



MOBILITY

Global EV Policy: A Long Winding Road

What China is doing right and what the US and Europe fail to appreciate about a mobility revolution that could determine the whether Net Zero is achievable.

Global EV Policy: A Long Winding Road

The more I focus on Climate Infrastructure as the most important macro narrative of the next three decades, the more convinced I am of the enormity of the challenge and the scale of the investment opportunity. My excitement about the potential for impactful long-term capital allocations is tempered by the fact that the opportunities at hand are present because we, as investors, governments, consumers, and scientists, are so far behind the curve in achieving the goal of Net Zero. The amount of capital that needs to be deployed, the number of government subsidies, and the tax incentives that will be required will make the risk-adjusted opportunities across multiple economic sectors incredibly compelling.

Most 2030 targets for everything from the amount of renewable energy being deployed to the number of registered electric vehicles will miss by a wide margin, with the only outcome being that government support measures from tax breaks to loan guarantees will reach a scale not seen since the early days of COVID. This will evolve, but the overreliance on market mechanisms will migrate to further government support. The Inflation Reduction Act is a precursor to several decades of government support to achieve a more sustainable global economy.

This creates a remarkable set of investment opportunities. One of the high-profile areas for decarbonization is mobility, specifically the electrification of passenger and commercial vehicles. Hundreds of billions of dollars will be spent on battery supply chains, charging infrastructure, and the arms race between automakers who want to be a part of the \$3tn of annual sales. With renewable energy, mobility receives enormous regulatory support for consumers and the essential infrastructure. It is transforming the demand for copper, lithium, and the metals required to produce nearly 100 million cars and trucks by 2040. It is impossible to deny the scale of the task at hand steer mobility from combustion to electrification.

It won't be as straightforward as throwing money at the issue. A common expression in investing is that you should never allocate capital to anything with wheels. The reason for this is simple. The automotive industry has been a single-digit margin business for decades. Governments have underwritten national champion car makers since the Second World War, and automakers from Detroit and Munich have been bailed out multiple times. The transition from combustion engines to electric vehicles is an existential threat to the industry. Many car makers have struggled for profitability with a process they have been refining for 50 years. Outside of China, there is not a single EV producer that is profitable without the role of subsidies. Tesla is struggling as it hasn't produced a new model in five years. Is it any wonder that Germany and Italy have pushed back on banning the sale of combustion engines in 12 years when global automakers have no pathway to profitability?

For valid decarbonization reasons, governments are asking automakers worldwide to cease producing cars that are major contributors to greenhouse gas emissions. However, they cannot make these vehicles profitably. The debate around price parity is often seen as the defining issue for the broad-based adoption of electric vehicles in Europe and the United States. There are often numbers thrown around that say that at some stage in 2024 -2025, price parity will be met in the United States. The problem is the

"Chinese EV adoption will continue to exceed expectations, with 50% by 2030 well within reach."

profit margin. US automakers can produce a combustion engine and generate a mid-teens gross profit margin. Current EV pricing has the likes of Ford and GM losing between 10 and 30% per unit. That is not price parity. That's a ticket to bankruptcy, and hence the notion that government support for consumers and electric vehicle manufacturers will only grow over time.

This is before we consider the ever-growing geopolitical tensions over Chinese supply chains. The Inflation Reduction Act is embedded with a slew of local production mandates that require up to 70% of a vehicle to be produced in the United States. Subsidies won't apply to vehicles with foreign, aka Chinese, components. When 80% of battery fuel cells are produced in China, is it any wonder that Washington is determined to bring the battery supply chain back to the US? It will take a decade for the United States supply chain in batteries and other auto parts to achieve price competitiveness with what is currently available in Asia. Building out a local supply chain will only add to the cost of a vehicle in the near term, and even when subsidies are taken into account, the prospect of price parity with comparable profit margins seems highly unrealistic. The cost of lithium-ion batteries rose in 2022, and that is with effectively one, highly efficient Chinese supply chain. The prospect of an affordable mass-market range of EV products from US automakers appears to be a 2030 concept at the earliest.

China's EV dominance is without question. I completely understand why brilliant analysts like Tu Le and Lei Xing are convinced that Chinese EV companies like BYD will expand globally to fill the void left by the underperformance of US, EU, South Korean, and Japanese automakers, especially for affordable mass-market brands. Geopolitics will prevent this, which will be a major reason why EV adoption, especially in the United States, will lag expectations.

It is not inconceivable that the United States Congress bans TikTok. Yet expanding EV adoption in the US and Europe will require cheap Chinese imports without tariffs and Chinese battery manufacturing in the United States at a time when no strategically important Chinese company (ex Tik Tok) has a meaningful presence in the US. The contradiction between national security imperatives and the economic reality of EV adoption is stark. The CATL/Ford collaboration is an important test case for policy, and given US/China relations are at their lowest point in fifty years (yes, worse than 1989), how does anyone practically expect collaboration with state-sponsored firms such as CATL?

Chinese EV adoption will continue to exceed expectations, with 50% by 2030 well within reach. Success at home does not imply success abroad, even with superior, cost-effective brands. With a scalable, domestic LFP battery industry five to seven years away, US EV adoption rates will lag, and Chinese alternatives to fix the deficiencies of Detroit will not be politically palatable. The EU will not allow its domestic auto market to be gutted by Chinese imports, even if it helps to achieve environmental targets. Chinese EV sales in Asia will be robust but will struggle in the developed world. Despite an overwhelming product advantage, China's EV success will be regional.

Putting cost aside, charging infrastructure and range anxiety are two limiting factors that will prevent

broad-based adoption. Between the United States and Europe, they will have to install 2,000,000 EV charging stations per year to meet 33% adoption rates. EV adoption in large cities is lagging in the United States as the availability of free charging is incredibly limited. Electric vehicles are the domain of the affluent suburbs where home charging units can be readily available. Multifamily homes in urban centers have a dearth of infrastructure. The prospect of a median income earner finding one hour per day to charge their vehicle publicly will prevent wide adoption in high population density areas.

Range anxiety concerns the US consumer. Consumers do not have the product option to get 500 miles of range at an affordable price. This will hold back sales. Michigan has a target of 2 million registered EVs by 2030. Hard to see how this is possible. Innovation will come, but with nothing commercially available, the prospect of 2030 targets being met in the United States is slim.

Sales will struggle, but the infrastructure rollout will not. In short, you need to avoid investment in global auto manufacturers outside of China. However, the primary investment opportunity around electric vehicle adoption revolves around the build-out of electric charging stations and battery infrastructure. It is about the renewable energy that drives them, the software that regulates them, and the installation and services required for ongoing maintenance. This should be viewed through a similar lens to renewable energy installation, which is less about growth equity returns and more about yield and carry. This is where companies like Shell, Exxon, Total Energies, etc., should dominate. It seems like a natural extension that the current global gas station infrastructure should be converted into EV charging facilities. The growth equity opportunities exist in the slew of amazing venture-backed software providers that will be required for everything from maintenance to load management.

Larger still will be the development of the battery supply chain. From lithium extraction to recycling, hundreds of billions of dollars will be invested in researching new battery chemistries and localizing a circular supply chain. The growth equity component is the venture capital investments being done in remarkable innovators looking to solve the inherent issues of cost, range, speed of charging, and reliability. There's been a wave of money into battery recycling, driven by stringent EU laws and a realization of the structural underinvestment in mining essential minerals that will drive the electrification revolution. The geopolitical choke point, the Chinese dominance of batteries, is in its earliest stages of adjustment. The inflation reduction act will be one global policy designed to ensure that battery production can be done securely and locally to support the auto industries of the United States, the EU, Japan, and South Korea. Of all the verticals we cover at Climate Transformed, battery tech, and the battery supply chain have the potential to produce remarkable returns.

"The growth equity opportunities exist in the slew of amazing venture-backed software providers that will be required for everything from maintenance to load management."

China EV Policy

Ilaria Mazzocco is a senior fellow with the Trustee Chair in Chinese Business and Economics at the Center for Strategic and International Studies (CSIS).

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Tu Le is the Founder of Sino Auto Insights and the Co-Host of the China EVs & More Podcast.



CSIS



Summary

The China EVs and More Podcast Team join Climate Transformed for an update on Chinese EV policy as China's economy opens up for the first time in three years. We discussed the end of subsidies, domestic competition, and whether Tesla's problems are as pervasive as many think.

Watch the full discussion [here](#).

Key takeaways

- China is currently dominating the global EV industry.
- In 2022, nearly 10 million or two-thirds of global sales of Battery Electric Vehicles (BEVs) were registered in China. China has been leading the EV market since 2015, except for 2021, when Europe took the lead. China aimed to have a 25% penetration of New Energy Vehicles (NEV) by 2025, but they achieved this target three years ahead of time, as the penetration in 2022 was close to 26%. They have set a target to achieve 50% NEV penetration by 2030. These goals are based on the current trajectory, but China might achieve 40% penetration in 2023
- Tesla faces sizable headwinds in China as a lack of new products is seeing sales lag and prices cut. BYD is dominating.
- One of the pivotal moments in the last three years of the pandemic was the Wuling Hongguang launching mini EVs that cost around \$5000. During the pandemic, consumers required personal vehicles to move around, and a mini EV was the perfect vehicle for many. This shows the importance of LFP batteries as a pathway for global profitability. Reputable automakers, including Japanese, German, and American, can not make affordable and profitable vehicles without Lithium Ferrophosphate (LFP) chemistry. Currently, China is the only country dominating the LFPs. If President Biden wants an earlier EV transition, a CATL plant must be opened in the US.
- Chinese charging infrastructure is extensive, but it is a constant concern for Chinese policymakers because the sales consistently outstripped the charging capacity. China has focused on the standardization of chargers. Charging infrastructure has been an important factor driven by the number of EV sales, and we will continue to see policies aiming to expand this.

Paul's observations

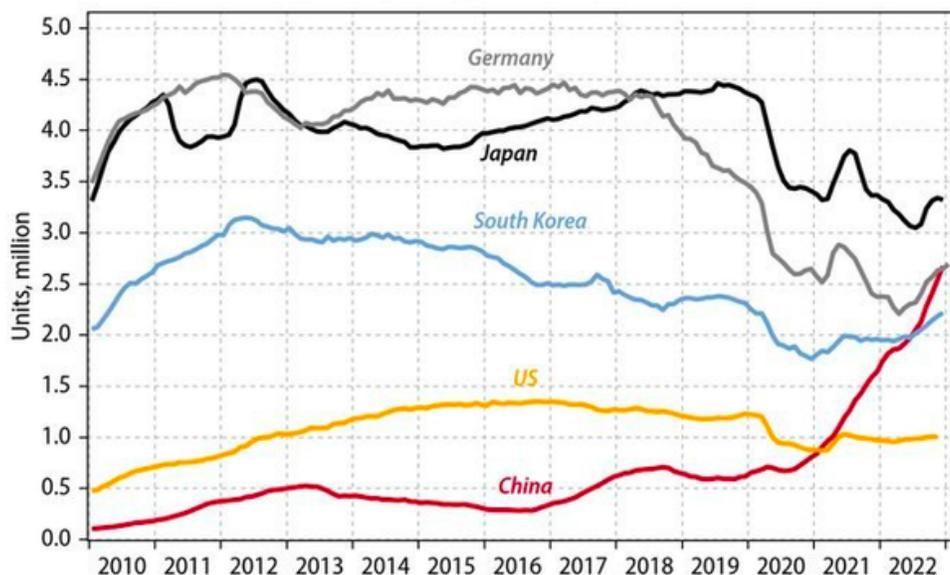
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Chinese EV adoption will continue to exceed expectations, with 50% by 2030 well within reach. Success at home does not imply success abroad, even with superior and cost-effective brands. With a scalable, domestic LFP battery industry five to seven years away, US EV adoption rates will lag, and Chinese alternatives to fix the deficiencies of Detroit will not be politically palatable. The EU will not allow its domestic auto market to be gutted by Chinese imports, even if it helps to achieve environmental targets. Chinese EV sales in Asia will be robust but will struggle in the developed world. Despite an overwhelming product advantage, China's EV success will be regional.

"Chinese EV adoption will continue to exceed expectations, with 50% by 2030 well within reach."

Exports of passenger cars



Source: Gavekal Research

Questions & Answers

The current state of the electric vehicle industry in China

Lei Xing:

China is currently dominating and leading the EV industry.

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Ford Motor has announced a collaboration with CATL to develop a new battery plant for EVs. China's battery dominance is without question.

The Executive Vice President of the European Commission, Frans Timmermans, stated that by the end of this year, China would bring 80 EV models of to the international market.

Is China's EV dominance driven by policy or consumer choice?

Ilaria Mazzocco:

There were central policies to start the EV revolution in China. Recently, consumer choice has become more important, but governmental interest has been consistent throughout. About a decade ago, EVs were just a curiosity, and China was lagging while the US had companies like Tesla.

If policy evolution is traced, it can be noticed that there was support for research and development in China around 2010, and the government provided incentive policies to promote the adoption of EVs in public transit. In 2010, a small program was initiated to encourage consumers to buy EVs.

Previously EV adoption was overlooked, but their sales started growing by 2015, and Beijing stepped in to decentralize policies. These policies grasped the interest of big companies, and consumer interests were also taken into consideration. As the central government got involved, the EV industry started requiring sophisticated thresholds to qualify for subsidies, which was important to get companies to invest in higher quality vehicles with better batteries that consumers would want to buy. That shifted the trend from public EVs to personal ones.

From 2015 onward, Chinese policies evolved from the subsidy program to the dual credit systems, which have been in place since 2019, and the subsidies declined significantly. China EVs are thriving.

Did Elon Musk get lucky, or did Tesla play a role in the broad-based adoption of EVs?

Tu Le:

The Chinese government played a major role in establishing Tesla. Tesla entered China in 2014 by importing vehicles. The first Tesla retail store was in Beijing's Parkview Green.

The Chinese government brings in foreign companies to build up its sectors. Therefore, Tesla was brought to China and given developmental opportunities by the local and central governments to build the Shanghai gigafactory, which started shipping EVs in less than a year.

China's acceleration in EV sales was stimulated by COVID, the Shanghai gigafactory delivering vehicles to the local markets, and EV adoption. However, Tesla must be credited for being a major catalyst in building the EV sector in China.

The dominance of local brands

Lei Xing:

The project "Ten cities, one thousand vehicles" was extended to 25 cities three years after it started. By then, 19,000 EVs had been adopted annually, most of which were in the public transit sector. With EV companies like Li Auto, this number has grown to around 20,000 a month.

One of the pivotal moments in the last three years of the pandemic was the Wuling Hongguang launching mini EVs that cost around \$5000. During the pandemic, consumers required personal vehicles to move around, and a mini EV was the perfect vehicle for many.

Chinese EV brands such as Nio, Li Auto, and Wuling Hongguang have offered affordable products and accelerated the EV revolution in China.

Ilaria Mazzocco:

Some of the Chinese EV brands can grow at a global scale, but that will not be easy. Europe can be the first big western market China will enter. Young EV companies might face the challenges of dealing with regulations in Europe. Currently, the number of exports from China to Europe is high, but most are non-Chinese brands, such as Tesla. Companies must be responsive and deliver great customer service after entering a new market. In addition, China's political relationships with the host countries will also impact export. It would be interesting to see how they respond to the challenges in the European market.

How can China overcome the political hurdles to sell EVs in Europe and the US?

Ilaria Mazzocco:

Some Chinese brands, such as Polestar, already sell cars in the US. The opening of the CATL factory has also been announced, but policies might alter its implementation.

Regarding efficient batteries, there are no other options than using Chinese LFPs, so Ford has to incorporate CATL's batteries.

Tu Le:

Reputable automakers, including Japanese, German, and American, can not make affordable and profitable vehicles without Lithium Ferrophosphate (LFP) chemistry. Currently, China is the only country dominating the LFPs. President Biden encouraged local production of the battery materials to cut reliance on China for that. Chinese LFPs will be existential for automakers like Ford to enable them to build affordable EVs because automotive companies are struggling with sales worldwide. CATL batteries

inside the vehicles must get credit to make Ford eligible for subsidies. This will open the door for other similar deals. CATL plant must be opened in the US if President Biden wants an earlier EV transition.

Lei Xing:

China can not be ignored when it comes to EVs. CATL is acting as a technology licensing partnership. So, affordable EVs can not be manufactured without Chinese batteries.

US Subsidies

Tu Le:

BYD and Tesla grow up on subsidies. There were years when BYD would generate revenue of almost \$1 billion in China due to the offered sales subsidies. The current challenge faced by the US is that they are not moving at a fast pace, and with that speed, they can not compete with China.

Assuming no tariff on Chinese imports, China may build EV plants in the greenfields and brownfields in North America. They might build them in Canada or Mexico and not in the US.

Lei Xing:

China had its own Inflation Reduction Act many years ago. They published white lists that required EVs to have Chinese battery cells, which led to the formation of companies like CATL.

Ilaria Mazzocco:

Washington is focusing a lot on subsidies and tax credits and overlooking other kinds of support that can be provided to EV companies. China has many battery manufacturers, and CATL is one of them. In contrast, the US does not have a scalable battery manufacturing industry, so this space needs sizable investment.

European policies to encourage EV production

Tu Le:

Automakers need to build authority over their brand to generate more sales. Tesla quickly built trust with consumers and became Germany's best EV brand. The challenge faced by the US and Europe is that they have banned the sales of internal combustion engine vehicles from 2035. They will not have enough EVs by then and will have to acquire Chinese EVs to meet the demand. By 2035, 75% of the vehicles in the US and Europe will be EVs, creating volatility in battery rare earth metal prices. Europe will require non-European automakers to achieve their near-term goals.

Ilaria Mazzocco:

The European Union has made green energy policies much more efficient than the US; for instance, they have been making battery alliances for years. Meanwhile, the US has now started discovering these tools. A lot of legacy companies are producing EVs in China and exporting them to Europe.

Chinese EV brands in Europe

Lei Xing:

Chinese EV brands, such as BYD and Nio, have been selling EVs in the US for years, but it will be their first time to sell in Europe.

Tu Le:

At least three of the Chinese EV companies are US publically traded. Li Auto has not been vocal about becoming a global company, and XPeng faced operational challenges in 2022. Despite challenges, Nio went into global markets like Germany and Norway.

How important is the Chinese charging infrastructure, and what can the US learn from them?

Ilaria Mazzocco:

Chinese charging infrastructure is extensive, but it is a constant concern for Chinese policymakers because the sales consistently outstripped the charging capacity. They have tried involving local government and developing private-public partnerships to build charging infrastructure. China has also focused on the standardization of chargers. Charging infrastructure has been an important factor driven by the number of EV sales, and we will continue to see policies aiming to expand this.

China is probably the only country where battery swapping has begun. So, they are focusing on multiple solutions to meet the charging requirements.

Lei Xing:

Chinese policy documents have started mentioning the term 'Charging, Swapping Infrastructure.' Foreign companies can adopt swapping options as well.

Tu Le:

Swapping might be economically more viable in China as most cities have a population of over 1 million. Whereas, in the EU, there might be a few hundred EV uses per city, making swapping less viable economically. China has enough EV superchargers, but they need to expand the current infrastructure into other cities by investing more in this space.

US EV Policy: Inflation Reduction Act

Tyson Jominy is the Vice President of Data & Analytics of JD Power where he advises OEMs on pricing and incentives for new and used car sales.

Richard Ezike is a Program Communications Specialist at the Joint Office of Energy and Transportation.

Ed Carson is a news editor at Investor's Business Daily, where he oversees business news coverage.



J.D. POWER



Joint Office of
Energy and
Transportation



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Summary

Excitement about the IRA is all-encompassing, and while electric vehicle infrastructure proposals are impressive, how quickly will this boost adoption? Subsidies help, but with charging infrastructure lagging every other developed country and cost parity many years away, is US EV adoption destined to lag?

Watch the full discussion [here](#).

Key takeaways

- According to the early data from 2023, EV policies are positively impacting Plug-ins Electric Vehicles (PEV) and EVs in general. Battery Electric Vehicle (BEV) were 8.8% of US sales in January 2023, reflecting an acceleration in the revolution of the EV, and the Inflation Reduction Act has been a contributing factor to this change.
- Automakers such as Mercedes and BMW have signaled about bringing their EV SUV production to the US. The US had two administrations in a row encouraging local manufacturing. The auto industry is getting an idea about the seriousness of the US regarding onshoring the supply chain and assembly of vehicles, particularly in the battery and EV space.
- Charging infrastructure is holding back EV adoption. According to JD Power, 80% of charging is done at home. This requires consumers to have off-street parking, a garage, and the ability to install high-speed chargers at homes. So, getting access to chargers can be challenging for people living in apartments. The US needs to find a way to enable EV charging for consumers living in urban areas.
- The lack of charging infrastructure, especially on the highway system, has forced OEMs to produce vehicles with larger battery packs that are more expensive. Cost parity is crucial for adoption, and we are years from that happening. Better charging infrastructure is essential for broader adoption.
- Subsidies will help and the IRA is littered with them. The Biden administration announced the new Charging and Fueling Infrastructure (CFI) Discretionary Grant Program of \$2.5 billion, \$700 million of which has been released for application. Final rules regarding the standardization of chargers have also been announced.

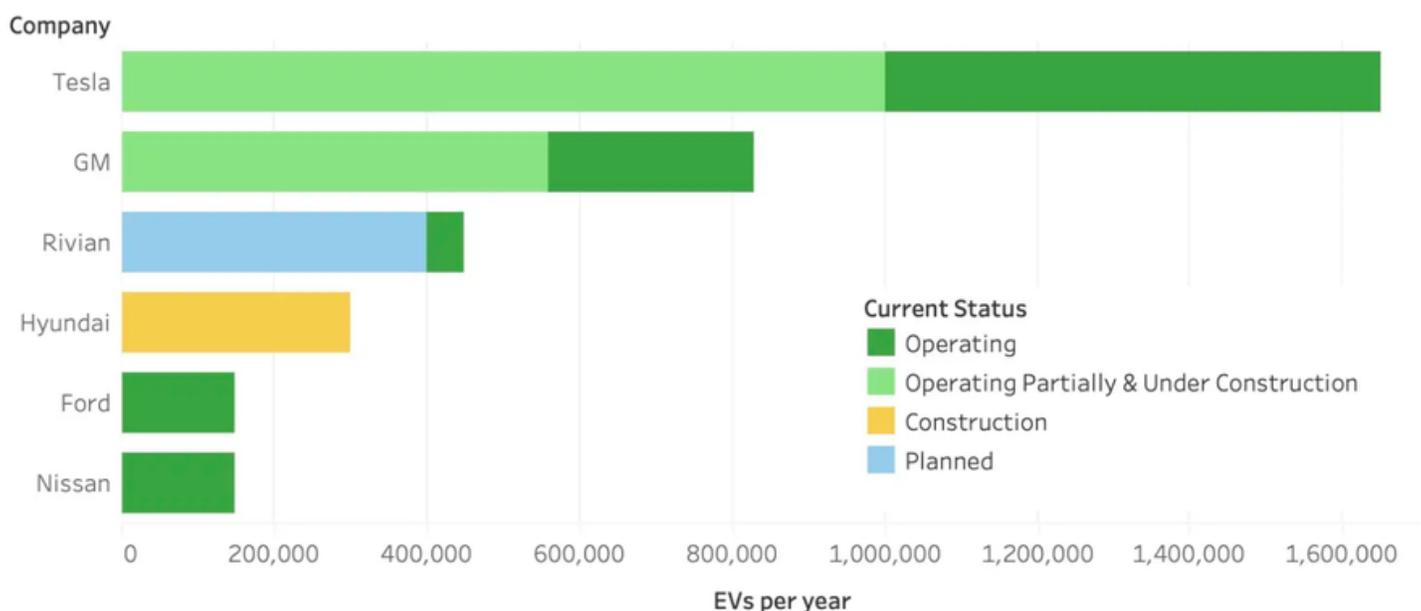
Paul's observations

We all are aware of the benefits of the Inflation Reduction Act (IRA). Subsidies of new EVs are essential in kick-starting adoption that remains below 10% in the US. Price remains the top limiting factor to EV sales, and frankly, it is tough to see how we will achieve price parity any time soon. Improved charging infrastructure will help as the market needs cheaper models with smaller batteries to increase urban adoption where charging is difficult. While battery manufacturing onshoring is actively encouraged, stringent local content rules in the IRA mean that Ford and GM may struggle to get the subsidies offered. We are 5 to 7 years away from the United States having a strong battery infrastructure, so for the rest of this decade, US automakers, with the possible exception of Tesla (which has its own China problems), will struggle for profits.

US auto manufacturers are forced to produce EVs, where profitability is a distant prospect. Even with subsidies that will be a round for years to come, the prospect of healthy profit margins for EVs when batteries will need to continue to be imported from China for most of this decade is negligible. There is a saying amongst investors to never invest in something with wheels. Global automakers, ex-China, will burn cash for years to come. Invest in charging infrastructure which will be heavily supported by policy. Never lose sight that auto manufacturing is a single-digit margin business after 100 years of building combustion engines. It will be much worse for EVs.

"Even with subsidies that will be a round for years to come, the prospect of healthy profit margins for EVs when batteries will need to continue to be imported from China for most of this decade is negligible."

Projected US EV Manufacturing Capacity by 2030



Source: CleanTechnica

Questions & Answers

Are EV policies in the US already creating an impact?

Tyson Jominy:

According to the early data from 2023, EV policies are positively impacting Plug-ins Electric Vehicles (PEV) and EVs in general. Battery Electric Vehicle (BEV) were 8.8% of US sales in January 2023, reflecting an acceleration in the revolution of the EV, and the Inflation Reduction Act has been a contributing factor to this change.

Tesla v other EV companies

Tyson Jominy:

EV companies, in general, are performing well but Tesla is dominating the US market. About two-thirds of Tesla's portfolio is eligible for IRA funding even under stringent parts of the code. GM is also one of the biggest beneficiaries since they were also capped out previously from any Federal Tax Credit.

Complexity around rulings on batteries by IRS

Tyson Jominy:

Section 45W of the IRS pertains to commercial leasing. This part of the code has fewer requirements making it easier for companies to get approved. Meanwhile, Code 30D has far more stringent requirements, such as final assembly in America or rulings related to income. Part of Code 30D, regarding critical minerals and the supply chain elements of the battery materials, is approved but not implemented. These rulings have been relaxed but can be changed anytime and implemented, making it difficult for anyone to qualify.

Will commercial leasing undermine the efforts to produce EVs in the US?

Tyson Jominy:

The IRA aimed at accomplishing a lot of goals, including EV adoption in general, localizing the supply chain, and income redistribution. The element of leasing vehicles will help in accomplishing EV adoption. With more EV sales, their price will eventually drop.

How will the IRA's credits for used EVs play out?

Tyson Jominy:

The IRA's Code 25E deals with used EVs and offers a rebate of up to \$4000 on any used EV below \$25,000. This part of the provision will have implications for new vehicle sales as well as for used EVs. This code has the ability to adjust the prices of EVs, making their adoption feasible.

A vehicle is applicable to the used EV credit only for the first time it is sold as a used vehicle.

Leasing programs playing into the used car market

Tyson Jominy:

Eventually, every vehicle will get to \$25,000 with varying lease periods depending on the model of the vehicle. For instance, Ford F-150 Lightning might cost \$80,000, but the lease period can increase from 3 years to 4 or 5 years for it to be available initially at \$25,000. So, the leasing program will impact the way of marketing and selling the new cars as well.

Are US policies having an impact on the global automotive industry?

Tyson Jominy:

Automakers such as Mercedes and BMW have signaled about bringing their EV SUV production to the US. The US had two administrations in a row encouraging local manufacturing. The auto industry is getting an idea about the seriousness of the US regarding onshoring the supply chain and assembly of vehicles, particularly in the battery and EV space.

The state of EV charging

Tyson Jominy:

The current EV charging infrastructure requires growth and improvements. Tesla has set the standard for charging in terms of quality and location, enabling drivers to drive without much concern. In contrast, non-Tesla drivers have to carefully plan their road trips due to the unavailability of superchargers. The US has focused on incentives, selling new vehicles, and the transaction price. As a result, automakers have designed EVs for big battery packs to solve charging infrastructure problems, making vehicles in the US much more expensive compared to the other markets. Policies should focus on improving the charging infrastructure, which will lead to a price reduction. It would be feasible for consumers if EV Superchargers were installed every 50 miles on the interstate. There is a need to sell cheaper vehicles with smaller battery packs.

The US needs to build charging infrastructure on highways. According to JD Power's research, over 80% of charging is done at home. This requires consumers to have off-street parking, a garage, and the ability to install high-speed chargers at homes. So, getting access to chargers can be challenging for people living in apartments. The US needs to find a way to enable EV charging for consumers living in urban areas. The automakers are designing EVs with bigger battery packs for longer road trips.

The quality of third-party charging stations

Tyson Jominy:

If the government does not ensure the proper working of chargers, the market will find a solution. The US needs to build an efficient infrastructure to meet the needs of the growing EV market. The malfunctioning

of chargers is a serious challenge that needs to be solved either by the government or the companies.

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What is the suitable place to install EV chargers?

Tyson Jominy:

EV chargers should be installed at major exist every 40 to 50 miles. Charging issues can be solved fast if companies like Starbucks and Panera team up and install chargers every 50 miles. EV chargers must be located where consumers can spend time comfortably. Currently, most EV chargers are not even covered; if prolonged, such conditions will make EV adoption harder.

How can the automotive industry provide fast charging solutions?

Tyson Jominy:

High-speed chargers are not required everywhere, particularly in urban settings. These chargers are needed to be installed at the fringe of cities. Cheaper and diversified infrastructure can fulfill the purpose in urban areas where high-speed charging is not required. Almost 80% of EV consumers are using Level 2 chargers at home. EVs can potentially provide more range than an ICEV, so fast charging is not a requirement everywhere.

Installation of 7,500 superchargers by Tesla for non-Tesla users

Tyson Jominy:

Tesla could have installed more superchargers because its greatest strength is the charging network. Many competitors may offer performance and better features in their models, but the charging network remains a plus point for Tesla.

Can charging-related issues be solved with Plug-in Hybrid Electric Vehicles (PHEVs)?

Tyson Jominy:

PHEVs can be great for solving the concerns of consumers regarding charging. Their maintenance costs are lower, and they are ideal for American driving styles. However, the market has voted for Tesla stock, which has changed the emphasis on PHEVs, and now less capital goes into this space.

What is the Plug-in Hybrid electric vehicle (PHEV) credit?

Tyson Jominy:

PHEV credit is based on the battery size and could be up to \$7,500 as well. Most of the purchasers may be eligible to claim a credit between \$6,500 to \$7,500. Most of the plug-ins have a minimum range of 20 miles, and going to 40 miles will require bigger batteries, making consumers eligible for the full credit. Therefore, most consumers should be able to qualify for PHEV credit.

How can policies impact the acquisition of battery materials?

Tyson Jominy:

The US will be getting lithium-ion batteries from the cheapest and easiest sources first. Bringing lithium-ion production online will take 5 to 8 years. However, in case of a continuous requirement for lithium, the US will move toward expensive mines.

The US is committed to bringing more of the supply chain of critical minerals and metals locally as much as possible because local manufacturing will be challenging in case of the absence of lithium and cobalt mines.

What do automakers expect regarding battery prices?

Tyson Jominy:

Automakers are hoping to find battery material mines locally. There is a possibility of change in technology and a shift toward alternatives, such as sodium batteries. Greenfield EV assembly plants are being built in the US that will make the auto industry more efficient at building EVs and assembling batteries, leading to a reduction in the cost of critical metals.

China and Europe are ahead of the US in EV adoption. Will the IRA close the gap?

Tyson Jominy:

The US is slower at EV adoption due to the cost factor. The median price for EVs is \$55,000. The US is moving at the right pace; however, the market for EVs will remain smaller until cheaper vehicles are offered. Policies must focus on building infrastructure for EVs for their mass adoption.

How can private and government sectors finance the BEV adoption?

Tyson Jominy:

Automakers can push forward EV adoption by building diversified segments and body styles. There is a lot of space for automotive marketing as some segments in the industry are completely untouched by electrification. The level of EV demand is enough so far, and we need to provide a better infrastructure for a better consumer experience. Consumers might not acquire EVs motivated by the mission, but they surely want them for their cost and related benefits.

How can automakers brand their charging services?

Tyson Jominy:

Automakers could offer charging incentives to EV owners for going with a certain brand and getting a discounted rate. Currently, Tesla and "the rest" are the two standards for charging, and developing a third one would be difficult and inefficient. Branding EV charging would have been applicable a decade ago for the early movers in the industry, but now new supercharger solutions are not required.

Important announcements by the Biden-Harris Administration regarding EV chargers

Richard Ezike:

The Biden-Harris Administration announced the opening of Tesla superchargers, new rules regarding *The Build America Buy America Act*, and funding opportunities from the Joint Office and Vehicle Technologies Office.

Additionally, the administration announced the new Charging and Fueling Infrastructure (CFI) Discretionary Grant Program of \$2.5 billion, \$700 million of which has been released for application. Final rules regarding the standardization of chargers have also been announced.

How will the funding of \$7.5 billion in the infrastructure bill fulfill the need for EV chargers?

Richard Ezike:

Over the next 5 years, this finance will be invested in EV superchargers and related areas, such as education, to develop a charging infrastructure.

\$1.5 billion has already been dispersed in the last fiscal year, and the rest of them will be funded between 2024 to 2026. Funding of \$2.5 billion has been announced through the CFI Discretionary Grant Program, \$700 million of which has been released for application. We will soon begin to see how these funds are seeded.

EU EV Policy

Giacomo Rossi is Principal Consultant at Frost & Sullivan, a global management consulting and market intelligence company.

Dr. Julia Hildermeier is an electro-mobility and transport expert at Regulatory Assistance Project (RAP).

Joost Vantomme is the CEO of ERTICO and a member of the Board and Vice President of the Mobility as a Service (MaaS) Alliance.

Martin Kahl is an independent writer, researcher, and consultant specializing in automotive and future mobility.



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Summary

Conventional wisdom has the EU as the global leader in EV adoption, ex China. A supported domestic policy framework has been key to this, but the US Inflation Reduction Act has swamped Europe's efforts. Does European EV policy risk being relegated?

Watch the full discussion [here](#).

Key Takeaways:

- European EV adoption continues to lag behind policy goals. Last year, Europe registered about 1.6 million EVs across all 27 countries. To match the 2040 EV goals, however, it would take 40 million EVs each year. Europe has 560,000 public charging stations, but we need 800,000 public stations installed each year up to 2030 to support sufficient market growth. This would provide 6.8 million public charging stations by 2030. Moreover, if EV purchasers continue at the current pace, 37% of vehicles will be EVs by 2030. However, 55% of vehicles must be EVs to meet the new EU targets.
- Policy remains incredibly supportive but execution is struggling.
- Many drivers like EVs but do not want to wait while the EV is charged. This means that the power of charging points becomes critical to EV uptake. Also, public charging infrastructure does not adequately cover the road network. Thirty-five percent of our survey interviews commented on the inconvenience of charging compared to refueling with petrol. A further 28% commented on the inability to charge the vehicle publicly or at work.
- National grid plans need to be ready for the EVs that will be connected in 5, 10, and 15 years. Network planning has very long timeframes, and significant investment and time are required to prepare for trucks that will need mid-high voltage infrastructure. EU member states must set out their plans, including where public infrastructure must be deployed.
- Battery recycling regulations are strong but local battery production remains a distant concept. The EU remains overly dependent on the Asia battery supply chain.

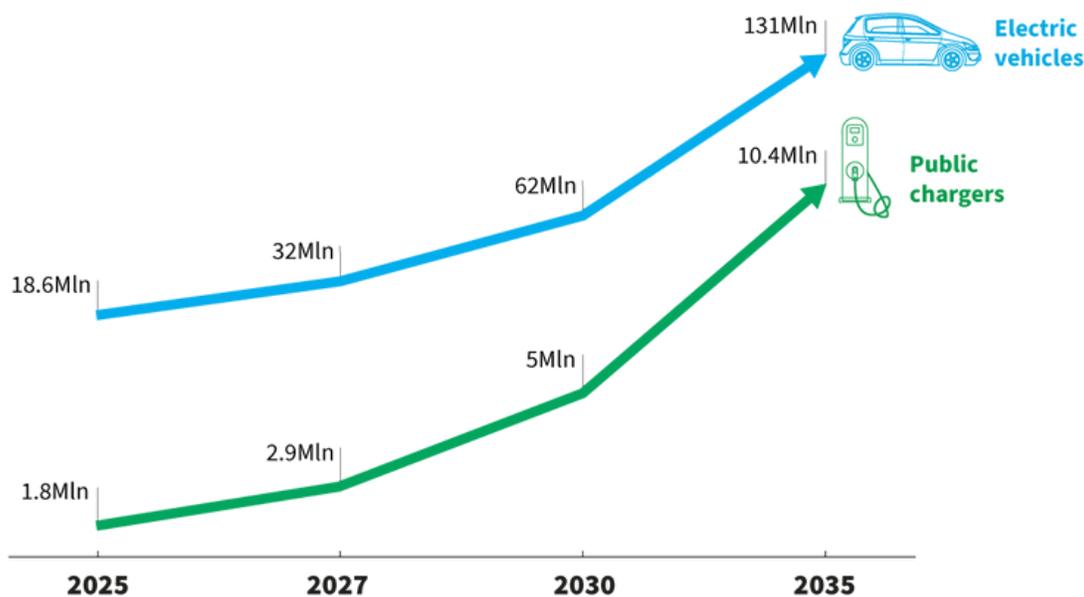
Paul's observations

The more I dive into global EV policy, the more convinced I am that adoption rates outside of China will continue to lag. While not as bad as in the US, EU charging infrastructure is deficient in terms of scale and the speed of public charging will hold back adoption. When 35% of consumers find public charging inconvenient and 28% reported that they cannot charge at work or home, adoption rates will be slow. Most median income earners do not have the time to wait 60 minutes to charge a vehicle publicly and until it becomes more convenient to charge, the adoption rate will struggle to keep pace with the EU's target of 55% by 2030. Connection to the national grid system is also vital, especially for commercial transportation. Smart charging networks are essential to ensure smooth load sharing as adoption rates rise. This is a software solution and a slew of VC start-ups are working to solve this issue. However, at its core, this revolves around the continued expansion of renewable networks, which will take time.

Despite the perception that the EU is ahead of the US regarding EV policy and adoption, they face many of the same limiting factors holding back the US. Consumers would like an EV but it remains incredibly inconvenient if you don't have the luxury of home charging. EU OEMs are as behind the curve as Detroit and while the EU will not have the geopolitical concerns of importing Chinese EVs that Washington will have, they too remain overly dependent on the Chinese supply of batteries and cheaper vehicle ranges. EU policy targets will be difficult to meet given the current infrastructure.

"When 35% of consumers find public charging inconvenient and 28% reported that they cannot charge at work or home, adoption rates will be slow."

Number of public chargers vs. number of EVs (EU-27)



Source: CleanTechnica

Questions & Answers

An overview of trends in the EV market in Europe

Giacomo Rossi:

We know that electrification is a reality, but considering the ambitious targets, it requires customer alignment to continue the rapid growth. Last year, Europe registered about 1.6 million EVs across all 27 countries. To match the 2040 EV goals, however, it would take 40 million EVs each year.

Infrastructure development is critical to EV market growth. Europe has 560,000 public charging stations, but we need 800,000 public stations installed each year up to 2030 to support sufficient market growth. This would provide 6.8 million public charging stations by 2030. Moreover, if EV purchasers continue at the current pace, 37% of vehicles will be EVs by 2030. However, 55% of vehicles must be EVs to meet the new EU targets.

Stronger regulation is required in Europe to drive quicker growth, but in 2023, there has been a loss of traction due to a change in priorities due to rising energy prices.

The key pillars driving EU policy

Julia Hildermeier:

With the new EU regulations in early February, we can see that the future of cars, vans, and trucks is electric. The EU Parliament voted that no combustion engine vehicles could be sold in Europe from 2035. The regulations for trucks and buses still need to include an end date, but the regulation still gives a clear direction to planners.

The CO2 standards for cars, vans, and trucks are the main drivers of EV supply in Europe, and they need to be ambitious because they give certainty to the whole supply chain that EVs will be sold and circulating on the roads.

Strong EV policies in Europe also signal to the power sector that our power grids must be ready for EV charging, including charging electric trucks. The power grids must evolve to service the growing number of EVs. The power grids will be able to manage if the planning starts now.

Joost Vantomme:

Consumers and professional drivers still need to be convinced that charging infrastructure is available and sufficient for their needs. Seeing is believing, and they need to see EVs and EV infrastructure deployed at scale. The supply of EVs is progressing quickly, but the demand still needs to be stronger. We can convince drivers through projects such as the [Ertico-Modales](#) project, which focuses on access to charging points, including interoperability between different charging point providers.

Other vital factors are upskilling vehicle owners to use EVs and the aftermarket for EVs. Boundary conditions are also necessary, including the Clean Energy Package, the Buildings Directive, Renewable Energy, Energy Efficiency Directive, and [EU Taxonomy](#). Companies investing sustainably need carbon credits and scoring points, which they do through the EU taxonomy regulations.

Does the US leapfrog the EU with the IRA?

Julia Hildermeier:

The EU has produced a solid framework to encourage consumers and develop infrastructure. For example, the Alternative Fuels Infrastructure Regulation, which the EU Parliament is just finalizing, created the first pan-European charging infrastructure network. This will ensure seamless cross-border mobility. The US does not have anything similar in place.

Giacomo Rossi:

Europe still has a role to play as a pioneer because it has demonstrated the regulatory capability to stimulate demand and reassure the supply chain. Moreover, some European economies are still closely linked with the production of combustion engine vehicles, so regulatory support should help across the value chain to encourage competitiveness.

A few European players plan to develop battery production, including in Germany, Scandinavian countries, Italy, France, and Spain, but the roll-out of gigafactories is still on paper only. If the target timeline makes Europe uncompetitive, Asian competitors will take more market share.

EU support for the EV use phase in the context of broader EU strategy

Julia Hildermeier:

Smart charging should be the priority for all EU-related policies. Smart charging means charging EVs when it is cheapest for consumers and best for the grid and the environment. It is helping to make the grid cleaner, and forecasts confirm that the additional electricity needed for EVs will mostly come from renewable sources.

There is a growing market for smart charging services for private consumers and commercial fleet operators that optimize their costs. This has benefits for every electricity consumer, not just EV users. Smart charging is essential to keep the costs of charging in check.

The Public Infrastructure Law will lock in requirements for all charging infrastructure to be smart charging capable. The same should be applied to private buildings, including smart charging infrastructure with facilities by default to improve energy use profiles and reduce bills.

Commercial EV fleets need the chance to save money through smart charging. Furthermore, EVs can be considered batteries on wheels, so they should be recognized as flexibility resources in energy markets. The EU energy market reforms are currently under review, considering how to help EVs integrate with the power grids optimally.

Charging time is holding customers back

Giacomo Rossi:

Many drivers like EVs but do not want to wait while the EV is charged. This means that the power of charging points becomes critical to EV uptake. Also, public charging infrastructure does not adequately

cover the road network. Thirty-five percent of our survey interviews commented on the inconvenience of charging compared to refueling with petrol. A further 28% commented on the inability to charge the vehicle publicly or at work.

Car dealerships could provide better information about charging networks in the local area and how the driver can best use the EV in a way that is convenient to them. They could provide information about how to charge and have a charging point installed at home. Clarity and upskilling around charging would increase uptake.

Smart grids are essential for progress

Joost Vantomme:

Internet bandwidth and electricity supply are critical to making the grid smart. Vehicle-to-grid and grid-to-vehicle connections will become the new norm, and drivers will know how much charge they have, whether a charging point is available, and how long it will take to charge their battery.

It is essential to unlock data sharing from vehicles to the grid. Each country needs a National Access Point under the Intelligent Transport Systems (ITS) Directive. Data sharing and cyber security in Europe are ahead of the US.

The European Parliament is pushing for more regulation, while the European Commission (EC) has weakened, and inflation is adding to the negative pressure as well. In addition, the EC has weakened the mandate for the number of charging points installed.

The importance of planning to build out charging infrastructure

Julia Hildermeier:

National grid plans need to be ready for the EVs that will be connected in 5, 10, and 15 years. Network planning has very long timeframes, and significant investment and time are required to prepare for trucks that will need mid-high voltage infrastructure. EU member states must set out their plans, including where public infrastructure must be deployed.

It is already well-known where long-haul travel stops must be because they have regulated resting times and mileage. The map of mobility demand needs to be matched with a map of where grid capacity is so that the current grid can be optimally used and upgraded where necessary. Any strategic upgrading should begin as early as possible. This will focus on truck resting areas connecting to a higher voltage. This needs to be part of national infrastructure plans, in coordination with network planning, which national grid operators must do by EU guidelines. This will reduce costs for EV drivers and everyone else too.

The EU standard for EV chargers

Giacomo Rossi:

Ensuring interoperability is a crucial issue at present. There is a mixture of AC, DC, and different plug types. There are also fast charging and ultra charging stations. Different charge point operators have

exclusive memberships and other processes for carrying out a charge.

EU countries also vary in terms of their sources of energy, so Scandinavian countries are typically around 85% renewable energy, while Mediterranean countries may still be entirely dependent on fossil fuels. Therefore, EVs charging on the grid in Scandinavia would be much more sustainable than EVs charging in the Mediterranean states. The mindset is different in those two regions regarding sustainable innovation and infrastructure development. It could be more effective for each country to adopt EV targets according to their country-specific context rather than based simply on population density.

EU support for manufacturers in EV production and battery recycling

Joost Vantomme:

Although the EU Chips Act 2022 was helpful, there is a risk of dependency on chips and semiconductors in South Korea, Taiwan, and China. In addition, while OEMs build gigafactories in Europe, much of the raw material comes from outside Europe. The European Commission wants to invest \$3 billion in improving European raw materials supply and materials innovation. There is already strong regulatory oversight for recycling EV batteries, but there are still some ways to make it more eurocentric.

Gigifactories in Europe

Giacomo Rossi:

Companies in Scandinavia, Germany, France, and Italy, including OEMs such as Volkswagen and Tesla, are progressing with gigafactory developments with the help of the European Battery Alliance. However, the timeline is an issue as the role of these facilities needs to match the action required to meet climate targets. Therefore, the entire value chain must be brought forward and accelerated, even while raw materials come from outside Europe.

Production and recycling of EVs

Julia Hildermeier:

The European Commission has set out its aim to be a globally competitive green economy and to achieve that, batteries and other components must have the best environmental footprint. The battery regulation agreed upon at the back end of last year is a game-changer in that it sets very high standards for carbon footprint, recycling, and due diligence checks designed to prevent environmental and human rights abuses throughout the supply chain.

The EU Critical Raw Materials Act is on its way. It is also expected to set high standards, including clean and ambitious targets for recycling raw materials and broader environmental impacts. This is essential to clean up the whole EV lifecycle.

Giacomo Rossi:

The EU Due Diligence Act includes consideration regarding the layout of the battery pack for longer life and easier recycling. It also contains requirements for recovering battery materials at the end of life. This

helps ease dependence on raw materials from outside the EU.

Other regulatory work looks at keeping consumers informed, for example, with a digital battery passport that includes information about the optimal procedure for the end of life.

EU EV policies in the context of wider EU decarbonization

Joost Vantomme:

Ertico now reaches across eight sectors, with more representation from the power and telecoms sectors. The EC Smart and Sustainable Mobility Strategy covers decarbonizing land, water, and air transport. It also comments on ticketing and booking to make all transport more integrated, accessible, and affordable.

Julia Hildermeier:

Journeys that cannot be avoided or switched to clean modes such as cycling, walking, or public transport should be electrified. In that way, the transport sector can deliver sustainable and equitable mobility. Electrification is always part of a broader sustainable transport policy.



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