



# Electric Vehicles and the Evolution of the Global Auto Market

Center Forward Basics

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## Overview

Electric vehicles (EVs) are widely considered the future of the auto market. They have lower greenhouse gas emissions and lower fuel costs than combustion cars and can shift the transportation sector away from its reliance on fossil fuels. The European Union, the United States, and China seek to capitalize on critical mineral resources worldwide and develop the capacity to extract and process the materials needed to produce batteries. Domestically, the United States is working to expand the use of charging stations for growing EV demand. To encourage a profitable and sustainable EV market in the United States, states and the federal government have been working to domesticate mineral supply chains and strengthen EV infrastructure. This Basic will consider how EV supply chains function and can be adapted, and how American EV infrastructure has and can further evolve.

## Supply Chains and Markets

Critical minerals (cobalt, lithium, nickel, manganese, and graphite) are in clean energy technologies, such as **lithium-ion batteries**, powering cell phones, computers, pacemakers, security systems, and portable chargers. These batteries are also the dominant type of rechargeable batteries used in EVs. Although no one country has reserves for every mineral, China dominates the supply chain from mining to mineral processing through business enterprises that are partly or fully Chinese-owned. The United States and European Union are seeking to **onshore** and allyshore their supply chains to de-risk, diversify, and boost resilience.

Lithium-ion batteries are the dominant rechargeable batteries used in the United States domestic supply chain for EVs to satisfy the demand of American auto manufacturing and other industries. However, as an early mover, China has developed the expertise and technical know-how to ramp up critical mineral projects, battery chemical production, and lead as the lithium-ion producer with a total of 67% of global pipeline capacity for 2030. Last year, over 85% of the lithium-ion batteries produced were in China, which meant that the country was able to export over a million EVs primarily to Europe. To bolster domestic supply chains and level the playing field, the United States government has imposed tariffs on Chinese lithium-ion batteries and critical minerals.

Countries competing to produce EVs are the same countries competing to sell them. China accounted for half of the EV market's growth in 2021. China has sold more vehicles in 2021 (3.3 million) than the entire world in 2020. Sales throughout Europe continued to grow (up 65% to 2.3 million) after the 2020 boom and increased in the

## Center Forward Basics

Center Forward brings together members of Congress, not-for profits, academic experts, trade associations, corporations and unions to find common ground. Our mission: to give centrist allies the information they need to craft common sense solutions, and provide those allies the support they need to turn those ideas into results.

In order to meet our challenges we need to put aside the partisan bickering that has gridlocked Washington and come together to find common sense solutions.

For more information, please visit [www.center-forward.org](http://www.center-forward.org)

## Key Definitions:

- **Lithium-Ion Batteries:** The dominant type of battery powering EVs, defined by their long life and high energy density.
- **Onshoring:** A business tactic which moves operations or production to the same country where the corporation is headquartered.
- **Level 2 Chargers:** Level 2 equipment, typically offered in residential and commercial applications, provides approximately 25 miles of range per 1 hour of charging.

United States (up to 630,000) after two years of decline. These trends continued into 2022. Governments in Europe and the United States have bold public sector initiatives to develop domestic battery supply chains, but they are unlikely to overtake China's market dominance through 2030.

**Onshoring** in the United States and working closely with allies is fundamental to building a more secure and resilient EV battery supply chain. This new market can bring upstream investment opportunities, processing facilities, and component-part manufacturing with higher labor and environmental standards. For example, since the Inflation Reduction Act was passed, the United States has seen more than \$40 billion worth of new investment announcements across the battery supply chain and more than 82,000 new American jobs created in the industry. The surge in investment in U.S. upstream EV and battery supply chains is largely driven by new manufacturing tax credits under the IRA, particularly the 48C Advanced Energy Project Manufacturer's Tax Credit and the 45X Advanced Manufacturing Product Tax Credit. These investments can help spur local economic development by supporting surrounding industries, fostering spinoff entrepreneurship, and contributing to developing industry clusters that improve productivity and growth. Allyshoring is also critical to maximizing these opportunities to build the domestic industrial base. Many American allies worldwide possess significant resources for critical minerals and rare earths, as well as the technology and tooling necessary for mineral extraction and processing.

## Infrastructure

As American consumers demand more EVs, the U.S. will need to build new infrastructure for an expansive network of charging stations to allow drivers to take longer road trips. Most new EVs can travel over 250 miles on a full charge, though some models can go up to 450 miles. EV range may be impacted by factors such as driving style, towing, and outside temperature. EVs are most often charged at home, but access to charging at public destinations is critical to market acceptance, mirroring the existing infrastructure for combustion cars.

Public charging stations typically offer **Level 2** or **DC fast chargers**, or some combination of both. However, not all chargers are created equal as different vehicles require different connectors to charge. J1772 and Combined Charging System are the most common connector types in the United States and are available at most charging stations. At the same time, other variations are more common in the UK, EU, and Asia. In the EU, car companies have created a universal port for all European-made cars. The United States has not adopted a single universalized port, which can complicate the American infrastructure rollout. However, virtually all automakers have recently announced that they will adopt the Tesla (J3400) connector as early as 2025, leading to further convergence.

Increased EV charging places new demands on the aging power grid in the U.S. The power grid was built under the assumption of a modest growth in demand. Today, however, demand is significantly increasing with the revival of domestic manufacturing, the rise of artificial intelligence, and trends toward electrification. Without adequate preparation and utility investment, the country's grid may not be

J1772 connectors and J3400 connectors are popular in the U.S.

- **DC Fast Chargers:** Direct-current (DC) fast chargers enable rapid charging at a rate of approximately 100-200 miles of range per 1 hour of charging. There are 3 types of DC charging systems, depending on the vehicle: Combined Charging System, CHAdeMO, and J3400.
- **Electric Transformers:** Convert electricity to allow it to travel long distances. Many deployed today are aging.
- **Advanced Clean Cars II (ACC II):** A California policy increasing the proportion of electric vehicles sold in California to reduce emissions. The goal of the act is for all new cars sold in California to be electric by 2035.
- **Infrastructure Investment and Jobs Act:** A bipartisan infrastructure bill passed in 2021 which among other things provides funds to update the American electric grid and expand charging stations.
- **CHIPS and Sciences Act:** A bill passed in 2022 to promote research and development for semiconductors.
- **Inflation Reduction Act:** Federal law passed in 2022

ready to meet this increased demand in the long run, stressing **electric transformers** that help deliver electricity from power plants to charging stations. Each utility will require a unique analysis of energy load patterns and weaknesses to plan for effectively increasing EV use.

## Recent Legislation

In the past five years, the United States has passed significant legislation at the federal and state levels to increase the proportion of electric cars sold to U.S. markets. California has notably enacted the **Advanced Clean Cars II (ACC II)** regulations, which require 35% of all new vehicles sold to be battery-electric or plug-in hybrid by 2026, on the way to making 100% of cars and light trucks all-electric by 2035. As of now, thirteen states—Washington, Oregon, Colorado, New Mexico, Maine, Vermont, Massachusetts, Rhode Island, Connecticut, New Jersey, New York, Delaware, Maryland, plus D.C.—have adopted California’s ACC II regulations, with several electing to adopt ACC II. There has been pushback from auto manufacturers, energy companies, and corn growers to these laws. These companies and trade associations collectively argued in the Supreme Court that it was unconstitutional for California, with support from the EPA, to set stricter EV mandates than the federal government. Still, the high court ruled with the EPA and California.

On the legislative level, Congress has passed several significant pieces of legislation to promote the use of EVs. The bipartisan **Infrastructure Investment and Jobs Act** passed in 2021 contains \$7.5 billion in new funding for EV charging stations, makes EV charging infrastructure eligible for additional federal funding programs, and provides funding for numerous other EV-related initiatives. This funding will benefit communities across the country by providing a ready source of capital for EV infrastructure projects. The **CHIPS and Sciences Act** was enacted in 2022 with bipartisan support and includes \$52.7 billion earmarked for research, development, and investments in the semiconductor supply chain (including lithium and copper), a key component of electric vehicle engines. The **Inflation Reduction Act** has several provisions to incentivize EV adoption, namely the New Clean Vehicle Tax Credit for individuals and businesses. The tax credit allows up to \$7,500 per eligible vehicle through 2032 and credits for used EVs for up to \$4,000 or 30% of the sales price, whichever is lower. These tax credits are not just for individuals; businesses and nonprofits can also benefit from the IRA’s tax credits. The bill also allocates \$3 billion to electrify the USPS fleet, including charging infrastructure.

## Looking Forward

The goals of a fair green energy transition require complex solutions. The American EV market can benefit from a domestic supply of critical minerals to achieve a steady supply chain of lithium-ion batteries and an updated power grid that can meet the demand for increasing EV use. In the next few years, the United States’ primary focus will be competing with cheaper EVs from China to promote competition in the market. The United States still lags behind the EU and China in EV production and sales; however, the proposed policy is intended to level the playing field. State mandates have allowed the United States to bolster its EV sales; however, China is still expected to remain dominant. To challenge that dominance in the market, the United States must expand its own supply chains and infrastructure to accommodate market growth. This process requires an intentional and balanced approach.

that aims to lower the federal government deficit and transition the United States to more clean energy.

## Key Statistics:

- 70% of the projected battery production capacity announced for the period to 2030 is in China.
- In 2026 there will be 4.4 million EVs sold in E.U. countries, compared to just 1.9 million in the United States - which equates to 997 and 556 vehicles per 100,000 people (using 2022 population figures) respectively.
- Starting July 5, 2024, the Inflation Reduction Act’s revised credits can save taxpayers up to \$7,500 on certain new EVs and up to \$4,000 on certain previously owned EVs.
- Starting in 2022, the CHIPS and Sciences Act allotted \$52.7 billion for semiconductor research and development.

## Links to Other Resources

- California Resources Board: [Advanced Clean Cars II](#)
- Congressional Research Services: [Critical Minerals](#)
- International Energy Agency: [China and Global Supply Chains](#)
- RMI: [The steps involved in producing and using an EV battery](#)
- U.S. Department of Energy: [What infrastructure is needed to power EVs](#)