

# Research status of new energy vehicles in various countries and the significance of new energy vehicles

**Jiayi Zhou**

Experimental High School Attached to Beijing Normal University, Beijing 100000, China

lina@focusedu.top

**Abstract.** The market for electric vehicles is expanding as the economy continues to grow. This report is in the context of the gradual electrification of the world in recent years. It focuses on analyzing the current achievements and development trends of the electric vehicle industry in various countries. Relevant literature was retrieved and information on the purchase volume of electric vehicles in recent years was obtained. In addition, relevant regulations by the government were introduced, and iterative updates of car brand models were analyzed. The advantages of electric vehicles, such as low emission, no pollution, energy saving and long service life were presented, all of which will prompt countries to focus on the field of electrification. For China to reach the worldwide advanced level in this field and take the "high ground". Last but not least, this paper will concentrate on analyzing the achievements to date and the trends in the development of the electric vehicle industry in different countries.

**Keywords:** electrification, new energy, environmental pollution, policies.

## 1. Introduction

Traditional fuel cars, which are familiar to the public, emit carbon dioxide and contribute to global warming. Compared with fuel cars, new energy vehicles have many benefits. First of all, it causes less pollution. New energy vehicles use clean energy such as electricity and hydrogen, which reduces the pollution to the air and environment compared with traditional fuel cars, of course, some people may say that electricity is actually generated by coal or oil, but the power station's power generation efficiency is much higher, the energy utilization is better, and the exhaust gas treatment is better. Electric cars do not produce exhaust fumes, and do not pollute the environment, and gaseous cars Extraction gas is water, it does not pollute the environment because it essentially belongs to null emissions, so it is also located outside of the range of restrictions.

Firstly, new energy vehicles have no exhaust emissions, which can effectively protect the environment and reduce exhaust emissions. Secondly new energy vehicles are cheaper in terms of usage cost because they use cheaper power resources such as electricity and hydrogen. In addition, the government will provide some benefits such as purchase subsidies or free parking. Finally, compared to fuel engines, new energy vehicles are usually quieter, with no engine noise. And there is no vibration when starting. As people's demand for environmental protection and health is increasing, the future of

new energy vehicles is very promising. If there is a breakthrough in battery technology in the future, new energy cars will have a chance to replace fuel cars (Table 1).

**Table 1.** Penetration rate of green cars.

| Date            | Fuel car | New power car | Total | Penetration rate |
|-----------------|----------|---------------|-------|------------------|
| January, 2-8    | 21.4     | 7.7           | 29.1  | 26.46%           |
| 9-15            | 33.9     | 9.9           | 43.8  | 22.60%           |
| 16-22           | 25.9     | 6.7           | 32.6  | 20.55%           |
| 22-29           | 7.3      | 1.8           | 9.1   | 19.78%           |
| 30-5            | 19.8     | 7             | 26.8  | 26.12%           |
| February, 6-8   | 19.8     | 8.6           | 28.4  | 30.28%           |
| February, 13-19 | 20.7     | 10.1          | 30.8  | 32.79%           |
| February, 20-26 | 22.5     | 11.2          | 33.7  | 33.23%           |
| February, 27-5  | 23.46    | 11.66         | 35.12 | 33.20%           |
| March, 6-12     | 21.1     | 10.8          | 31.9  | 33.86%           |

## 2. New energy vehicles

New energy vehicles can be divided into three main categories: pure electric vehicles, plug-in electric vehicles and hybrid electric vehicles.

The main technologies of these three types of vehicles are discussed as follows. The pure electric vehicle is a new kind of vehicle which uses a battery as when main energy source as well as is driven by an electric motor to realize vehicle movement. It has no pollutant emission during its operation, and is a real green vehicle. However, the range of pure electric vehicles is the biggest bottleneck problem. At present, the breakthrough of pure electric vehicles in the range is mainly achieved through the improvement of battery technology. The upgrade of cathode material and electrolyte is a major direction, which has led to a range of hundreds of kilometers.

### 2.1 Electric plug-in hybrids

A plug-in hybrid electric car is a type of automobile that combines a traditional internal combustion engine and an electric motor. It mainly uses batteries to store the power needed to drive the vehicle's electric motor, improving the efficiency of fuel use. In the case of sufficient battery power, all or most of the vehicle's driving power can be provided by the battery, achieving a truly environmentally friendly and fuel-efficient. And when driving long distances, the engine will automatically start to provide electricity to the battery, increasing the driving range while the battery is charging. Currently, plug-in Hybrid vehicles have achieved remarkable results in charging efficiency and fuel-saving performance.

### 2.2 Hydrogen powered vehicles

Hydrogen fuel cell vehicles use hydrogen and oxygen to generate power to drive the vehicle. Its advantages are zero emissions, high efficiency, and short charging time. However, the application of hydrogen fuel cell vapor also faces problems such as the high cost of hydrogen production, difficulty to solve the problem of hydrogen storage, and large investment in the construction of supporting facilities. Therefore, hydrogen fuel cell vehicles have become the direction of development in the end, but there is still a long way to go before they can be used in a hot way. Other panels discussed the effects of nanotechnology on electronic cars and the challenges of the final power density of batteries, among others.

### 3. The current position and trends of the evolution of the European new power car industry

#### 3.1. Current situation of the industry

Europe has a long-standing automotive saving energy and reducing emissions strategy, the EU once set a strategic goal for environmental protection indicating that: in 2020, greenhouse gas emissions should be reduced by 20% on the basis of 1990, of which the transportation industry is the main target, and in 2020, the CO<sub>2</sub> emissions of all new cars in the EU will be reduced to 95 grams per kilometer. In the last two years, the EU plans to require new car and truck emissions to fall by 65% from 2030, to achieve net zero emissions from new cars in 2035, and to achieve net zero emissions from the automotive industry in 2050.

#### 3.2. Development trend

Led by lofty development strategy goals, Europe is likely to develop a set of strategies with greater preferences to help develop the European new power vehicle industry. Europe's development into the world's most dynamic market for new energy vehicles may become a reality in a few years. The situation of charging electric vehicles by European new energy electric vehicle charging piles is shown in Figure 2.



**Figure 1.** Electric vehicles charging at charging stations [1].

### 4. Current situation and trends of the evolution of the U.S. new energy vehicle industry

#### 4.1. Current situation of the industry

By 2021, almost 70% of U.S. new energy automotive will be occupied by Tesla Model 3 and Model Y models, while Toyota, GM, Hyundai and Ford will jointly occupy a 30% market share of the rest of the world. 59 new energy vehicles will be on sale in the U.S. in 2020, while China and Europe will supply 300 and 180 models respectively [1]. In quantitative terms, the U.S. The new energy vehicle industry is still at an early stage, with few types and numbers, and the industrial market is largely monopolized by Tesla.

#### 4.2. Development trend

Industry policy is the main factor influencing the future development trend in the U.S. new power vehicle industry. If the U.S. government with strong financial strength chooses to raise the policy support of the new energy vehicle Industry and spend more money to guide the development of new energy vehicle industry, then U.S. New Energy Car Sector will have great potential. Tesla's new energy cars development strategy is a key factor affecting the future evolution of the U.S. new energy automotive industry. As an electric vehicle and energy company that occupies 70% of the U.S. new energy vehicle market, Tesla's R&D and sales strategy for new energy vehicles will greatly influence the structure and demand of the U.S. new energy vehicle market [2]. The production, R&D and sales of new energy vehicles by other auto manufacturers will also affect the structure and demand of the U.S. new energy vehicle market to a certain extent. Combined with the current international trend of rapid development

of new energy vehicles, the U.S. government's willingness to support the development of the new energy vehicle industry may be greater, and the evolution of the US. new power vehicle industry may harbor great potential. The Tesla Model 3 model display is shown in Figure 3 [3].



**Figure 2.** Tesla motors [3].

## **5. Current status and trends in developing Japan's New-energy vehicles manufacturing industry**

### *5.1. Current situation of the industry*

Japan has a relatively deep accumulation of new energy vehicle technology. Its hybrid electric vehicles are in the world's top sales. Japan is also an early launch of new energy-pure electric vehicle countries. In recent years, Japan's new energy vehicle development has slowed down and lagged behind developing new-energy vehicles in China, Europe, the USA and other regions due to its main reliance on fuel engine technology advantage to produce fuel cars and hybrid vehicles.

### *5.2. Development trend*

At the end of 2021, Toyota CEO Akio Toyoda announced a sales target of 3.5 million electric vehicles per year by 2030, which means that Japan's new energy vehicle market may gain greater development in the next decade. Some information suggests that the explosive growth of new energy vehicles in Japan will occur between 2025-2035 through the accumulation of technology in this field of vehicles powered by new energy sources and economy still maintaining development and relatively stable consumer demand for cars. However, the data suggests that the Japanese auto market has matured and sales and ownership figures have stabilized in recent years, so future explosive growth in new energy vehicles may not reach the growth rate of a large developing auto country like China [4].

## **6. The development status and trend of China's new energy vehicle industry**

### *6.1. Current situation of the industry*

In May 2022, the value added of China's national industry above the scale up 0.7% year on year, of which the production of new energy vehicles was 108.3% year-on-year [5]. The People's Republic of China Ministry of Industry and Information Technology said on June 14 that cumulative sales of new energy vehicles in the country of China increased significantly from 20,000 units at the end of 2012 to 11.08 million units at the end of May this year. World leader in the production and sales of seven from 2015 onwards. China's new energy vehicle manufacturing industry is developing at a rapid pace, and is in the market leadership in the global New Energy Vehicles industry. With regard to policy, China has recently had a series of policy statements favorable policies to promote the development of the industry for new energy vehicles. The policies of the 2020-2022 new energy car automotive industry are summarized in Table 2 [6].

**Table 2.** China's policies on new energy vehicles in recent years.

| Time | Publishing Department                                                                              | Policy Name                                                                                                                                     | Highlights                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------|----------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2020 | Office of the Council of State                                                                     | Announcement on the Issuance of the New Energy Vehicle Industry Development Plan (2021-2035)                                                    | Implementation of new energy vehicle base engineering upgrading plan. Breakthroughs in core technologies and product support technologies, such as automotive-grade chips, automotive operating systems, new embedded systems and electrical and electronic architectures, and high-efficiency and high-density drive motor systems. Support basic components, key production equipment, high-end test instruments, development tools, high-performance automatic testing equipment and other basic common technology research and development innovation. |
| 2021 | State Council of the Central Committee of the Communist Party of China                             | Opinions on the complete and accurate implementation of the new development concept to do a good job of carbon peaking and carbon neutral work. | Vigorously develop low-carbon and environmentally friendly industries. Accelerate the development of a new generation of information technology, new energy biotechnologies, new materials, high-end equipment, new energy vehicles, green environmental protection, aerospace and marine equipment and other strategic emerging industries.                                                                                                                                                                                                               |
| 2022 | State Council                                                                                      | Fourteenth Five-Year Plan" Comprehensive work plan for energy conservation and emission reduction                                               | Take the lead in phasing out old vehicles, take the lead in purchasing and using energy-saving and new energy vehicles, and equip new and existing parking lots with electric vehicle charging facilities or set aside conditions for the installation of charging facilities.                                                                                                                                                                                                                                                                             |
| 2022 | State Council                                                                                      | Announcement of Metrology Development Plan (2021-2035)                                                                                          | Conduct research and test evaluation of new energy vehicle batteries, charging facilities and other measurement and testing technologies, and strengthen the study of smart car measurement and testing methods and infrastructure construction.                                                                                                                                                                                                                                                                                                           |
| 2022 | Ministry of Industry and Information Technology, Ministry of Public Security and other departments | Further strengthen the guidance of new energy vehicle enterprise safety system construction                                                     | Strengthen the analysis of operational data mining. Encourage enterprises to strengthen the analysis and mining of vehicle operation data, sort out the regularity and universality of safety issues and take timely improvement measures to continuously optimize the safety performance of products in different scenarios. Encourage active research and application of advanced Safety warning methods, and constantly improve the safety warning capability of new energy vehicles.                                                                   |

## 6.2. Development trend

Electrification of commercial vehicles is advancing step by step. New energy commercial vehicles have not yet been in use on a large scale because of the technology. As the technology continues to mature switching heavy trucks and the power battery technology of pure electric heavy trucks, the new energy heavy trucks are likely to reduce the quality, optimize the appearance and greatly improve the range, which will greatly promote the process of electrification of commercial vehicles.

Integration of new energy vehicles and emerging technologies is accelerating. New energy vehicles and the Internet, big data, artificial intelligence, and other emerging technologies to accelerate the integration of energy from new sources of vehicles, the degree of intelligence, networked new energy vehicle products increased significantly, adaptive cruise, automatic parking and other automatic driving technology popularity continue to rise, the convenience and satisfaction of people's travel will be raised to a new height.

New energy passengers for China cars account for a large proportion of new energy vehicles, and both new energy passenger cars and new energy commercial vehicles available now are pure electric vehicles, which account for the largest proportion. The data shows that the proportion of commercial vehicles in China accounted for 5.25% of new energy vehicle sales, while the proportion of pure electric vehicles reached 98.48%, 98.48%, indicating that the promotion and application of new energy commercial vehicles in China is not high, and there is still a long way to go, much room for development, and pure electric commercial vehicles will become the main development form of commercial vehicle electrification [7,8]. 2021 China's new energy car sales structure is shown in Table 3 [9,10].

**Table 3.** Proportion of various types of electric vehicles used.

| Type                          | Account ratio | type           | Account ratio |
|-------------------------------|---------------|----------------|---------------|
| New Energy Passenger Cars     | 94.75%        | Pure Electric  | 77.67%        |
|                               |               | Plug-in Hybrid | 17.05%        |
| New Energy Commercial Vehicle | 5.25%         | Pure Electric  | 5.17%         |
|                               |               | Plug-in Hybrid | 0.09%         |

## 7. Conclusion

It is believed that new energy vehicles have a broad development prospect. With policy support, technological innovation, increased market demand and accelerated energy transition, new energy vehicles will become an important part of future transportation. New energy vehicles not only have the advantages of environmental protection and high energy efficiency, but also will have more intelligent functions and better user experience, such as automatic driving technology and vehicle networking. In addition, with the advancement 5 and cost reduction, penetration rate of new energies vehicles will gradually increase. For the global automotive market, new energy vehicles are also a huge business opportunity. Major automakers have already started to invest a lot of money and energy to accelerate the development and production of new energy vehicles. With the gradual growth of the new energy vehicle market, more and more new energy vehicle companies will emerge, further promoting the development of the new energy car sector. Overall, future prospects for new energy vehicles are very bright. Even though still facing some challenges, with policy support, technological innovation and increased market demand, new energy vehicles will become an important development direction for the automotive industry of the future and make an important contribution to the global economy, environmental protection and energy transition.

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