



Research on New Fuel Vehicles and Its Development Status in China

Yuxuan Chen^(✉)

Aquinas International Academy, Hangzhou 310000, Zhejiang, China
gaoming@cas-harbour.org

Abstract. In recent years, the new fuel vehicle industry has become the focus of the world, and hybrid electric vehicle, as one of the most important directions of the development of the new automobile industry, has received unprecedented attention. China's industrial development is also very rapid. This paper introduces the classification of new fuel vehicles and focuses on the main development trends and policy changes of new fuel vehicles in China. It also compares the development trend of other international and Chinese new energy vehicles and explores the reasons why the development of new energy vehicles is blocked. This paper also gives the development prospects and suggestions of new fuel vehicles in China. This paper mainly uses comparative analysis and data analysis to compare the new energy vehicles in China and the United States and analyzes the data in the market. In the future, more and more pure electric vehicles will appear in the market, and new fuel vehicles will be accepted by more people.

Keywords: Battery · New fuel vehicle · Status · Development · China

1 Introduction

In recent years, the new-type electric vehicle industry has become the focus of all countries in the world, and hybrid electric vehicle is one of the most important directions in the development of the new-type automobile industry. For example, Italy will ban the production of fuel engines in 2035. This paper introduces the classification of new vehicles, the changes in China's policy on the development of new energy vehicles, the relationship between Chinese buyers and sellers, and the comparison of new fuel vehicles between China's development and that of other countries. This paper focuses on the main development trend and market trend of new fuel vehicles in China. It also compares the development trend of other international and Chinese new energy vehicles and explores the reasons why the development of new energy vehicles is blocked. This paper also gives the development prospects and suggestions of new fuel vehicles in China. To a certain extent, it can give the researchers experience guidance and has a certain degree of innovation.

2 Introduction of New Fuel Vehicles

Simpson Spence &, a shipping consultancy Young (hereinafter referred to as “SSY”) points out in a report released recently that the carbon dioxide emissions of global shipping in 2021 will reach 833 million tons, compared with 794 million tons in 2020, with a year-on-year growth of 4.9% [1]. With the increase of carbon dioxide in the air, and the emissions of automobile exhaust account for 7.5% [2] of the carbon dioxide emissions of the whole society, the temperature the chamber effect is more and more serious, the melting of glaciers, the increase of average annual temperature, and many small animals have lost their homes due to the increase of greenhouse gases, such as penguins and polar bears. So people decided to help themselves and animals by turning gasoline in their cars into electricity or other materials to reduce air pollution.

2.1 The Concept of New Fuel Vehicles

New energy vehicles refer to the use of unconventional vehicle fuel as the power source (or the use of conventional vehicle fuel, the use of new vehicle power device), integrated vehicle power control and drive advanced technology, the formation of advanced technology principle, with new technology and the new structure of the car. At the same time, new fuel vehicles are also known as zero emissions zero pollution vehicles. It will also greatly reduce car emissions and improve air quality.

2.2 Classification of New Fuel Vehicles

2.2.1 Hydrogen Cars

Now the mainstream new fuel vehicles on the market are classified into hydrogen vehicles, natural gas vehicles, oil-electric hybrid and pure electric vehicles. A hydrogen car is a car powered by hydrogen, which converts the chemical energy generated by a hydrogen reaction into mechanical energy to drive the vehicle. Hydrogen vehicles are divided into two types. One is the Hydrogen Internal Combustion Engine Vehicle (HICEV) [3], which is powered by the combustion of Hydrogen (usually through decomposition of methane or electrolysis of water). Hydrogen Fuel cell vehicle-FCEV makes hydrogen or hydrogen-containing substances and oxygen in the air react in the Fuel cell to generate an electric motor, which drives the vehicle. Widespread use of hydrogen fuel as a transportation energy source is a key factor in the hydrogen economy. The biggest advantage of using hydrogen as energy is that it reacts with oxygen in the air and only produces water vapor discharge, which effectively reduces the air pollution problem caused by traditional gasoline cars. Secondly, the energy conversion efficiency of fuel cells can be as high as 60%–80%, 2–3 [4] times that of internal combustion engines. The fuel cell itself has no noise, no movement, no vibration, its electrode only as a chemical reaction site and conductive channel, itself does not participate in the chemical reaction, no loss, long life. Hydrogen fuel comes from a wide range of sources and can be obtained from renewable energy sources that do not rely on petroleum fuels. But although gasoline is more dangerous than hydrogen, hydrogen is a highly flammable and volatile substance that has often raised concerns about its potential dangers. Hydrogen lacks odor compared

to gas, which makes leak detection nearly impossible. Transporting hydrogen is also a daunting task because of its lightness. Oil can be transported safely because most of it is pushed through pipelines. Coal can be easily transported by dump trucks. Hydrogen also poses challenges when considering transporting it in large quantities, which is why it is mainly shipped in small quantities. So, the transportation price is also very high four or five times the price of regular fuel [4].

2.2.2 Gas-Fueled Vehicles

Natural gas vehicle A vehicle powered by natural gas. Natural gas, which contains more than 90% methane, is a good fuel for car engines. Stable combustion, no detonation, and easy to start hot and cold. Compressed natural gas storage and transportation, decompression, combustion are carried out in a strict sealed state, not easy to leak. In addition, its gas storage cylinder passes various special destructive tests, safe and reliable. Compressed natural gas combustion safety, less carbon deposition, reduce gas resistance and knock, is conducive to prolonging the service life of engine components, reducing the number of maintenances, greatly reducing maintenance costs. Reduces engine oil consumption. Using compressed natural gas can significantly reduce carbon monoxide, sulfur dioxide, carbon dioxide emissions compared to gasoline. And no benzene, lead and other carcinogenic and toxic substances harm human health. However, due to the low energy density of gas fuel, natural gas vehicles carry less fuel and generally travel shorter distances than gasoline vehicles. Since gaseous fuel occupies a certain volume in the combustible mixture in the cylinder (the volume of fluid fuel in the cylinder of a gasoline engine is ignored), less work is done when using natural gas as fuel for the same cylinder working volume. Natural gas is gaseous fuel and is not easy to store and carry. In order to do so, it needs to be pressurized or liquefied for easy bottling, and it also needs to build a refueling station that costs more than gasoline and diesel stations [5].

2.2.3 Gasoline-Electric Hybrid Vehicles

The biggest characteristic of petrol-electric hybrid vehicles is fuel-saving, because when starting and accelerating, with the assistance of an electric motor, it can reduce fuel consumption. In addition, the electric motor can drive the car only at low speeds, and the engine and electric motor can share the power when the speed increases. The point is that the driving range is longer, of course, compared with pure electric vehicles, in addition, the low rotation and high torsion characteristics of the motor also make the vehicle's start and acceleration performance is better, the comprehensive 100 km fuel consumption is lower than ordinary gasoline engines, and can also enjoy subsidies. It can also reduce the emission of carbon dioxide appropriately. The defect is unable to directly use the engine to drive a car, must put gasoline engine combustion heat energy into electricity, electricity to drive the car, in the process of energy conversion, definitely will cause energy loss. Compared to other types of hybrid vehicles, their program has a higher mix of energy, so the conversion efficiency is lower, which is difficult to change quickly [6].

2.2.4 Battery Electric Vehicles

Battery Electric Vehicle (BEV) is a Vehicle powered entirely by rechargeable batteries such as lead-acid, nickel-cadmium, nickel-metal hydride or lithium-ion batteries. Although it has a long history of 186 years. As for pure electric vehicles, it greatly improves environmental protection and 0 pollution. Secondly, it has low noise and no loud engine sound like a fuel engine. Meanwhile, the cost of pure electric vehicles is only one-fifth of that of gasoline cars, and the energy efficiency is high and can be recycled. However, the mileage of today's pure electric vehicles is very low, the battery storage is very low, and it cannot be driven for a long time. Meanwhile, the charging is very slow, and it cannot be fully charged in a short time.

3 Analysis of the Development Status of New Fuel Vehicles in China

3.1 China's Relevant Policies

Due to policies and other reasons, the sales of new fuel vehicles in China have gradually increased in recent years. The demand for the convenience of travel increases, and with the enhancement of environmental awareness, there are new requirements for green travel. In this context, new energy vehicles emerge at the historic moment. Combined with the need for environmental protection, The Chinese government attaches great importance to the development of new energy vehicles. The 14th Five-Year Plan of China has clearly mentioned the focus on strategic emerging industries such as new energy vehicles and the implementation of future industry incubation and acceleration plans in hydrogen and other industries. In the New Energy Vehicle Industry Development Plan (2021–2035), the development goals of new energy vehicles in 2025 and 2035 are clarified. Under the impetus of the policy, China's local automobile manufacturers such as BYD, Geely, JAC and other enterprises have begun to deploy for the research and development and manufacturing of new energy vehicles. As early as in the “five-year” period, the “five-year” period means the plans are major national construction projects, the distribution of productive forces and the important proportion of the national economy, and sets targets and directions for the long-term development of the national economy. New energy vehicles are also a big project in China, so they are also included in the policy. The new energy vehicles plan has been put on the agenda by China. 1995 national Ministry of Science and Technology will be the development of new energy vehicles set as “ninth five-year plan”, key projects during the period of “15”, national 880 million investment during the Olympic Games were created by the electric buses, during the period of “11th five-year plan” in our country put forward the industrialization of new energy vehicle development and attention of strategy, “Twelfth five-year” plan to make the production and marketing of new energy vehicles plan, requirement of new energy automobile production volume reached 1 million in 2015 [7], during the period of “much starker choices-and graver consequences-in” Ministry of Science and Technology, Ministry of Industry and Information Technology sectors through the implementation of the national key research and development plan of “new energy vehicles” special, strong industrial base construction, technological upgrading projects, such as arrange financial capital 2.7 billion yuan, We will accelerate technological breakthroughs in new energy vehicles.

**Projected top BEV Players
I.H.S. Forecast 2025**

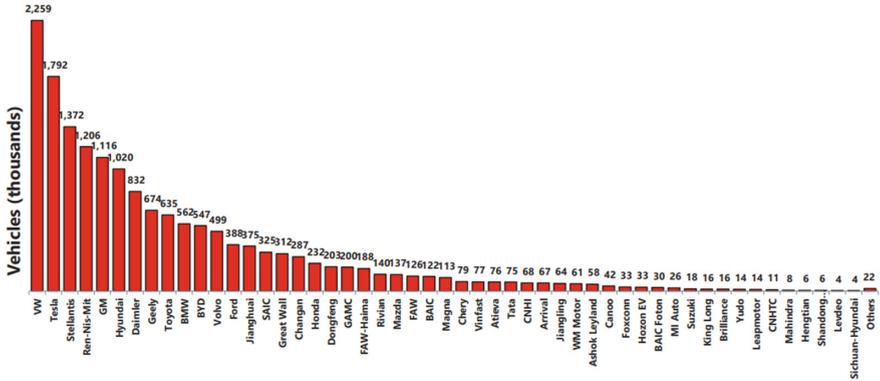


Fig. 1. Projected top BEV players I.H.S forecast 2025. *Original by the author

3.2 Sales of New Fuel Vehicles in China

Some enterprises represented by BYD took the lead in strategic planning and vigorously developed the new energy industry, and achieved initial results. According to the China Association of Automobile Manufacturers, 20,477 new energy vehicles were sold in the first half of 2014, surpassing the sales for the whole of last year and increasing 2.2 times year-on-year. Byd’s neV market share reached 37%, among which BYD Qin was the sales champion in the first half of the year with 5,357 units sold, accounting for 97% of plug-in hybrid sales. In the area of public transport, BYD has signed orders in Nanjing, Hangzhou and other cities. In addition, the K9 electric bus has been tested in many overseas countries and regions, including Europe, the United States and Asia [8]. During the 2008 Olympic Games, many Chinese auto manufacturers launched “green” new energy vehicles, and Chery A5 hybrid and Geely TX4 hybrid cars were also put into use during the Games. For the policy support, many car manufacturers are happy to be the production of electric cars, as the price of an electric car is cheap more than 130000 yuan [9]. With the mileage of electric vehicles starting from 300 km to 500 km in recent years, it is expected to reach 1000 km in the future. The market can substantially narrow the mileage gap between new energy vehicles and fuel vehicles. Make more and more people begin to accept new energy vehicles (Fig. 1).

In the next two to three years, the competition pattern between the head companies will continue to maintain, and more changes and adjustments will occur in the waist companies. According to the data of the Passenger Car Association, from January to October 2021, the cumulative retail sales of new energy passenger vehicles in China have exceeded 2 million and reached 2.139 million units. It’s the car’s performance, such as battery capacity and charging speed, that will affect buyers’ reactions. Most buyers remain skeptical about the current battery capacity, so sales have not increased significantly. Sales in China are on average higher each year.

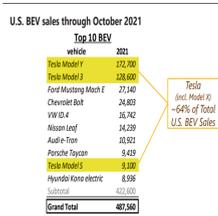


Fig. 2. U.S. BEV sales through October 2021. *Original by the author

4 Analysis of the Development Status of New Fuel Vehicles in the United States

However, not only in China, but the United States also has the same policy to promote people to buy new energy vehicles and strengthen environmental protection. According to the law, American taxpayers can enjoy corresponding tax rebates on eligible plug-in hybrid electric vehicles and pure electric vehicles newly purchased after December 31, 2009. The specific calculation method of the refund amount is as follows: Starting from the vehicle power battery capacity of 5 kWh, the corresponding amount is \$2,500; for the part larger than 5 kWh, the amount is \$417/kWh, and the upper limit is \$7,500 [10] (Fig. 2).

5 The Development Prospects and Suggestions of New Fuel Vehicles in China

With the construction and development of society, the total amount of energy is gradually decreasing. People’s environmental awareness is increasingly strengthened, which also makes new energy vehicles become an emerging industry in society. In order to further promote the development of new energy vehicles, it is necessary to clarify the advantages of new energy vehicles. The biggest advantage is highlighted in environmental protection, zero pollution and zero emissions.

People need to keep pace with the times and constantly pursue new technologies. Countries, enterprises and consumers are eager to see the rise of the new energy automobile industry. To further promote the development of new energy vehicles system, first of all, it is needed to possess a binding policy to limit excess emissions of production and sales of cars. The enterprises whose emissions of cars are beyond the standards need to collect a certain amount of air pollution control costs. At the same time, encouraging hybrid cars to achieve rapid development. On this basis, the exhaust emission standards need to be clarified, to achieve the effect of completely replacing fuel vehicles. Secondly, it is necessary to do a good job in the performance and safety testing of new energy vehicles, clarify the responsibilities of different sectors and create a healthier operating environment. The United States is now studying how to increase the battery capacity and reduce the weight of cars and build better-charging stations. There are only 160 quick-charging stations in China, far fewer than in the US. Therefore, for pure electric vehicles, China needs more rapid charging stations to ensure the driving of pure electric vehicles.

6 Conclusion

A variety of new fuel vehicles in China have been supported by the government, which makes China's new energy has a better development. In the future, new fuel vehicles will gradually replace fuel cars in the market. The future development of Pure electric vehicles in China will be improved year by year, and the growth rate in the market will also be greatly improved. The paper lacks some data searches, and a variety of search engines can be used to further expand the search scope of data and information.

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