TRANSITION TO EVs GAINING MOMENTUM IN THE US

— US AUTO INDUSTRY REACHING A TURNING POINT —

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SUMMARY

- US regulations for automobile fuel economy and CO2 emissions have gone through many twists and turns due to the tug-of-war between Democratic and Republican administrations, but under the Biden administration, legislation and budgetary measures to promote wider adoption of electric vehicles (EVs) have made headway.
- In the US auto market, sales of battery electric vehicles (BEVs) other than Tesla models have been low, as the market is characterized by a high proportion of heavy vehicles, making it less compatible with EVs. However, pushed by policy support, automakers are beginning to launch new EV models and, at the same time, significantly expand production capacity.
- With the narrowing of the cost difference of ownership between BEVs and gasoline-powered vehicles and the purchase subsidies provided by the Inflation Reduction Act helping to expand BEV demand, companies' capabilities to rapidly and significantly expand local production of on-board batteries and locally procure materials and components will be the key to the uptake of BEVs in the US auto market.

1. TWISTS AND TURNS OF ENVIRONMENTAL POLICIES IN THE US AUTO INDUSTRY

1-1. Democrats and Republicans squabble over automobile fuel economy regulations

The current US automobile fuel economy regulations (CO2 emissions regulations)[1] were originally enacted in 2012 under the pro-environmental regulations-minded Obama administration. The requirement to improve fuel economy by 5% annually from 2017 to 2025 has provoked backlash from the auto industry, as it will increase costs to comply, and that higher cost will ultimately be passed on to consumers. When the Trump administration took office in 2017, with its reluctance to reinforce environmental regulations, it immediately began reviewing these regulations and significantly relaxed them in March 2020. The Trump administration also decided to deprive the state of California of its previously granted right to impose its own environmental regulations, which were more rigorous than federal standards. The state lodged a lawsuit against the federal government to challenge this decision, asserting it to be a violation of the Constitution, and became embroiled in a long legal battle. However, the succeeding Biden administration dropped the lawsuit, recognizing the authority of the California state government, and in April 2022, it issued tightened fuel economy regulations (Figure 1).

The Biden administration has also launched a drive to decarbonize automobiles by issuing an executive order that includes a provision requiring that zero-emission vehicles (ZEVs)[2] account for 50% of all new vehicle sales by 2030. In August 2022, the state of California announced regulations to transition to 100% ZEVs for new

[1] Nearly identical regulations are enforced by the US Department of Transportation's National Highway Traffic Safety Administration (NHTSA) as fuel economy regulations and by the Environmental Protection Agency (EPA) as CO2 emissions regulations.
[2] ZEVs are battery electric vehicles (BEVs), plug-in hybrid electric vehicles (PHEVs), and fuel cell electric vehicles (FCEVs).

vehicle sales by 2035, and that has given impetus to the national move to decarbonize automobiles through stricter fuel economy regulations and wider adoption of ZEVs.

Figure 1: Timeline of US auto industry legislation and regulations

Month/Year	Policy trend	Administration
August 2012	New fuel efficiency regulations for cars and light-duty trucks for 2017~2025 announced	Obama
2017	New fuel efficiency regulations become effective	Trump
September 2019	Federal government revokes the California state government's authority to set its own more rigorous GHG and ZEV regulations (waiver granted previously exempting the state from following federal regulations)	
June 2020	Fuel consumption regulations modified (greatly relaxed) for 2021-2026	
August 2021	Executive order issued to have ZEVs account for 50% of new car sales by 2030	Biden
November 2021	Infrastructure Investment and Jobs Act passed	
December 2021	Senator Manchin opposes Build Back Better (BBB) bill, which fails to pass	
March 2022	California's exemption from federal regulations restored (allowed to set own regulations)	
April 2022	Fuel efficiency regulations for 2024-2029 announced (tightened again)	
August 2022	California introduces regulation to transition to 100% ZEVs for new vehicle sales by 2035	
August 2022	Inflation Reduction Act passed	

Note: Blue text indicates promotion of tighter GHG emissions regulations, while red text indicates easing of regulations.

Source: Compiled by MGSSI based on data of the US Environmental Protection Agency, National Highway Traffic Safety Administration, Congressional Research Service, California Air Resources Board, and JETRO

1-2. Difficulties in securing budgets for decarbonization initiatives

The Biden administration has taken a major step toward decarbonization, but securing the budgetary support to implement the needed initiatives has not come easily. The Infrastructure Investment and Jobs Act, passed in November 2021, excluded a large portion of the climate change and new energy-related budget that was originally meant to be included. The excluded portion was considered for legislation separately as a US$3.5 trillion investment package (Build Back Better Act), which included funding for up to US$12,500 subsidies for buyers of new ZEVs, but this bill, too, ultimately failed to pass due to opposition from Democratic Senator Joe Manchin from West Virginia.

Finally, the initiatives took shape in August 2022 as part of the Inflation Reduction Act, and a ZEV purchase subsidy (tax credit) of up to US$7,500 was regulated. However, in the process of enacting the legislation, it was found that even Democrats, such as Senator Manchin, who are elected from fossil fuel-producing regions, did not readily agree, indicating that the US is divided on decarbonization not only by party affiliation, but also by regional interests. It is possible that the Republican majority in the House of Representatives, an outcome of the 2022 midterm elections, could impede advancement of the Biden administration's decarbonization policies in the future.

ZEV UPTAKE TRENDS IN THE US AUTO MARKET

2-1. Large vehicles make up greater part of US auto market

The US automobile market has a unique structure. In other markets, passenger vehicles with a gross weight of up to about 3.5 to 4 tons are grouped as passenger cars, but in the US, such vehicles are divided into two categories: (1) passenger cars: sedans, hatchbacks, and station wagons, and (2) light trucks: SUVs, vans, and pickup trucks. In the past, sales of passenger vehicles in the US were divided roughly equally between passenger cars and light trucks, but in recent years, light trucks have come to account for 70-80% of the market as SUVs have become more popular with consumers and the availability of crossover utility vehicle (CUV)[3] models, which are categorized as light trucks, has expanded. As light trucks are generally larger, heavier, and

[3] Crossover Utility Vehicle: An SUV-type vehicle model that uses the same monocoque frame as a passenger car.

less fuel-efficient than passenger cars, the US has a separate system for fuel economy regulations for light trucks in consideration of its domestic automakers, who rely on light trucks as an important source of profit.

Among ZEVs, BEVs are considered unsuitable as light trucks because the larger and heavier the vehicle, the greater the weight of the battery to be installed and the worse the energy efficiency. In addition, because gasoline is less expensive in the US than in Europe and Japan, it is difficult to argue in favor of the lower fuel cost (electricity charge) of BEVs compared to gasoline, which, combined with the high sticker price of BEVs, had been a factor in their failure to achieve widespread adoption.

2-2. BEV sales trends

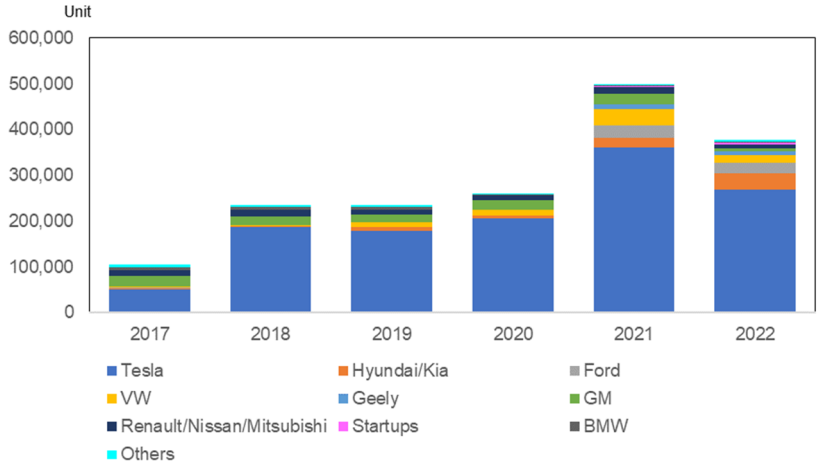
In the US, ZEVs accounted for just over 6% of vehicle sales in the first half of 2022, less than in China and Europe, where ZEVs made up about 20% of sales. Sales volume of BEVs, the mainstay of ZEVs, remained flat at slightly over 200,000 units until 2020, then sales almost doubled year-on-year in 2021, and are expected to increase further in 2022 as sales for the first half alone reached nearly 400,000 units (Figure 2). However, a breakdown by manufacturer shows that Tesla's vehicles continue to dominate the market, accounting for 70% of the total. Until the launch of its first light truck, Model Y (Photo 1), Tesla's models were all passenger cars, and the market overall had few light truck BEVs, even when including the offerings from other automakers.

Photo 1: Tesla Model Y



Source: https://www.tesla.com/modely

Figure 2: BEV sales trends in the US



Notes: The figures for 2022 are the cumulative totals for January-June. BEV (battery electric vehicle) refers to vehicles that use only a battery as a power source.
Source: Compiled by MGSSI based on MarkLines data

2-3. **Successive BEV model launches and production capacity expansions**

The market is beginning to see signs of change. In January 2021, GM announced its goal to end the production of gasoline-powered vehicles by 2035 and to transition to 100% ZEVs. The company plans to launch 30 BEVs, which would represent 40% of its entire lineup, by 2025. Ford also announced a BEV version of its flagship pickup truck, the F-150 (Photo 2), and launched sales in the spring of 2022. In view of the fact that initial reservations exceeded 200,000 units, the automaker plans to double its current production capacity to 150,000 units per year in 2023.

Photo 2: Ford F-150 Lightning



Source: https://www.ford.com/trucks/f150/f150-lightning/

In addition, many of the world's major automakers, including leading European manufacturers and South Korea's Hyundai and Kia, have successively announced plans to expand or build new BEV assembly and battery plants in North America. Seeing these trends, Japanese automakers, such as Toyota and Honda, which

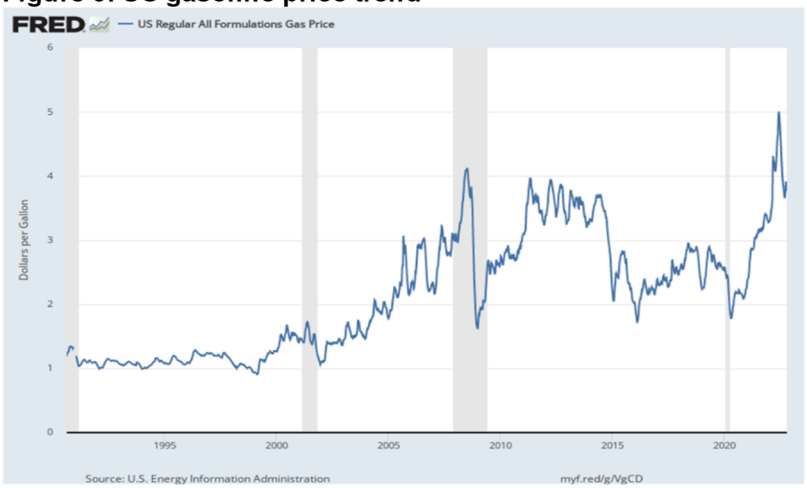
had been noted for being late to the party, have announced investments in large-scale battery production plants. When the plans of all these companies are added together, production capacity will be built up to be well in excess of 5 million BEVs a year by around 2025. In addition, considering the requirement to comply with the provisions of the Inflation Reduction Act, moves to expand local production capacity for battery materials will likely accelerate.

POTENTIAL AND CONDITIONS FOR ZEV UPTAKE IN THE US MARKET

3-1. Changes in the cost of ownership of gasoline-powered vehicles and BEVs triggered by the COVID-19 pandemic and inflation

The US automotive market has been chronically undersupplied for the past several years due to the aftermath of the production shutdown during the COVID-19 pandemic and the semiconductor shortage. As a result, the average sales price of a new car reached a record high of over US$48,000 in August 2022. In addition, due to the energy crisis triggered by Russia's invasion of Ukraine and high inflation, gasoline prices, once around US$2 per gallon, temporarily exceeded US$5 per gallon, and recently stood at around US$4 per gallon, equal to or higher than in Japan (Figure 3).

Figure 3: US gasoline price trend



Source: FRED (Federal Reserve Economic Data, Federal Reserve Bank of St. Louis)

The average price of a BEV at about US$65,000 remains well above the average for a gasoline-powered vehicle. However, a look at individual models shows there are some more affordable options, with the Ford F-150 Lightning starting at a price of US$47,000, and GM's new small SUV BEV, launched in September, with a starting sticker price of about US$30,000. As mass production progresses and costs come down, the market can expect to see more offerings of less expensive BEVs and a narrowing of the price gap between BEVs and gasoline-powered vehicles. In addition, US consumers often lease vehicles or buy vehicles with financing and recognize the cost of automobile ownership as a monthly payment plus the cost of fuel. If a rise in gasoline prices makes the cost of ownership, including fuel costs, more expensive, it is quite possible that more consumers will choose BEVs.

3-2. The challenge is to establish a mass production system

The Inflation Reduction Act stipulates that, beginning from 2029, eligibility for BEV purchase subsidies requires that 100% of battery components be produced in North America and at least 80% of battery materials be sourced from within the US or from countries with which the US has a free trade agreement in effect (Figure 4). At present, most BEV batteries for vehicles sold in the US are manufactured using components and materials from China, South Korea, and Japan. Since consumers will no longer be able to receive purchase subsidies if the components are sourced from these non-FTA countries, automakers and battery manufacturers are under pressure to switch to local production and material procurement.

Figure 4: Conditions for qualifying for EV purchase subsidy under the Inflation Reduction Act

- Allow a total tax credit of US$7,500 for qualifying vehicles (EVs = plug-in vehicles): US$3,750 for meeting the critical mineral resource use requirement and US$3,750 for meeting the battery component requirement.
- Conditions for sourcing origin of applicable minerals
  - Critical minerals requirement: 40% in 2023, 50% in 2024, 60% in 2025, 70% in 2026, and 80% in 2027 and thereafter of mineral resources extracted and manufactured in the US or countries with which the US has FTAs or recycled in North America
  - Battery component manufacturing requirement: 50% of battery components manufactured and assembled in North America in 2023, 60% in 2024-2025, 70% in 2026, 80% in 2027, 90% in 2028, 100% in 2029 and beyond
- Exclusion of vehicles with batteries containing critical minerals or battery components manufactured in a foreign entity of concern
  - From 2024, any vehicles with batteries containing any components manufactured or assembled in a foreign entity of concern (including China, Russia, etc.)
  - From 2025, any vehicles equipped with batteries that use critical minerals extracted, processed, or recycled in a foreign entity of concern
- Price requirement for eligible vehicles: Manufacturer's suggested retail price must be US$80,000 or less for SUVs, vans, and pickup trucks, and US$55,000 or less for all other vehicles
- Purchasers exempted from the subsidy: Married couples with modified adjusted gross income (MAGI) of US$300,000 or more, heads of households with MAGI of US$225,000 or more, and all others with MAGI of US$150,000 or more in the preceding taxable year

Source: Compiled by MGSSI based on a US Congressional Research Report

That said, it is not easy to build production facilities or secure new procurement routes for the large amount of raw material minerals required for battery production. If battery makers must switch to local procurement for the parts and materials thus far sourced from East Asian countries, where suppliers have already established a certain level of economies of scale, significant cost increases are inevitable as material procurement and labor costs are rising amid global inflation. Already, prices have been raised for some vehicle models. One of the keys to the market uptake of BEVs will be whether the mass production of batteries and their materials can get on track.

3-3. Will this be a turning point for the US auto industry?

When compared globally, the US was thought to be the furthest away from widespread adoption of ZEVs and, in particular, BEVs, because gasoline prices are notably low, and large-displacement, heavy-duty vehicles have dominated the market. Moreover, conflict and divisiveness continue between proponents of environmental regulations, led by advocates in California, and opponents of environmental regulations, supported by the domestic energy industry. Still, the global decarbonization wave appears to be slowly reaching the US. On top of this trend are the combined repercussions of the COVID-19 pandemic and Russia's invasion of Ukraine, suggesting the tide may be turning in the US auto market. Despite the challenges of building a new industrial supply chain, the US auto industry, which has thrived on the mass consumption of fossil energy, appears to be at a major turning point.

As electrification of automobiles accelerates in China and Europe, and if the shift to EVs also progresses in the US, the world's second largest auto market, the majority of the global market will move toward electrification. This will also have a big impact on the strategies of Japanese automakers and the direction of the Japan’s auto market.

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