

The Outlook for the Adoption of Electric Vehicles in the United States by 2050  
~ Considered by extending the scenarios for the United States in the IEA Global EV  
Outlook 2022 ~

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1. The important United States market for the automobile industry of Japan

According to the statistics of the Japan Automobile Manufacturers Association (JAMA), automobile sales by Japanese companies (including local subsidiaries) in 2019, before the COVID-19 pandemic, came to approximately 6.5 million units in the United States market. In the same year approximately 9.7 million automobiles were produced in Japan, so we can understand immediately how important a market the United States is for the automobile manufacturers and automobile-related companies of Japan. In that United States market, the shift from conventional automobiles using an internal-combustion engine to electric vehicles (EVs) is gradually progressing. Therefore, I decided to use the IEA Global EV Outlook 2022<sup>1</sup> (GEO) to estimate the number of new light-duty vehicles (LDVs) which will be sold and the number of LDVs that will be owned in the United States by 2050<sup>i</sup> and to consider the process of EVs coming to dominate the United States market.

2. The “conservative outlook” and “outlook according to the declaration” for sales of new EVs and number of EVs owned

(1) Conservative outlook (STEPS extension case)

In the case of considering the outlook for the number of new EVs which will be sold based on STEPS, the conservative outlook of the GEO, in 2040 approximately 12.5 million of the LDVs sold will be EVs, so the EV ratio of the total number of LDVs sold will be 81% (Figure 1, left). Subsequently, by about 2043 most of the LDVs sold will be EVs, and in 2050 more than 16 million EVs will be sold and the EV ratio will be 100%.

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<sup>1</sup> <https://www.iea.org/reports/global-ev-outlook-2022>

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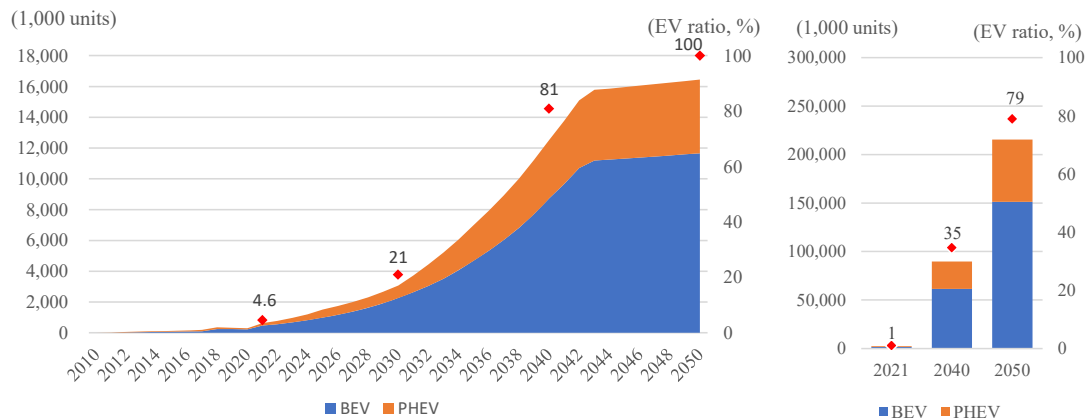


Figure 1 STEPS extension case: sales of new EVs (left) and number of EVs owned (right)

Furthermore, regarding the number of EVs owned, approximately 90 million LDVs will be EVs in 2040, and the EV ratio of the total number of LDVs owned will be 35% (Figure 1, right). Subsequently, in about 2044 the EV ratio will exceed 50%, in 2050 more than 215 million EVs will be traveling on the roads, and in about 2060 the EV ratio will exceed 98%.

(2) Outlook according to the declaration (APS extension case)

On the other hand, in the case of considering the outlook for the number of new EVs which will be sold based on APS, namely the case based on the declaration by President Biden in August 2021 that the US will aim for 50% of automobiles sold to be zero-emissions vehicles (ZEVs) by 2030,<sup>2</sup> in about 2034 all vehicles sold will be EVs, and all of the approximately 15.5 million units sold in 2040 and approximately 16.5 million units sold in 2050 will be EVs (Figure 2, left).

<sup>2</sup> In the statement by President Biden, it is mentioned that fuel cell automobiles are also one type of ZEV, and the statement could be read as declaring that heavy-duty vehicles and two-wheeled vehicles will also be 50% ZEVs by 2030, but GEO interprets the statement as meaning that 50% of LDVs will be EVs.

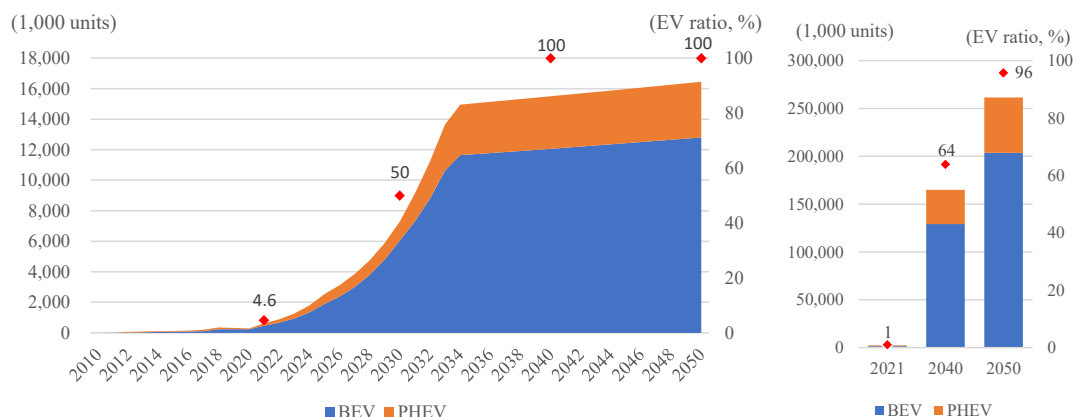


Figure 2 APS extension case: sales of new EVs (left) and number of EVs owned (right)

Furthermore, regarding the number of EVs owned, in 2040 approximately 165 million of the LDVs will be EVs, and the EV ratio of the total number of LDVs owned will be 64% (Figure 2, right). In 2050 the EV ratio will be 96% and more than 260 million EVs will be registered in the United States.

### 3. Even viewed conservatively, rapid EV adoption is unavoidable

On the basis of the number of new cars sold, an EV ratio of 80% will be achieved in 2040 in the STEPS extension case and between 2032 and 2033 in the APS extension case. The executive summary of the Electric Vehicle Outlook 2022 (EVO) by BloombergNEF<sup>3</sup> predicts that the EV ratio will be approximately 80% of the PLDVs sold in 2040 under the Economic Transition Scenario, the EVO's base case, which is extremely close to the STEPS extension case. In other words, even viewed conservatively, the EV ratio of new cars sold in the United States will be about 20% by about 2030, 50% by the middle of the 2030s, and approximately 80% by about 2040, and we can conclude that this is the shared view of IEA and BloombergNEF.

Approximately when will this forecast of the explosive adoption of EVs in the LDV market of the United States become a reliable forecast? Regarding this, Bloomberg<sup>4</sup> calls the point when the EV ratio exceeds 5% of the total number of units sold the tipping point. Not only EVs but also other new technologies such as electricity, television, mobile phones, the Internet, LED lightbulbs, etc. follow an S-shaped adoption curve. Bloomberg says that if we look at the examples of countries with advanced EV adoption, such as Norway, etc., the mainstreaming of EV demand in the automobile sales market is certain when EVs exceed 5% of the total number of units sold. In the United States the EV ratio of the LDVs sold in 2021 had already reached 4.6% and if we take into consideration the strong EV sales

<sup>3</sup> <https://about.bnef.com/electric-vehicle-outlook/>

<sup>4</sup> <https://www.bloomberg.com/news/articles/2022-07-09/us-electric-car-sales-reach-key-milestone>

in the first half of 2022 the EV ratio will probably exceed 5% this year, 2022. If this theory that “5% is the tipping point” is correct, there is a possibility that the transition to EVs will proceed rapidly in the United States.

Meanwhile, on the basis of the number of EVs owned, the time when the EV ratio will exceed 50% is 2044 in the STEPS extension case and 2038 in the APS extension case, so in both of these cases a substantial number of conventional vehicles utilizing internal-combustion engines will remain on the roads even in 2045. Japanese companies selling automobiles in the United States are in the situation of having to focus on sales of new EVs from the 2030s to the 2040s while continuing the maintenance of conventional vehicles.

#### 4. The “now or never” situation for Japanese companies

According to this paper’s outlook for the period until 2050, it will be difficult for not only Europe and China but also the United States to avoid the wave of electrification of vehicles; moreover, the pace of the electrification looks to be quite fast. Therefore, it is necessary for Japanese companies which have sold many conventional vehicles to keep in mind not only “attack,” namely the EV sale business with respect to the electrification of the United States market which will progress rapidly from the 2030s to the 2040s, but also “defense,” namely the maintenance business for conventional vehicles.

At the present time, the medium- to long-term sales plans of Japan’s automobile manufacturers do not contradict this outlook. In August 2022, there have been developments such as California deciding on a proposed regulation to ban sales of hybrid vehicles as well from 2035 onwards, while Toyota and Honda have announced investments in EV battery plants inside the United States. Going forward, regarding “attack,” Japanese companies will probably set themselves the questions of “can we find strengths in adding some kind of Japan premium on top of EVs?,” “should we continue our efforts to expand the adoption of ZEVs other than EVs, such as fuel cell automobiles and hydrogen engine vehicles, etc.?,” “should we expand sales channels for ZEVs in the heavy-duty vehicle (HDV) market for trucks, buses, etc. in which electrification has been relatively slow?,” etc., as they consider their medium- to long-term strategies in greater detail. Furthermore, regarding “defense,” they will probably deepen their considerations of converting conventional vehicles into carbon neutral vehicles by developing the new fuel technologies sector, including synthetic fuels (e-fuels), which use CO<sub>2</sub> as their raw material, and biofuels, etc. The United States market is an important overseas market, so Japanese companies must continue to consider and take action on the question of how to maintain their competitive advantage as a “now or never” situation. Needless to say, automobiles are a key industry in the Japanese economy.

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<sup>i</sup> The points to note regarding the estimate are as follows.

(1) Scenario-setting in the GEO

The GEO analyzes the current situation of EVs globally and estimates the global EV outlook by 2030 based on original scenario-setting. There are three scenarios: the Stated Policies Scenario (STEPS), the Announced Pledges Scenario (APS), and the Net Zero Emissions by 2050 Scenario (NZE). STEPS reflects existing policies and targets that have been legislated. The APS reflects the most recent declarations, regardless of whether or not these have been anchored in legislation or in Nationally Determined Contributions (NDCs). The NZE presents one path which is back casting from the achievement of net zero by CO<sub>2</sub> emissions by 2050.

(2) Basic approach of the estimate

GEO publishes the actual data from 2010 to 2019, the estimated data of 2020 and 2021, and the predicted data for STEPS and APS in 2025 and 2030. In this paper, in the form of using the data of these two scenarios to extend the trends of the GEO, I set the STEPS extension case and the APS extension case to make estimates of the total number of LDVs sold and owned and the number of EVs sold and owned in the United States by 2050.

(3) Estimate of the number of EVs owned

Please note that I made an original estimate of the number of EVs owned incorporating average lifespan, etc. based on the results of the estimate for number of units sold, so the EV ratios for the number of EVs owned for 2021 and 2030 differ very slightly from those of the GEO.

(4) The definitions of LDVs and EVs in the GEO data

The GEO classifies four-wheeled vehicles into four types: LDVs, trucks, buses, and vans. LDVs include passenger light-duty vehicles (PLDVs) and light commercial vehicles (LCVs). It is necessary to note that this definition comes close to combining the “Light-duty vehicle, short wheel base” and “Light-duty vehicle, long wheel base” definitions of the US Bureau of Transportation Statistics, and differs from the classification of PLDVs and other commercial vehicles including trucks and buses, etc. in JAMA, Wards, and the International Organization of Motor Vehicle Manufacturers (OICA), etc. Furthermore, in the GEO, “EVs” means the sum of battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs).

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