



THE RISE OF EVs: UPDATE

In April, car sales in China slumped to their lowest level in a decade, but that decline had a silver lining. Despite the overall slowdown, sales of new-energy vehicles (NEV) increased 44.6 percent year-over-year to 300,000 units for the month. In the first half of this year, over 2.2 million NEVs were newly registered in China, a record high and an increase of 100.26 percent year-over-year. Those sales increases are part of a larger upward trajectory for NEV adoption in China. The country has been the world's largest NEV market for seven years in a row, and last year, electric car sales in China almost tripled compared to 2020. The momentum behind electric cars doesn't end with the Middle Kingdom. In 2021, electric vehicle (EV) sales in Europe increased by two-thirds year-over-year to 2.3 million. In the U.S. in May, EVs reached a record high of 6.1 percent of new car sales, a 70 percent increase in EV sales year-over-year. In the second quarter, EVs accounted for 5.6 percent of U.S. new car sales, twice the share a year ago. Despite the many problems associated with supply chains during the pandemic, the global EV market tripled in 2021 compared to the number of electric vehicles sold in 2019, reaching a total volume of 6.6 million vehicles. **The increase in electric vehicle sales is driving investments in research and spending on batteries, charging stations and EV manufacturing facilities, as well as a build-out of auto supply chains.** (*iea.org*, 1/30/22 and 5/23/22; *China Daily*, 6/9/22; *New York Times*, 7/14/22)

IMPLICATIONS

- Sales of EV cars will continue to grow by large percentages year-over-year, taking a greater share of the overall auto market, especially in China, Europe and the U.S.
- Spending on EV-manufacturing facilities will increase. Supply chains will be built out in the largest global auto markets.
- Spending on battery technology will increase.
- Demand for essential minerals and components for batteries will remain strong.
- The need for battery recycling will grow.
- Spending on charging infrastructure will increase.
- R&D will ramp up to lower the weight of batteries and parts, and to increase battery efficiencies.
- The repair industry will contract.
- The profitability of the auto sector will be in question.
- Auto makers will look to subsidies for enhanced consumer acceptance of EVs.

The Original Context In a 2017 *inFocus* titled "The Rise of EVs" we outlined the evidence suggesting the auto industry was in the early stages of a restructuring thanks to numerous social, consumer and technological changes. We wrote, "From changes in driving habits, to the growth of ride sharing, to the potential of autonomous cars, automakers are having to constantly adjust to the future. Driven by China, India and some European nations, auto companies are now finding that the future will soon include another secular change – the rise of electric

cars and other new-energy vehicles.” We further suggested, “The move to electric cars will not be a seamless transition, as automakers must figure out how to make such vehicles profitably... The rise of electric vehicles will have implications for the auto companies, and the makers of batteries and battery components, among others” (see [inF 1209](#)).

We followed that report with a March 2021 *inFocus Context Update* about the implications of the rise of EVs, in which we noted that “auto companies and suppliers, as well as governments, are making investments and policy changes to transition the auto industry into one driven by electric-vehicle production and sales.” We added, “Though at this early stage many car buyers, especially in the U.S., are not yet on board, the auto industry’s restructuring to EVs is under way... Given the current indications about accelerating climate change, which is driving this vehicle shift, the speed and intensity of this change is likely to accelerate” (see [inF 1604](#))

New Observations: Batteries

- Since the beginning of 2022, China has launched more than 30 new construction projects for power batteries used in NEVs and energy storage systems.
- In June, China’s Contemporary Amperex Technology (CATL), the world’s top manufacturer of automotive batteries, unveiled its Qilin battery, which will be mass produced starting next year. The battery has a record-breaking volume utilization efficiency of 72 percent and can deliver a driving range of over 1,000 kilometers (625 miles).
- Factories in China currently account for nearly three-quarters of global EV battery production.
- In June, BMW announced an agreement with battery start-up Our Next Energy to integrate the latter company’s long-range battery technology into a BMW prototype. Our Next Energy’s batteries reduce the use of lithium, nickel and cobalt.

(Automotive News, 6/20/22, China Daily, 6/9/22 and 6/24/22; Financial Times, 6/24/22)

New Observations: Solid-State Batteries

Solid-state batteries do away with the liquid or gel electrolyte in lithium-ion batteries, which can be flammable. Solid-state batteries can be charged more quickly and don’t rely as heavily on nickel and cobalt.

- Solid Power, a Colorado-based battery start-up backed by BMW and Ford Motor, said it has begun pilot production of a new solid-state battery cell. The company claims its batteries can be produced using the tooling and processes already in place in current factories making lithium-ion battery cells. Solid Power plans to hand off its design to an existing battery manufacturer for mass production.
- Last September, Toyota released an 11-second YouTube video of a car cruising down a test track. The tagline was “Powered by All Solid-State Battery.” In January, the company announced that it will put solid-state batteries in hybrid cars on dealership lots by 2025.
- Volkswagen has invested \$300 million in QuantumScape, a solid-state battery company, also backed by Bill Gates.

(Washington Post, 5/18/22; CNBC, 6/6/22)

New Observations: 800-Volt Electrical Systems

The 800-volt vehicle architecture systems can deliver the same amount of power at a lower current, and batteries can be charged approximately 50 percent more quickly than by using 400-volt technology. This allows for smaller batteries, the costliest component in an EV, and reduced weight, which increases efficiency.

- The Porsche Taycan, Audi E-tron GT, Hyundai Ioniq and Kia EV6 all utilize 800-volt systems.
- Volvo, Polestar, Stellantis and General Motors have said that future models will use the technology.
- Chinese automakers including XPeng, Nio, Li Auto, BYD and Geely-owned Lotus have announced that they will move to 800-volt architectures.
- Auto supplier Borg Warner has won a number of 800-volt orders, including one for an integrated drive module for a Chinese luxury brand.

(Automotive News, 4/18/22)

New Observations: Battery Swaps and Recycling

- Nio, Geely, Aulton and Sinopec say they plan to establish a total of 24,000 battery-swapping stations across China by 2025, up from about 1,400 now. CATL is also developing a battery-swapping service.
- Toyota Motor North America announced a collaboration with battery-recycling company Redwood Materials. Ford, Volvo and Tesla have already struck deals with the company.
- China had 38,500 companies involved in the power-battery-recycling business by the end of April 2022, with about 24,400 of them established last year.
- In 2021, Chinese industrial-waste-recycling company GEM Col Ltd. sold 91,000 metric tons of positive-electrode-precursor materials to domestic NEV battery makers, a 120 percent increase year-over-year.

(Reuters, 3/24/22; China Daily, 6/9/22; Automotive News, 6/27/22)

New Observations: Charging Stations

- In 2021, nearly 500,000 chargers were installed worldwide, an increase of 37 percent year-over-year and more than the total number of public chargers available in 2017.
- In 2021, the number of publicly accessible chargers worldwide approached 1.8 million, of which a third were fast chargers.
- In the first half of 2022, the total number of Chinese charging infrastructure facilities and battery charging facilities increased by 1.3 million, or 380 percent.
- One part of the \$1 trillion infrastructure law signed by President Biden last November is \$7.5 billion allocated to help build 500,000 EV charging stations across the U.S. by 2030. The law provides \$5 billion for states to build out a charging network and \$2.5 billion for local grants to support access to EV charging in rural areas and disadvantaged communities.
- In June, the Biden administration announced a series of goals for a national charging network, including a proposed rule that would set minimum standards and requirements for federally funded EV charging stations and the formation of the EV Working Group.

(iea.org, 5/23/22; Automotive News, 6/13/22; China Daily, 7/20/22)

New Observations: Research-and-Development Spending for EV Production

- Toyota, the world's largest automaker, plans to spend \$9.3 billion on R&D this fiscal year, a record, and nearly half the amount it forecasts for operating profit. A majority of the spending is expected to be on EV-related technology.
- Honda is planning to spend more on R&D than it has in at least a decade, and more than it earns from operations.
- Nissan Motor Co. is budgeting a record \$4.51 billion for R&D as it updates and electrifies its lineup.
- Nissan is investing \$500 million to turn its Canton (MS) assembly plant into a "center for EV manufacturing and technology."
- Hyundai Motors has pledged \$16 billion globally through 2030 for EVs. The automaker is investing \$4.54 billion in its first dedicated EV factory in Ellabell (GA) and also plans to build a battery-manufacturing facility with a joint partner "nearby."
- In North America, Volkswagen Group has committed about \$7 billion worth of investments to EV-building capacity through 2027 and plans 25 EVs for the U.S. by 2030.
- GM is investing \$35 billion in electric and autonomous vehicles through 2025, with the goal of having an all-electric portfolio by 2035.

(Automotive News, 5/23/22 and 7/4/22)

New Observations: EV Supply Chain Buildout

- Last summer, Ford and its South Korean battery-manufacturing partner, SK On, announced a \$5.8 billion project to produce batteries in Glendale (KY), 60 miles south of Ford's big truck assembly in Louisville. This April, Japanese EV battery maker Envision AESC announced that it will spend \$2 billion to build a battery-manufacturing plant in Bowling Green (KY).
- SK On also launched production this year in Commerce (GA). Korean manufacturer Enchem Ltd. is building two plants in Jackson County (GA) to produce electrolytes and electrostatic double-layer capacitors for SK. SK partner EcoPro BM, a cathode-materials manufacturer, also is investing to supply SK in Georgia.
- In June, Stellantis said it secured a supply of lithium through a 10-year agreement with Controlled Thermal Resources, which operates in California's Salton Sea. That followed similar deals with Controlled Thermal announced by Tesla, GM and Ford.

(Automotive News, 6/27/22)

The auto industry's shift to EVs is picking up speed. To facilitate this transition, significant corporate and government investments are being made in battery technology, charging infrastructure, manufacturing plants and supply chains. Consumers, especially in China and Europe, are embracing new-energy vehicles, and higher gas prices will likely motivate others who haven't previously considered an EV. The auto industry's restructuring is shifting into the next gear, and it's going to be quite a ride.