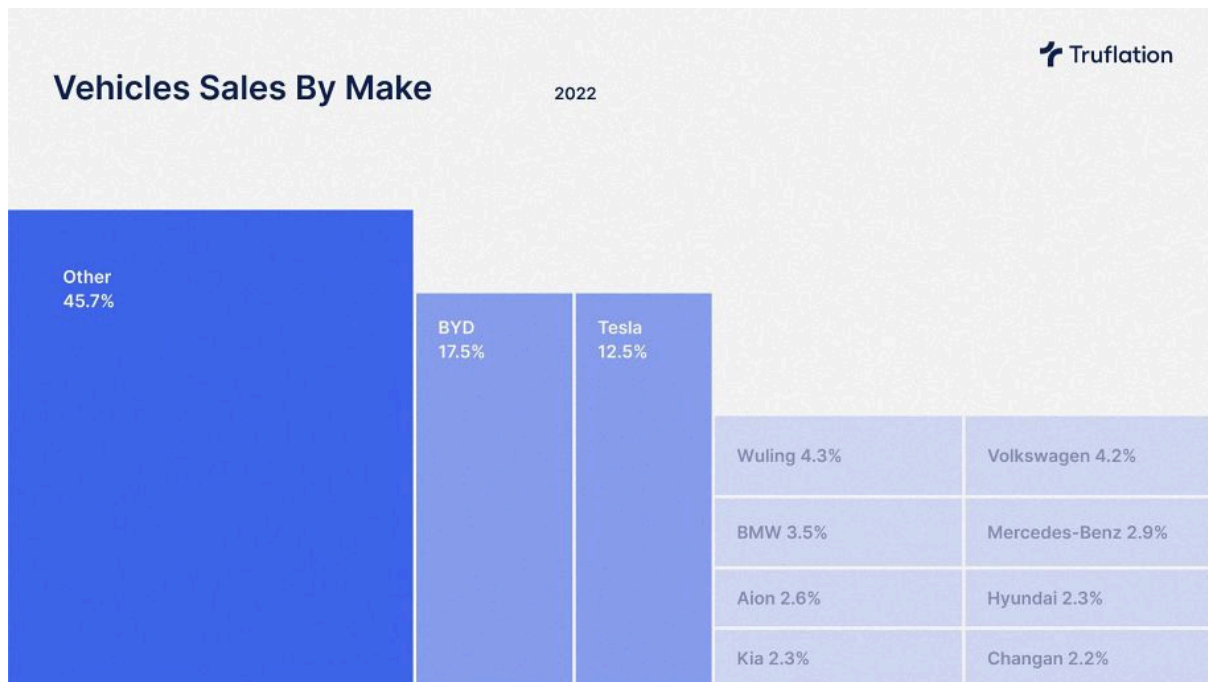
The Earth's natural resources power our everyday lives. VC Elements breaks down the building blocks of the universe.

We live in a material world.

With 1.4 billion people and record-high CO2 emissions, China is also the biggest target market for EVs. Decreasing global EV sales could be traced back to the cooling Chinese domestic market, as the country continued to experience rising consumer debt and a housing crisis. The Chinese economy struggled in 2024 after it never truly recovered from stringent and prolonged COVID lockdowns and decreases in domestic and international tourism.

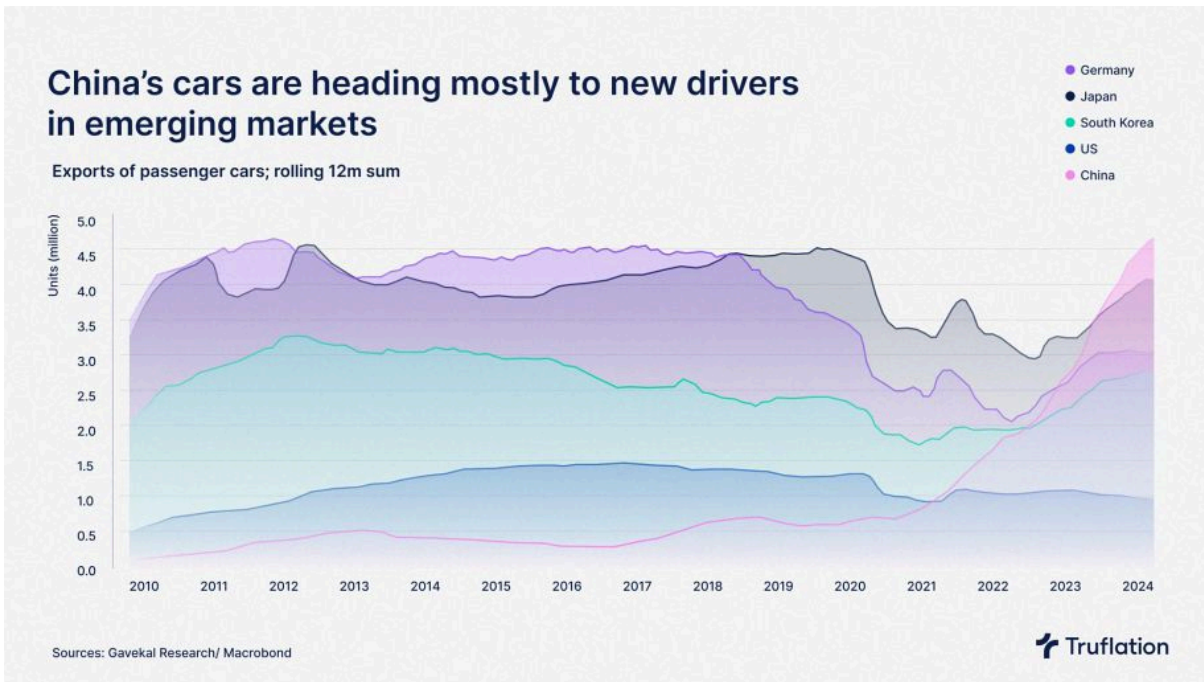
The Chinese electric vehicle market and stock prices were also affected by the US and EU tax tariffs due to trade wars related to chips, semiconductors, batteries,

solar panels, rare earth metals, and electric vehicles themselves. The tariffs aimed to prevent the cheaper Chinese vehicles, heavily subsidized by the Chinese government, from flooding the markets and uprooting domestic EV production.



China is a strategic partner but also a competitor and a threat to the US and EU EV manufacturing. In 2023, China exported over 1.5 billion vehicles outside of mainland China, and the Chinese company BYD briefly beat Tesla to become the top EV company in the world. BYD's competitive advantage over other EV manufacturers lies in their in-house EV battery production, which has significantly lowered BYD's production costs.

On average, all Chinese EV models were cheaper than their EU and US alternatives while offering fast acceleration, long battery life, and luxurious finishes. Chinese companies also proved innovative when NIO solved many EV industry issues around EV charging speed by introducing exchangeable battery packs. No wonder the Chinese model posed a threat to the US and EU electric vehicle markets, springing global governmental-level responses.

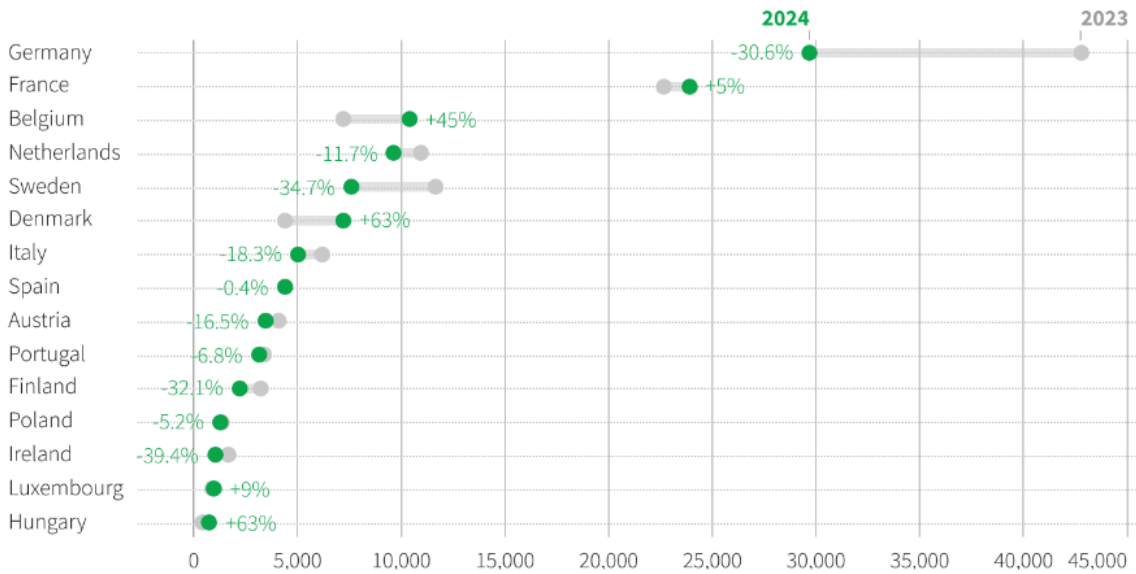


European Electric Vehicle Trends

After years of EV sector growth, the electric vehicle market saw significant drops in EV sales and new registrations in 2024, with a small uptick in hybrid models instead. The biggest economy in Europe, Germany, experienced the largest 30% decrease in electric vehicle market sales compared to the same time last year, while the whole European EV sales decreased by around 12.5% year-over-year. Tesla sales decreased by 34% in Europe amidst controversies with labor unions and mega factories. It also failed to release competitive enough models while Europe continued to struggle with high inflation, an energy crisis, and an affordability crisis. Furthermore, many European countries discontinued some of their EV and renewable energy subsidies as they tackled governmental debts and deficits.

Following market analysis and pressure from the US, the EU also imposed taxes on Chinese car companies to protect domestic manufacturers from cheaper models from China. Starting July 2024, the Chinese EVs will experience tariffs of up to 38.1%.

BEV REGISTRATIONS IN MAY (The percentage change figures from May 2023 are highlighted)

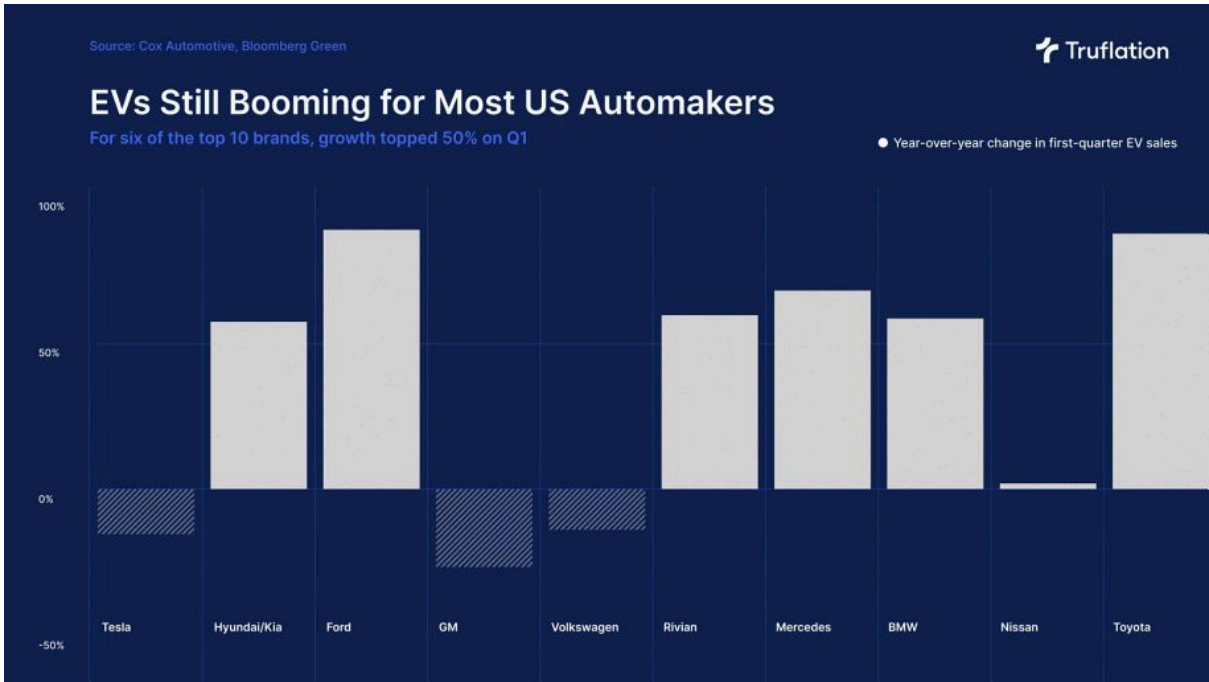


Source: ACEA | Reuters, June 20, 2024 | By Sumanta Sen

Reuters Graphics

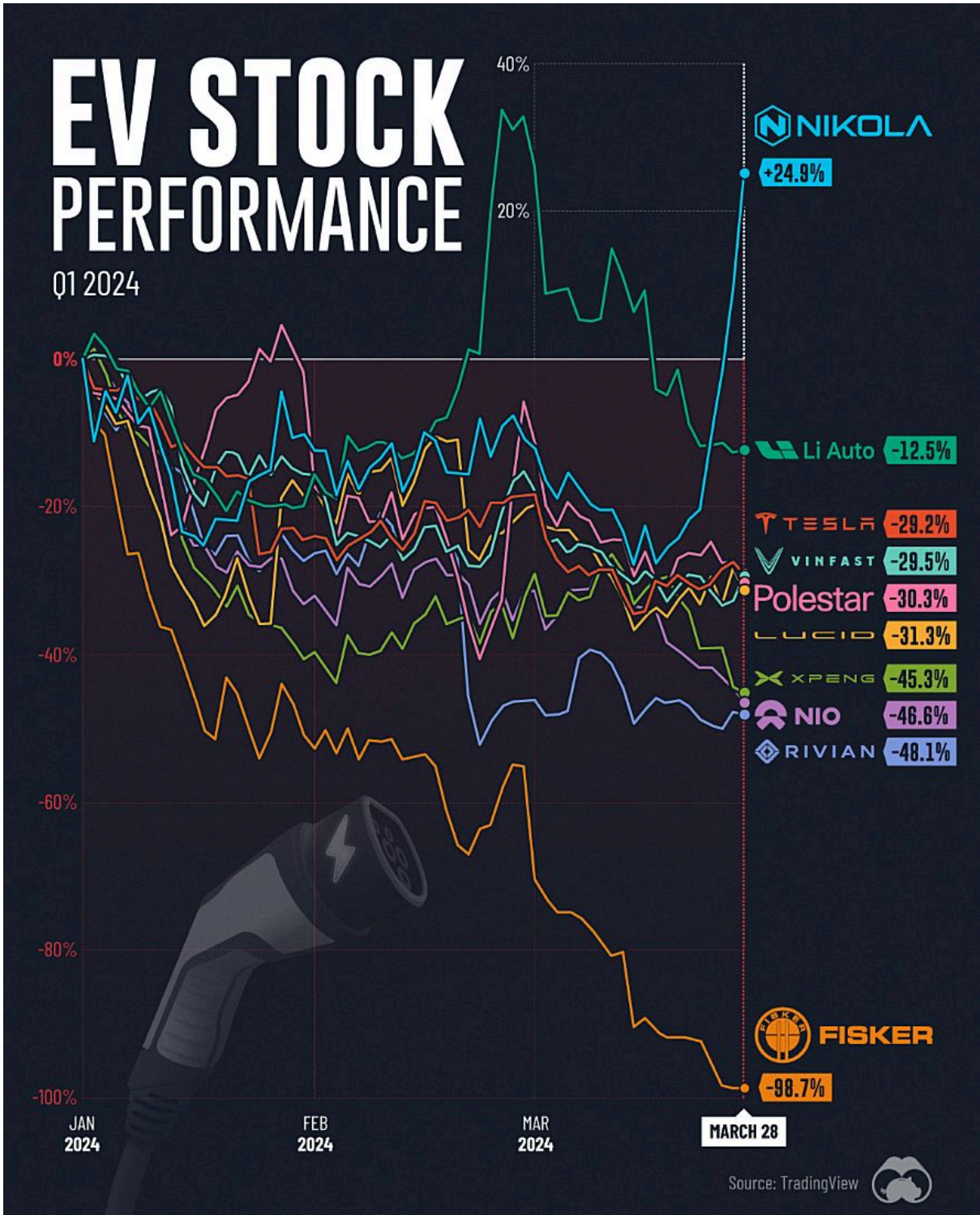
The US Electric Vehicle Trends

Despite the global slowdown, many US brands experienced high EV sector growth, with consumers flocking to lower prices and choosing higher battery ranges and better overall statistics, especially acceleration. Still, many current EV owners in the US expressed disappointment in the insufficient charging infrastructure, high cost of ownership, and limited travel distance, with 46% of drivers claiming they would go back to the combustion engine vehicles in the future and 29% of EV users dissatisfied globally.



Tesla, which for years dominated the US market, reported disappointing sales for 2024, failing to release the new, more affordable models it promised. Investors were also weary of Tesla letting go >10% of its staff, scaling down the charging stations plans, and other Elon Musk controversies like his record \$56 billion payout. However, despite all the poor sales and bad press, Tesla stock held surprisingly steady, and shareholders largely voted in favor of the record pay package, a vote of confidence for Musk's long-term Tesla plans that bring the EVs into the energy, edge computing, and AI training markets.

However, the global EV stocks slowed significantly, giving way to the AI boom, and investors carefully analyzed the new model pipelines, real production capacity, and companies' guidance on future sales.



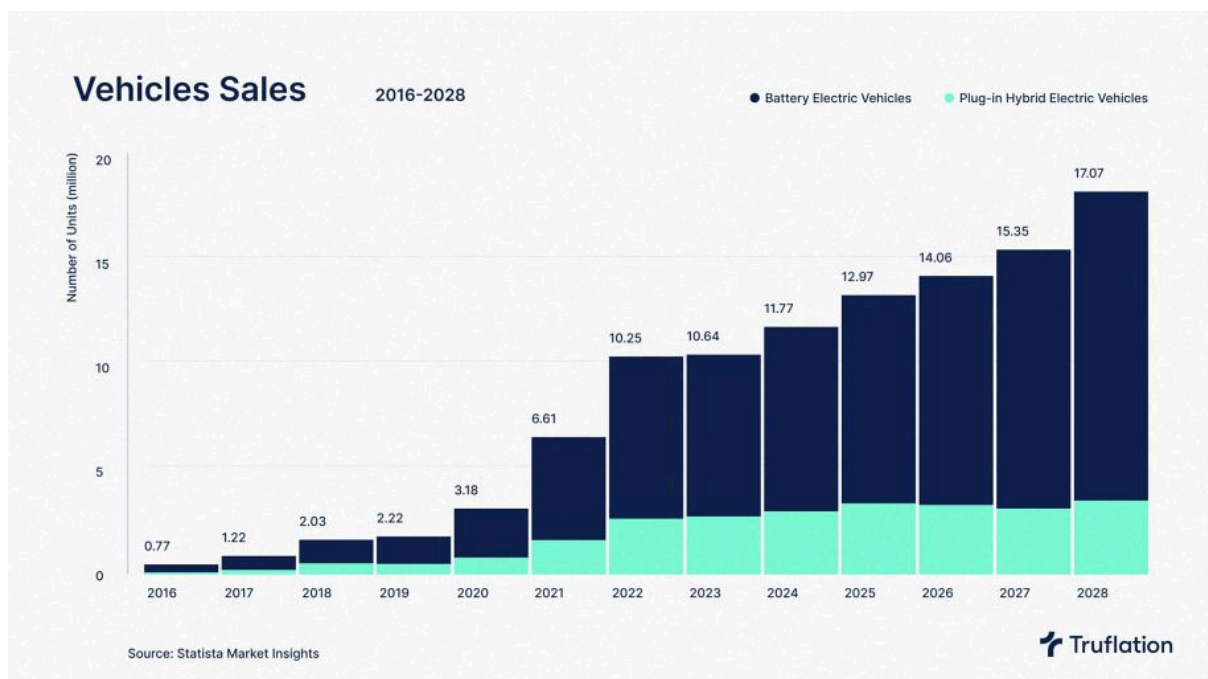
On the US-China front, the trade wars of the Trump era introduced more aggressive 100% tariffs on all goods from China, while the Biden administration opted for a more targeted approach around saving jobs and national security narrative. The Chips and Science Act of 2022 and new tariffs covered many industries related to EVs, including semiconductor chips, batteries, metal, and rare

earth metal commodities, aiming to make the US less dependent on China's production and commodities. The US also imposed more tariffs on the Chinese EVs in hopes of saving their domestic production and moving some of the car manufacturing back to the US.

Another element of why governments took a more active role in regulating the market could be the data collection and AI training using the EVs related to national security for the US and China. It was perhaps why Elon Musk, whose hope is to use Tesla to train new AI models, urgently traveled to China in Q2 of 2024 to assure the Chinese government that all data collected by Tesla would continue to be stored and processed in China.

Future Electric Vehicle Trends

Despite the 2024 bust, the electric vehicle market is still expected to grow, especially as the new emissions target takes effect in 2025. We can expect the return of some subsidies and moves to secure domestic production.



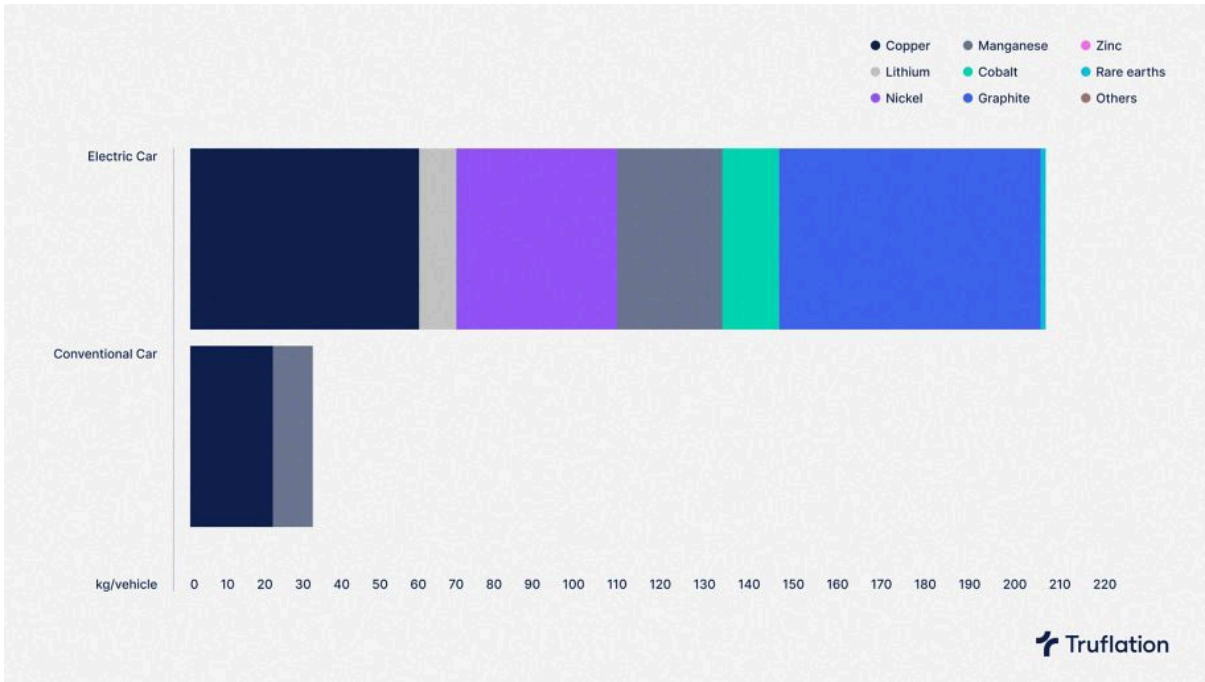
The outlook for the whole EV industry has become even more interesting after the Tesla Q1 2024 shareholder call, where Elon Musk painted a wider role for EVs, related to the latest technology boom in the AI, energy, and computing sectors.

EV charging and supercharging stations have long been hoped to become the main electrical grid stabilizer, with EVs considered mobile batteries that can store excess energy during overflow and sell excess energy during peak hours to prevent blackouts. Now, EVs that come with computer chips could also be used for edge computing as part of the wider cloud of electronic devices. The extra energy and computing power of EVs could be interesting if the AI training models prove to be as energy- and compute power-hungry as analysts expect them to be. The EVs could also collect and train new geo-location AI models on real location data, which is interesting for many industries and players, with implications for national security and warfare.

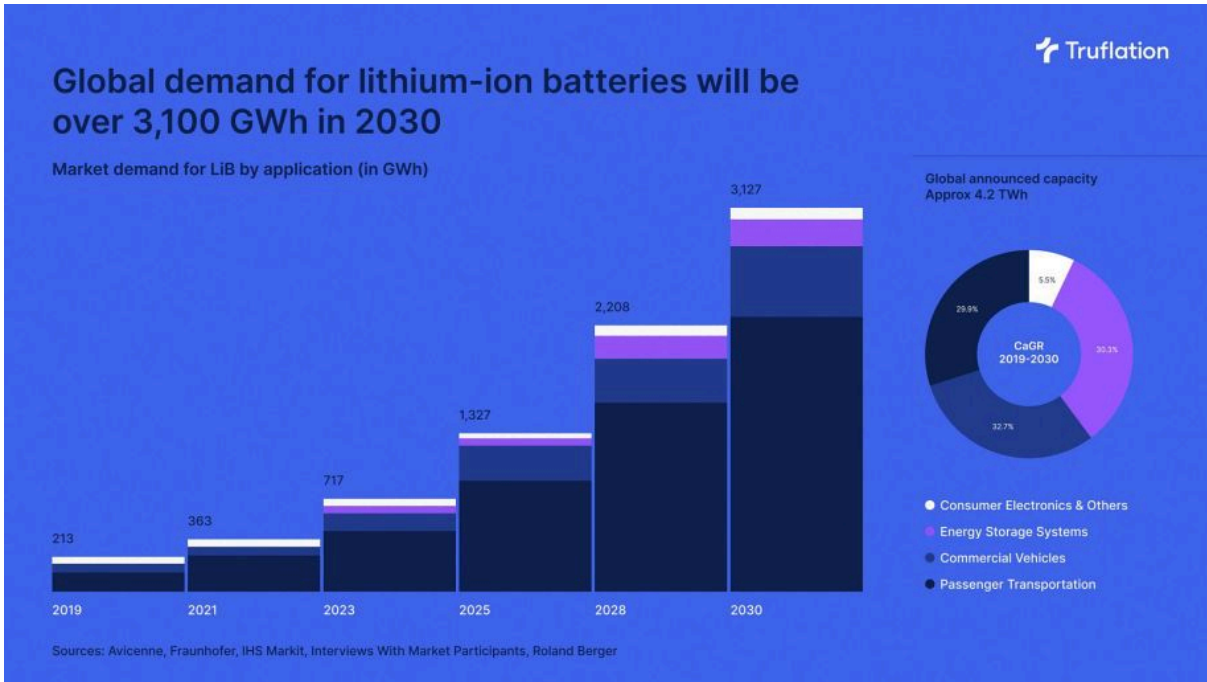
Electric Vehicle Commodities in EV Market Predictions

EV manufacturing requires a wider variety of metals than standard car manufacturing and some EV commodity prices can be used to predict the EV market.

Specific metal commodities are necessary for manufacturing batteries and semiconductor chips used in EV cars and electronics. Lithium-ion batteries, first developed for the computer industry, have now dominated the battery EV markets (BEV) and vice versa; the EV boom fueled an exponential demand growth for batteries and related metal commodities. This strong relationship with the electric vehicle sector growth is making some electrical vehicle commodities interesting market predictors.



The demand for the most popular Lithium-ion batteries continues to be strongly driven by the passenger electric vehicles market and, secondly, by commercial electric vehicles, with other industries claiming a much lower market share in the sector. Given how strongly the EV sector drives the demand for certain metal commodities, especially the passenger car battery EVs (BEVs), one could use the price movements of chosen metal commodities and futures contracts to gain invaluable insights into the market and the current EV manufacturing status, ahead of the EV quarterly sales.












To understand which electric vehicle commodities hold the key to the EV market predictions, one has to understand the underlying metal types and quantities required in EV battery production.

Lithium-ion battery manufacturing uses large amounts of metal minerals, which, depending on the type of battery, can include Lithium, Nickel, Cobalt, Manganese, Aluminum, Iron, and others. The most popular batteries with 59% BEV market share are the Li-NMC (Lithium Nickel Manganese Cobalt batteries), followed by LFP (Lithium Iron Phosphate) in 40% of BEVs, and Li-NCA (Lithium Nickel Aluminum batteries) in 7% of the new battery vehicles.

HOW BATTERY CHEMISTRIES DIFFER, BY MINERAL CONTENT FOR A 60KWH LITHIUM-ION BATTERY

The name of the battery chemistry typically indicates the composition of the cathode.

	NMC811 Nickel (80%) Manganese (10%) Cobalt (10%)	NMC523 Nickel (50%) Manganese (20%) Cobalt (30%)	NMC622 Nickel (60%) Manganese (20%) Cobalt (20%)	NCA+ Nickel Cobalt Aluminum Oxide	LFP Lithium iron phosphate
 LITHIUM	5KG	7KG	6KG	6KG	6KG
 COBALT	5KG	11KG	11KG	2KG	0KG
 NICKEL	39KG	28KG	32KG	43KG	0KG
 MANGANESE	5KG	16KG	10KG	0KG	0KG
 GRAPHITE	45KG	53KG	50KG	44KG	66KG
 ALUMINUM	30KG	35KG	33KG	30KG	44KG
 COPPER	20KG	20KG	19KG	17KG	26KG
 STEEL	20KG	20KG	19KG	17KG	26KG
 IRON	0KG	0KG	0KG	0KG	41KG

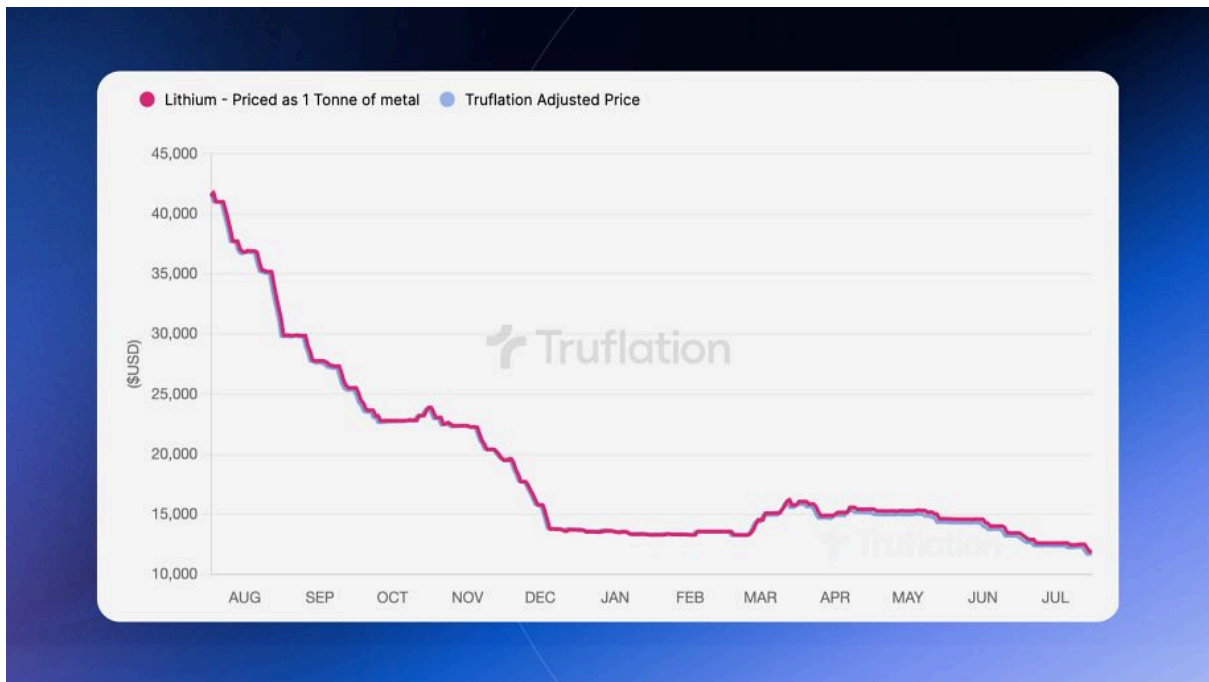
ELEMENTS 

Aluminum might also soon become the metal commodity that is more widely used across EVs, as Tesla is pioneering its gigacasting technology. Gigacasting, otherwise known as megacasting, uses huge presses to produce the EV underbody as single pieces by die-casting aluminum sheets. Tesla hopes to use gigacasting to produce much lighter EV models, which increases overall EV battery efficiency over traditional, heavy steel bodies. Gigacasting also keeps production costs down by requiring less aluminum, a metal commodity usually significantly more expensive than steel.

EV Market Predictions Example

To see electric vehicle commodities' potential in the EV market predictions, we can look at the prices of Lithium, the main component of Lithium-ion batteries. Lithium prices plummeted in the second quarter of 2023, months ahead of the lower EV sales reported in 2024. While the new EV sector growth at the end of

2023 was still riding the EV sales boom, EV manufacturing has already been winding down. Car manufacturers responded to the real-time EV market analytics by adjusting their electric vehicle supply chains and production pipelines, which were reflected in the EV commodities prices.



As Lithium prices are further decreasing in mid 2024, we could be looking at the continuous downtrend for EV manufacturing and the signs it is not bouncing back yet as all the negative market influences like inflation, geo-political uncertainty, and lower consumer spending remain in place.

An even more valuable way to understand the EV market trends would be to weight-adjust the electric vehicle commodity prices by their market share and actual levels used in the production of specific EVs. That's where the Truflation EV Index comes in, using electric vehicle commodities to make EV market predictions.

The Truflation EV Index

The Truflation EV index was designed to provide insights into EV market trends using EV economic indicators. By tracking specific EV commodity prices using real-time data and EV data analytics, the EV Index encompasses electric vehicle supply chain and manufacturing trends, with various implications for EV investment opportunities.



Truflation's EV Commodities Index tracks essential electric vehicle commodities, including Lithium, Cobalt, Nickel, Copper, Palladium, and Platinum used in manufacturing across four different electric vehicle types:

- Battery EVs (BEV)
- Hybrid EVs (HEV)
- Plug-in hybrid EVs (PHEV)
- Hydrogen Fuel Cell EVs (FCEV)

The EV Index weights the electric vehicle commodities by their metal intensity or how much is used in the production of different EV batteries and then further adjusts according to the EV market analysis of the sales data for each car type.



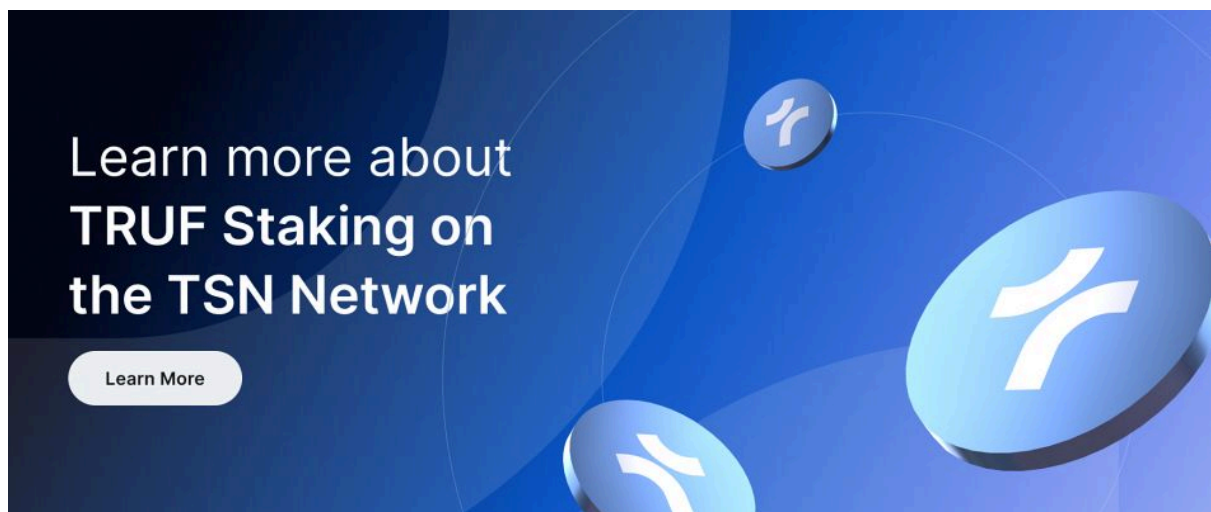
The weighting adjustments of the EV commodity prices offer unique insights to help investors better understand and predict future electric vehicle trends.

EV commodity prices are compiled from reputable market exchanges augmented with information from industry-leading sources, as well as direct data from EV manufacturers. This multi-layered, quality-first approach ensures a comprehensive view of the electric vehicle market.

As with all Truflation data services, the quality of data is a critical aspect of the methodology. The institutional-grade EV Commodities Index represents a meticulous and comprehensive approach to provide stakeholders with a reliable and insightful tool for understanding and navigating the complex dynamics of the electric vehicle market, with new AI electric vehicle prediction models coming soon.

The Truflation Stream Network

For those data analysts who also hold TRUF tokens, the new Truflation EV Index offers a unique opportunity to stake TRUF for a share in the EV Index sales revenues. Learn more about the TSN and TRUF staking opportunities on the [Truflation's Governance Portal](#). In the near future it will also be possible to trade the Truflation EV index.



Thank You

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