

# An Investigative Study on the Development Strategies for Electric Vehicle Enterprises

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*Abstract:* - With the continuous development of science and technology, cars have become an indispensable means of transportation for human beings in daily travel. More and more cars appear in our life. In recent years, as consumer awareness of energy conservation and environmental protection has increased, global demand for sustainable development has increased, and many new energy vehicles. Because the non-renewable resources such as oil and natural gas needed by traditional fuel cars are consumed faster and faster, the exhaust emissions of traditional cars are polluting the environment increases, so new energy vehicles are the future development trend of the automobile industry. With the international context of the rapid development of new energy trams, the sales volume of electric vehicles in China's automobile market is not good. Through data analysis and industry research, the key factors and reasons affecting the development of electric vehicles are found, make certain suggestions to Chinese new energy electric vehicle companies, in order to change the current situation of low sales of new energy vehicles, the report objectively and truly analyses the future planning of the development of Chinese electric vehicle enterprises and the change of the development trend, as well as the moderate fine-tuning of the sales pricing.

*Key-Words:* - Electric Vehicles (EVs), Strategic Development, Transportation, Green Energy, Automotive

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## 1 Introduction

With the development of economic globalization, residents' demand for cars is increasing year by year, and they have higher requirements for quality of life. More and more cars are produced, sold, and used [1]. While providing people with convenient and efficient services, the exhaust emissions of fuel cars and the consumption of non-renewable resources and fuels bring a lot of trouble and harm to human life. Automobile exhaust contains hundreds of different compounds. The main pollutants emitted by automobiles are carbon monoxide (CO), hydrocarbons (HC), nitrogen oxides (NO<sub>x</sub>), carbon dioxide (CO<sub>2</sub>), and particulate matter (PM). Automobile pollution has become a global public hazard, and its contribution to the increase of greenhouse gas concentration cannot be ignored [2]. The internal combustion engine of a car is a small chemical plant, consuming a lot of oil resources. The combustion of gasoline generates a driving force, but also produces a lot of complex chemical reactions, emitting many greenhouse gases, aggravating the greenhouse effect, bringing great challenges to the ecological balance, but also to the optimization and improvement of the global environment has caused huge pressure [3].

In the 1960 s, the oil crisis makes people pay attention to pure electric cars again this time it actually entered the industrialization stage of the continent, in the middle of the oil crisis has frequently, this period became the human cannot ignore a problem, people have realized this problem, and began to reflect on the increasingly serious environment will bring mankind huge disaster, The electric motor is small, does not pollute the environment, does not emit exhaust gas, the noise is very small so that people re-examine the pure electric vehicle. Driven by capital, in those ten years, the driving technology of electric vehicles has made great development, pure electric vehicles have attracted more and more attention, and small electric vehicles began to occupy a fixed market, such as golf course mobility scooters [4].

The biggest problem that hindered the development of electric vehicles in the 1990s was the lagging development of battery technology and the market pressure of traditional car manufacturers to develop hybrid cars to overcome the problem of short battery and range. This time frame is best represented by Plug-in hybrid electric vehicles and hybrid electric vehicles. the plug-in hybrid is a kind of new energy vehicle between pure electric vehicles and fuel vehicles, which has the engine, transmission,

transmission system, oil circuit, and fuel tank of traditional cars. There are also pure electric vehicle batteries, motor, and control circuit, and the battery capacity is relatively large, and there is a charging interface; It combines the advantages of pure electric vehicle EV and hybrid electric vehicle HEV, which can not only achieve pure electric and zero-emission driving but also increase the driving range of the vehicle through hybrid mode. -----hybrids electric vehicle is a compromise between conventional vehicles and fully electric vehicles: It simultaneously uses the internal combustion engine of traditional vehicles which can be designed smaller and the motor of fully electric vehicles for hybrid driving including battery and inverter links, reducing the demand for fossil fuels and improving fuel economy, thus achieving energy saving, emission reduction, and greenhouse effect mitigation.

## 2. Research Background

At the beginning of the 21st century, with the continuous development of science and technology, the range of electric vehicles keeps increasing, which can meet the needs of some residents in daily life. Therefore, many electric vehicles pour into the car market and get a part of the market share.

### 2.1 China Automobile Market

The People's Republic of China has a land area of 9.6 million square kilometres, which is the third largest country in the world. The People's Republic of China is the world's most populous country, according to the latest statistics, about 1.42 billion people in the China statistics bureau [5], at the same time, the People's Republic of China is the world's second-largest economy, gross domestic product in 2021 totalled \$17.7 trillion, according to the international exchange rates came second in the world, second only to the United States, In purchasing-power-parity terms, it ranks first in the world. China is the main sales target market for major auto production companies due to its vast land and large population, good economic development, and sufficient purchasing power of local people [6].

China's domestic car market has also continued to grow rapidly since the country joined the World Trade Organization in 2001. In 2009, for the first time, China surpassed the United States to become the world's largest auto producer and seller. The rapid growth of China's automobile market benefits from the market-oriented and liberalized economic reforms and the increasing degree of opening to the outside world. Although liberalization still has a long way to go, it has attracted large amounts of foreign investment and boosted imports of cars and auto

parts. At the same time, rising income levels, continued urbanization, and the implementation of China's economic rebalancing policy aimed at increasing household consumption have all boosted the demand for automobiles. Despite the large volume of car sales in China, the car ownership per 1000 people in China was only 204/1000 in 2021. In 2019, according to World Bank statistics, the number of cars per thousand people in China was only 173.

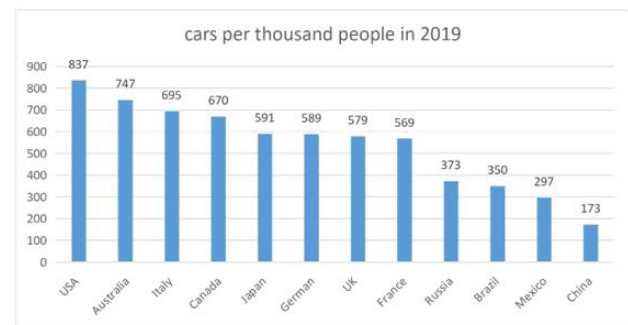


Figure 1. No of Vehicles per x1000 in 2019

### 2.2 China's Economic Development

China's economy, which has grown rapidly since the country's reform and opening in the 1980s, has shown a trend of contraction in recent years despite the global economic downturn. China's economy has maintained steady and sustained growth. In 2021, China's gross domestic product reached 114 trillion CNY, an increase of 8.1 percent compared with China's gross domestic product in 2020 [7]. China's disposable income is 35,100 CNY, up 9 percent from 2020. Chinese residents for transport and communications consumer spending as much as 3156 RMB per person, compared with 2020 increased by 14.3%, so the Chinese residents for transportation spending good trends, demand increased year by year, and the economic situation is not good in the world at present, the Chinese people have strong consumption ability to buy cars, China's auto market is a market with strong potential [8].

### 2.3 International situation

At present, the global energy and environmental systems are facing great challenges, and the automobile, as a major consumer of oil and carbon dioxide emissions, needs to undergo revolutionary changes [9]. The global development of new energy vehicles has formed a consensus. In the long term, pure electric drive, including pure electric and fuel cell technology, will be the main technological direction of new energy vehicles. In the short term, gas-electric hybrid and plug-in hybrid will be an important transition route. At present, the development of global new energy vehicles is still

facing some common problems, such as breakthroughs in key technologies, the transformation of the automobile industry, infrastructure construction, and consumer acceptance [10]. For example, the United States has long focused on the strategy of reducing oil dependence and ensuring new energy security. It takes the development of new energy vehicles as an important measure to fundamentally get rid of oil dependence in the transportation field and determines the strategic position of new energy vehicles in the form of laws and regulations. During the Clinton administration, there were programs aimed at improving fuel economy, and hybrids were the main technological solution. In the Bush era, it became a pursuit of zero emissions and zero oil dependence.

The technical solution was mainly hydrogen fuel cell vehicles. Later, there was a plan to achieve 20% oil replacement and savings in ten years, mainly by biomass fuel. Now. Developed countries such as Europe, the United States, and Japan attach great importance to the core content, using the government, enterprises, and research institutions of the R&D system for different degrees of research and development. However, the differences in the basis of the automobile industry, industrial advantages, and development ideas in different countries eventually form different technical emphasis routes. Japanese companies take hybrid as their main models and have developed gas-electric thermal hybrid technology that can be applied on a large scale. Europe is involved in the fields of thermal hybrid power technology, pure electric vehicle technology, and hydrogen fuel vehicle. Hydrogen fuel vehicle is the focus of European research and development, including both hydrogen fuel cell vehicle and hydrogen internal combustion engine vehicle. In addition, Europe is the world leader in the field of biodiesel vehicle industrial applications. In terms of technology research and development and industrial practice of new energy technologies in the United States, they mainly focus on hydrogen energy and fuel cell vehicles.

In recent years, Tesla Company created by Musk has achieved great success in recent years, gaining a global reputation in the trolley field and becoming the industry leader in the trolley industry [11]. In 2020, Tesla sold 147,997 cars in China, of which 94% were domestic Model 3. Its global sales volume is 499,550, and the sales volume in the Chinese market accounts for 29.6%. In 2021, the global registered sales volume of new energy vehicles is 6,501,400. Tesla wins the global sales volume with 935,700, which is 1.6 times of BYD in the second place, accounting for 14.4% of the global new energy passenger car

market. The pure electric market accounted for 20.3%. At the same time, the strong rise of Tesla also leads the wave of the development of new energy electric cars. More capital and talents enter the industrial chain research and development of new energy electric cars, injecting new vitality into the new energy electric car industry. What follows is the continuous improvement of market competitiveness. Due to the new crown the spread of the epidemic that began in late 2019 led to the development of the global economy, the current decline in global chip industry production, demand for the auto chip in the new energy car is great, and a lot of chip manufacturing industry chain supply can't support the demand of the new energy car, also leading to a fall in new energy capacity of electric cars, compared with the rapid development of a few years ago, In recent three years, the growth rate of the new energy trolley industry has been reduced.

### 3. Literature review

New energy car entered the Chinese market, the new energy market share increased year by year, and sales of electric cars and ownership is in rapid development, at present, China's vehicle ownership according to figures released by China's transport sector has been more than three hundred million vehicles, but until 2021 the Chinese market of new energy car market than just still account for 13% of the total market share, In China, the main body of automobiles is still fuel cars, which have stable power output. After hundreds of years of development, the vehicle manufacturing process system is mature, and the supporting service system of vehicles is gradually improved, so it still occupies a leading position in China's automobile sales market. However, the power source of fuel vehicles is non-renewable fossil fuels, which can obtain the target and ideal power output. However, the cost of using these fossil fuels is to produce a large amount of harmful automobile exhaust and noise pollution, which will make the fragile ecological balance faced with a more serious burden. For example: Forcing global warming to intensify, leading to the loss of ice in the Arctic and Antarctic, and extreme weather in many countries and regions, these ripple effects will cause untold harm to people in many regions [12]. Therefore, to reduce the occurrence of these natural disasters that cause great harm to human beings, increasing the market share of new energy trams is an effective way, which also shows the potential advantages of increasing the sales of new energy trams and the correctness of selection. In China's automobile sales market, before customers choose to

buy a car, there are a lot of factors: the rationality of the vehicle price, the exquisite appearance, the collocation of interior decoration, the noise of the vehicle, the comfort of driving, the use cost, and the cost of later maintenance.

### **3.1 Forecast of passenger car market structure and environmental impact analysis in China**

Through the analysis of the current passenger car market in China and the use of scientific digital modelling --The *Lotka-Volterra* model, the purpose is to predict the size of China's passenger car market in the next 30 years and the proportion between fuel cars and new energy trams [13]. According to this literature, it is finally predicted that in the Chinese car market in 2040, There will be a period of replacement between old and new energy sources. The planning of Chinese government decision-making departments and Chinese new energy tram enterprises will promote the new energy tram to become the mainstream of the market. The Lotka-Volterra model provides a new method to predict the relationship between market share changes. It can make comprehensive judgments from various aspects under the action of comprehensive factors such as the change in the international economic environment, the fluctuation of China's domestic market, and the change in the external natural environment. The ultimate purpose is to predict the relationship between new energy trams in the passenger car market from the perspective of the overall market. And the predictability of the growth of new energy electric cars and the importance of social decisions, to put forward policy suggestions [14].

From the perspective of market implementation, to continue to vigorously promote new energy electric passenger vehicles and to continue to promote the proportion of new energy trams in China's automobile market, China needs to give higher priority to new energy trams, such as the mandatory electrification of right-of-way, public or shared fleets [15]. Meanwhile, the Chinese government and enterprises should continue to strengthen the research and development of infrastructure, electric vehicle power batteries, and charging and discharging technologies. The government should focus on investing in the construction of clean energy upstream of passenger vehicles and strengthen the coordinated development of the industrial chain of new energy electric cars.

Considering the direction of setting energy conservation and emission reduction targets, China should set different energy conservation and emission reduction targets. In addition to achieving the maximum possible energy conservation and

emission reduction targets through technological innovation and green upgrading of each component, the level of atmospheric environmental pollution and some priority pollution sources should also be assessed to achieve comprehensive energy conservation and emission reduction and contribute to the global ecological environment balance [16].

From the perspective of policy measures, policies need to give technical subsidies to key enterprises and related technologies, and incentives should be slowly reduced. Use tax means to control the market, and macro-control the market to promote the progress of the new energy trolley industry and strengthen the implementation. At the same time, the establishment of a market exchange platform between enterprises and the government to promote mutual benefit and win-win results is in line with the goals of China's Belt and Road Initiative

### **3.2 Who buys New Energy Vehicles in China? Assessing social-psychological predictors of purchasing awareness, intention, and policy**

The literature investigates psychosocial factors to explain why it is important for Chinese drivers to buy new energy vehicles, including hybrid electric cars, battery electric cars, and fuel-powered cars [17]. Using six test dimensions: attitude, subjective norm, perceived behavioral control, personal norm, low carbon awareness, and policy [18], the author conducted a questionnaire survey on potential customers and obtained three main findings: 1. Low carbon awareness will have a slight regulating effect and influence on the purchasing behaviour of potential customers through psychological factors. 2. The influence of subjective norms is far greater than other social factors in customers' purchase intention of new energy electric cars. 3. The government has a positive influence on the new energy electric car and plays a positive role in its development in terms of policy tendency. The psychological factors affecting customers in the purchase process are used to objectively analyse the influence of these six dimensions on the purchase of new electric cars.

### **3.3 The government regulation and market behaviour of the new energy automotive industry**

Environmental issues and cleaner production are receiving increasing attention. Cleaner production with low emissions and sustainable consumption are of great significance. Traditional energy vehicles are more and more unsuitable for the development of today's society. New energy vehicles to accelerate the replacement of traditional energy vehicles is the trend in the current automobile market [19].

Support for government's new energy automobile market, the author has carried on the theoretical research, set up, including domestic and imported new energy automobile manufacturers, data model, through the analysis of the model, this paper argues that the government subsidies, tariffs, and other supporting policies can effectively expand domestic technology content low market share of new energy vehicles [18]. But this approach is not sustainable, as domestic NEVs with lower technology content can only survive in the market by narrowing the gap with imported brands. This paper establishes a Stackelberg model with product price as the decision variable and finds that when there is a technology gap, the first-mover advantage in the market will no longer exist. Finally, this paper compares the two subsidy methods of domestic new energy vehicles and finds that there is no difference between the two subsidy methods and subsidizing consumers or enterprises to expand market share [20].

Whether in the process of daily use or in market recognition, new energy vehicles are temporarily unable to be compared with traditional energy vehicles. Therefore, in the market competition between new energy vehicles and traditional energy vehicles, the new energy vehicle industry needs to rely on government support. In countries with relatively backward technology, to ensure the healthy development of the domestic new energy vehicle industry. Governments also need to erect trade barriers to reduce the impact of foreign products from high-tech countries on domestic industries.

Under the premise of the same government subsidy intensity, the government with the goal of maximizing social welfare is more suitable to take the way of subsidizing consumers to promote the development of the renewable energy vehicle industry. The principle of subsidizing consumers is different from that of subsidizing producers. When the government subsidizes consumers, an increase in disposable income leads to an increase in demand, which boosts production. The effect of government subsidies on consumers is more direct than subsidies to producers because the former avoids the possibility of producer fraud.

### **3.4 Hierarchical optimization decision-making method to comply with China's fuel consumption and new energy vehicle credit regulations.**

To achieve the goal of carbon neutrality in 2060, the Chinese government has put forward extremely high requirements for energy conservation and emission reduction in the new energy electric car industry [21]. The Chinese government's actions, due to fuel consumption and new energy vehicle credit policy

system has a significant impact on China and even the global auto market. Fuel consumption and new energy vehicles in China lack credit laws and regulations system evaluation model, based on the technological frontier curve hierarchical optimization decision-making model and contain China market and technology, product and enterprise data of database, using different algorithms for the future development of China's market planning industry feasibility of reasonable risk assessment. To improve the regulatory evaluation model of traditional fuel vehicles and new energy vehicles in China by establishing a dual monitoring system, to simulate and evaluate the technology compliance and policy impact under multiple regulations [22]. The authors put forward new ideas :

- A hierarchical optimization decision-making method based on technology frontier curve is proposed to guide the formulation and decision-making strategy of the industry technology roadmap of OEM.
- To evaluate the official credit supervision system of China's automobile market and put forward the quantitative evaluation of supervision synergy effect and policy compliance, which is conducive to the protection of the rights of producers and consumers.

### **3.5 Key Literature Summary**

According to the literature can be found in the introduction of China's car is still in the traditional fuel vehicles as the main market, new energy car is still in after a few years the rapid development of industry competitive disadvantage, so the analysis of the Chinese consumers are bought on data modelling using big data analysis summary, the influencing factors of consumers shopping choice: the early stage of the vehicle's price , the use cost of the vehicle during the service period: energy use cost, commercial insurance cost, and the maintenance cost of the vehicle caused by the aging of the vehicle. Secondly, the convenience of life, the comfort of driving, and the power output of the vehicle are all key considerations for consumers. At present most of the city planning in China is behind The Times development, led to the new energy vehicle parking and charging has become a main problem of urban development, the shortcomings of China's urban infrastructure services are a normalized problem, need spend a lot of time cost and government fiscal spending to meet the current rapid development of new energy car industry of high demand. From the perspective of the development of The Times, the development of new energy electric cars can delay the coming of energy crisis and the use of non-

renewable fossil resources to a certain extent, to seek more time for the development of cleaner and more convenient green energy. Another serious environmental deterioration in today's international, Eurasia up extreme climate, its basic reason is the increasing industrial development and energy consumption lead to a lot of pollution, the pollution is global warming and greenhouse effect induced catalyst, use clean green energy as the core power output can alleviate this destructive global disaster.

With the development of science technology, improving the core of the new energy battery technology has become the field of new energy car development acceleration and point to the policy, the popularization and research and development in terms of charging pile development, new energy car companies provide different types of charging service: alternating current (ac) slow filling and dc fast charging service, in guarantee under the premise of safety facilities for the product quality With great improvement and help, improve the service quality level of supporting services, provide a variety of choices to meet different needs. To improve the supporting service level of new energy trams and make the use of new energy trams more convenient and cost saving for consumers, will promote consumers' car purchase tendency and decision making. The goal is to increase the sales of new energy trams, expand the social influence of trams, and the theme of low carbon and environmental protection fits each other.

China's government in policy of macro regulation and control, from big help in the early development of new energy industry and made clear instructions to suit the Chinese market in the future, only the continued expansion of China's new energy market can mobilize more capital into the new energy industry, resulting in more powerful production power, and form a good circulation, complete carbon neutral policy goals.

## 4. Research Methodology

Paper mainly research in the present international situation is complex, the international oil price volatility, international industry competition is the increasingly fierce, increasingly severe ecological environment, and under the condition of non-renewable resources is used up big, the Chinese car market as the world's largest market, between the traditional fuel cars and new energy car market share, does not conform to the international principles of sustainable development [23], Chinese tram companies and local governments need to make

positive decisions on the development and promotion of new energy trams in the face of many pressures.

Through quantitative analysis of the social phenomenon of quantity characteristics, quantity relationship, and quantity change analysis and demonstration, using the PEST analysis method for the Chinese market to analyse all aspects of the social macro environment, understand the potential of China's new energy car market and rising space, at the same time also analysis the development of Chinese electric limitation and must be overcome. The goal is to improve the limitations of China's automobile market and enhance the sustainable development ability of the market. In terms of environmental protection, we can also reduce the consumption of non-renewable fossil fuels and the damage of automobile exhaust emissions to the ecological environment by reducing the use of fuel vehicles. Finally, realize the resource-saving and environment-friendly Chinese automobile market.

By new energy for China in the recent ten years of production and sales of electric vehicles, a new energy car company in the last ten years of production and operation, this paper analyses the data report of the Chinese government white paper and official documents issued by the transport sector, China passenger car association's official data were collected for reliable secondary data for proofreading. The annual trend and future development trend of the research data are finally combined with the objective and external environment of the Chinese market to make a reasonable analysis of the small market share of China's new energy trams and summarize the difficult development process and make a comprehensive discussion with PEST analysis. Also need to consider the limitations of secondary data: data correlation of poor, poor timeliness, accuracy, poor, telling the development of China's market competition pressure is great, in the new energy car need to improve their own core technology, the core technology of lead is superior to the traditional fuel vehicles, some short to make up for their own can quickly occupy the market more smoothly.

### 4.1 Research Philosophy and Approach

The methodology will use positivism, meaning that a research problem will be demonstrated through rigorous data analysis based on facts. In this article, the cause of the development of China's new energy car market downturn, the use of official data can be collected second-hand to prove that China's new energy electric transmission slower and less market share, the comparative analysis to the data in combination with the international environment and

the situation of complex cases, through some powerful measures to ensure the development of new energy car, Prepare in advance for future energy crises. Quantitative analysis and PEST analysis are mainly used Through quantitative analysis, the understanding of the research object can be further refined, to reveal the law, grasp the essence, clarify the relationship, and predict the development trend of the market more scientifically. In the face of China's auto market under the condition of unbalanced development, through objective evidence that the rational analysis of large data, the future of China's auto market is to develop new energy cars as the main, but the data analysis of the current 2021 come out conclusion is that China's new energy car industry compared with the traditional fuel vehicle is a disadvantage, low market share. At the same time, it also uses the PEST analysis method: politics, economy, society, and technology to conduct a macro analysis of the reasons for the small proportion of new energy trams in the Chinese market. The macro environment is used to make a comprehensive discussion according to the external and internal environment of China's automobile industry.

## 4.2 Research Theme and Objectives

### 4.2.1. Why do new energy vehicles have a low share in the Chinese market?

According to the data from the China Association of Automobile Manufacturers, the sales volume of new energy vehicles in China from 2016 to 2021 has been 510,000 [24]. The sales volume of new energy vehicles in 2016 accounted for 1.8% of the total car sales volume in China.

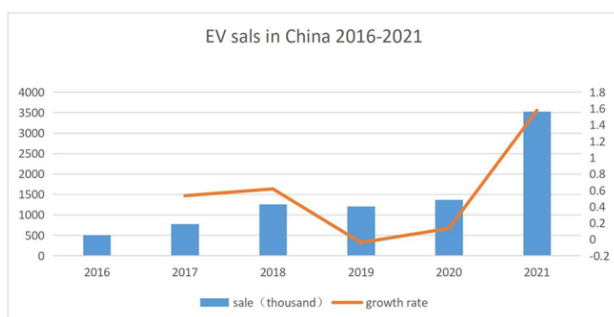


Figure 2. EV Sales in China (2016-2021) [24]

In 2017 and 2018, the annual sales volume of new energy vehicles increased by 53.3% and 61.6%, respectively, entering a rapid growth trend. In 2019, due to the economic downturn in the market, the shortage of chips in the auto industry led to a decrease in sales volume. The annual growth reached the lowest in the recent five years, as the total sales

volume in China's auto market decreased, and the share of new energy increased by 0.2% compared with 2018 [24]. In 2021, China's new energy vehicle sales had a dramatic growth, the sales of 3.52 million new energy vehicles, the growth rate was as high as 157.6%, and new energy accounted for 13.4% of the total sales [24].

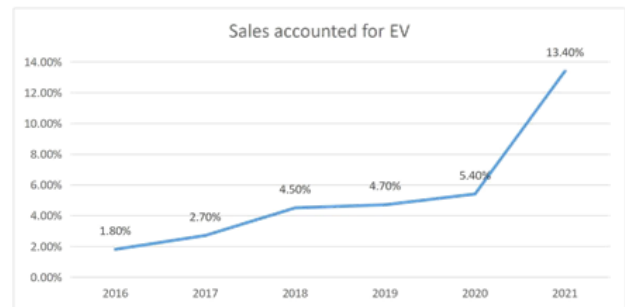


Figure 3. Sales Accounted for EV [24]

According to the chart data, although the sales volume of new energy vehicles in China is increasing year by year, and the production capacity of new energy vehicles is gradually increasing, the market share is still far smaller than that of traditional fuel vehicles after the development of recent years, and the mainstream of China's auto market is still fuel vehicles. New energy vehicles in the Chinese market are still at a stage of development.

### 4.2.2 How to promote the development of China's EV industry.

As an important part of the development of the future era, new energy electric cars can not only reduce the consumption of non-renewable resources of traditional gasoline vehicles but also reduce the harm caused by automobile exhaust emissions to the human body. Therefore, the vigorous development of the new energy vehicle industry is conducive to the progress of The Times, and improving the market share of new energy electric cars and fuel cars will bring a lot of benefits. As an important part of the development of the future era, new energy electric cars can not only reduce the consumption of non-renewable resources of traditional gasoline vehicles but also reduce the harm caused by automobile exhaust emissions to the human body. Therefore, the vigorous development of the new energy vehicle industry is conducive to the progress of The Times, and improving the market share of new energy electric cars and fuel cars will bring a lot of benefits.

### 4.2.3 Add the sales of new energy vehicles to improve the market share of the Chinese automobile market.

The emission of electric vehicle exhaust and large consumption of non-renewable fossil fuels will further deteriorate the unstable ecological balance. According to the current trend of The Times, increasing the sales of new energy vehicles can effectively solve the problem of environmental deterioration and improve the quality of life of residents. Rational use of renewable energy instead of fossil fuels, to ensure the sustainable development of the world's resources, and further make a good plan for human life planning in the future. In addition, the power source of fuel for cars is mainly oil, as a crude oil importer, China's great dependence on oil imports, with the international economic situation is not optimistic in recent years, the international oil price volatility, excessive reliance on a large number of imported crude oil to ensure that domestic demand, will lead to the national energy security threatened by the international oil price fluctuations, is not conducive to the steady development of China's economy.

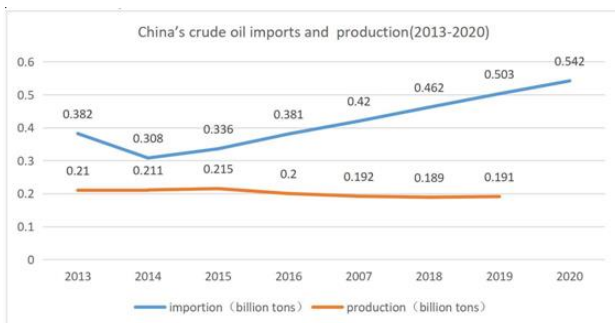


Figure 3. China's Crude Oil Imports [25]

### 4.2.4 Enhance market competitiveness.

The research and development of new energy vehicles are conducive to stimulating product upgrading and technological innovation in the automobile market, mobilizing the enthusiasm of automobile companies to research and develop new technologies, and finally contributing wonderful products to meet the needs of human production and life as well as the environmental protection requirements of nature in the competitive market. Finally, create a more perfect new energy vehicle to serve mankind. Only enterprises in a crisis will have enough motivation to improve the deficiencies of enterprise products, through product optimization and promotion to comply with the trend of market development. China's new energy car companies compared to the United States of the tesla, gm group, such as Germany's Volkswagen group started late,

the top technical level is not enough, the perfect degree of the industrial chain is also less, so the new energy car enterprises in China need to rely on a series of economic and policy measures to effectively improve the market competitiveness in the industry and can secure their market share, Ensure the sustainable development of the enterprise itself.

### 4.2.5 Environmental protection

Energy saving and emission reduction, reduce the use of fossil fuels, reduce the environmental harm caused by the exhaust gas of fuel vehicles, the adverse impact on human health, and create a more harmonious society. It has attracted worldwide attention since the 1990s. Among them, the car-oriented transportation area in the city has become the biggest battlefield for emission reduction. Countries around the world have issued strict automobile exhaust emission standards, and energy conservation and environmental protection have gradually become the hard requirements and key factors for the development of the automobile industry. Electric vehicles to meet the needs of environmental protection have emerged. In December 2015 [26], nearly 200 countries and regions under the United Nations Framework Convention on Climate Change reached the Paris Agreement at the Paris Climate Change Conference [26]. It is the second legally binding climate agreement after the Kyoto Protocol and sets out arrangements for post-2020 global action on climate change. Increasingly stringent environmental protection protocols will speed up the electrification process. In Europe, there are many developed countries that have already planned to realize real low carbon travel, improving the structure of Europe's energy use, currently in one of the most successful European countries, Iceland, is just the energy use of Iceland is more than 98% of its energy from renewable green energy, truly the status of the sustainable development of the energy [27]. China aims to achieve zero carbon emissions by 2060, At present, China is extremely dependent on fuel vehicles. At present, the volume of fuel vehicles in China is large, and it is difficult for China's automobile market to carry out the new energy transformation, and the transition time required is relatively long. Now, the technology of new energy trams needs to be improved, which will bring the development power to the industry under the incentive of the target. Therefore, measures should be improved before the general premise of improving the environment. The ultimate purpose of this research is to realize a resource-saving and environment-friendly society.



## 5. Research Analysis and Results

Through quantitative analysis and PEST analysis method, from the aspects of policy, economy, society, and technology perspective analysis of the subjective and objective factors of the status quo, get the improvement of China's new energy car industry and clear goals, the final summary analysis and give effective strategies and Suggestions to promote the sustainable development of China's new energy car industry.

### 5.1 Pest analysis method

*The political system, economic system, fiscal policy, tax policy, industrial policy, investment policy.*

The Chinese government's policy on the new energy tram industry is constantly changing with the change of time. China has determined the development strategy of new energy vehicles and supported the development of the industry chain of new energy vehicles. The marketing of new energy vehicles has been favourable. Since new energy trams entered the market, the Chinese government has given strong support in terms of policies. New energy automobile vehicle tax shall be exempted, new energy vehicles shall be exempted from tax, new energy automotive subsidies, adjustment of new energy subsidies, government agencies and public institutions to purchase new energy vehicles plan for a series of measures such as new energy car policy to protect the new market, new energy vehicles sales in China's auto sales market has a good start,

China's state council released in May 2015 policy - "made in China 2025" [28]. The main purpose was to support the development of China's automobile industry, encourage enterprises to actively master automobile low carbonization and intelligent core technology, promote new energy power batteries for electric vehicles, drive motor, transmission, vehicle research and development of core technologies such as artificial intelligence. It also enabled to form a complete production system from key parts to vehicle production, and ultimately promote the development of Chinese domestic brands, to shorten the distance between the international auto companies with advanced technology [28]. In December 2016, The State Council of China issued the 13th Five-Year National Strategic Emerging Industries Development Plan, which set a goal for the development of new energy electric cars, aiming to achieve the production of two million and the sales of new energy electric cars over five million by 2020 [29]. In addition, with the support of policies, enterprises related to new energy trams can gain more international competitiveness in the competition of China's

automobile market. In April 2020, the Ministry of Finance, the State Administration of Taxation, and the Ministry of Industry and Information Technology of China issued a new policy -- "Announcement on the Relevant Policies of the Exemption of Vehicle Purchase Tax for New Energy Vehicles". The Chinese government actively and positively guided the development of new energy vehicles from January 2021 to December 31, 2022, to reduce and exempt the purchase tax for new energy vehicles.

However, with the growth over time, the subsidies for new energy vehicles decline, and the government's support decreases. According to the official documents of the Chinese government, since 2015, the Chinese government has given huge preferential welfare policies to support the development of new energy electric cars in the market. To help the new power of new energy electric cars to hold the market share, the financial subsidies of the policy are surprising. Until 2019, subsidies for new energy trams with a range of less than 250km will be exempted, and subsidies for more expensive and longer-range models will be reduced, gradually making new energy trams adapt to the pace of competition in China's auto market.

Despite the Chinese government's strong policy support for the development of new energy trams The outbreak of the COVID in 2019 to now, the world economy, also led to the government's fiscal income reduction, reduced subsidies for new energy cars, also reduce the buyer's shopping enthusiasm for new energy cars [30], according to the data analysis in the future forecast China's push to achieve the goal of carbon neutrality date will be delayed with the change of the policy. Once the policy does not give financial subsidies, the price of new energy trams at the same level is much higher than that of traditional fuel planning, which will reduce the competitiveness of new energy trams in the automobile market.

### 5.2 Economic environment

China's second-hand car market is too large, and the market competition pressure According to the Ministry of Public Security, the number of motor vehicles in China reached 395 million in 2021, including 302 million cars; The number of motor vehicle drivers reached 481 million, of which 444 million were automobile drivers [31]. In 2021, 36.74 million motor vehicles were newly registered, with 27.5 million newly licensed drivers. The number of new energy vehicles reached 7.84 million. By the end of 2021, the total number of new energy vehicles in China reached 7.84 million, accounting for 2.60% of the total number of vehicles. Excluding scrap notes, the sales volume increased by 2.92 million compared

with 2020, an increase of 59.25%. Among them, the number of pure electric vehicles is 6.4 million, accounting for 81.63% of the total number of new energy vehicles [31].

The number of car transfer registrations in China continues to grow. In 2021, China's public security traffic administration departments handled 30.48 million motor vehicle transfer registrations. Among them, 29.23 million cases of car transfer registration business, accounting for 95.90 percent. In the past five years, the proportion of transfer registration of second-hand cars and registration of new cars has increased from 0.67 to 1.11, which is more than the registration of new cars. Under the positive boost of the policies such as the cancellation of the "relocation restriction" of second-hand cars and registration of second-hand cars in other places, the second-hand car trading market has become increasingly active. A used car in the car market tends to have better cost performance and can let customers use lower prices to get the ideal models, with the continuous development of social informatization, China's second-hand car trading market is increasingly mature and transparent, and the rights and interests of consumer protection are doing more and more in place, avoid the dealer to buy the high-priced trick, poor quality of used cars, The normalization of the market will allow used cars to have a better priority in vehicle selection and family utility. Car price is one of the main factors affecting the choice of car.

Due to the rapid development and innovation of new EV, the emergence of new technologies will lead to the reduction of the market value of the previous generation of trams, and lead to a low rate of car retention. Car retention is also an important consideration for Chinese customers before they buy a car. The development of new energy electric cars is like that of smartphones a few years ago. While developing rapidly and occupying a certain market share, the technology is also constantly improving, and the price is constantly optimized. For example, when Tesla first entered the Chinese market, the price of Model3 reached nearly one million CNY. After several years of upgrading and the establishment of a Tesla factory in Shanghai, China, Tesla increased Tesla's output. The price of Tesla Model3 has been reduced to 300,000 RMB, and the price of Model-Y has been reduced to 700,000-1 million RMB from nearly 2 million RMB in the past, depending on the cheap labour force and preferential policies in the Chinese market as well as the local material selection with high-cost performance. Therefore, the model of the new energy tram is too fast for the new one, which will cause the value of the sold vehicles to depreciate substantially.

### ***Parts-to-Whole Price Ratio***

The parts-to-Whole Price ratio of an automobile is the ratio between the sum of the parts price of a specific model and the sales price of the whole vehicle. As a durable consumer product, the initial purchase cost and subsequent use cost of an automobile are both large expenses. Therefore, the larger the zero ratios are, the more money needs to be spent on the later maintenance of the vehicle. Therefore, when buying a car, customers also need to consider the zero ratios of the car into the cost of using the car, which leads to the high Parts-to-Whole Price ratio of the car will increase the cost of using the car and lead the change in the choice of buying the car. The high battery maintenance cost of new energy trams is an important factor affecting car sales. The replacement price of power batteries for energy vehicles is determined by battery capacity, brand, and process type. , as the core parts of new energy vehicles, power battery costs are generally accounted for 40% to 60% of the cost of a car, and if the new energy car battery technology, carrying on the new energy electric vehicle battery model and types are different, so the process is more complicated, the technology is more advanced battery technology extra costs will be higher than the market average. When customers understand LingZheng than data, the consumer is relatively clear in replacement of parts of the maintenance cost and the link between the vehicle price, to know the maintenance cost differences between various brands, various models, to a greater degree under the existing conditions of increase consumers' right to know and options, high LingZheng than is new energy car sales slow growth in one of the original

### ***Use Cost of Vehicle***

New energy car on use cost depends on the country's lower prices, can be achieved with new energy car use cost low, 0.2 to 0.4 CNY per kilometres, and then the use of traditional fuel vehicle costs will change with fluctuations in international oil prices, represented by 2.0 t fuel vehicle, the fees will be in 0.9 to 1.2 CNY per kilometres of transport costs. It can be clearly seen that in terms of the use cost per kilometres, the new energy tram can save several times the energy payment per kilometres.

On December 27, 2021, the exclusive insurance of new energy vehicles was officially announced, and 12 mainstream property insurance companies began to sell exclusive new energy vehicle insurance products simultaneously. The biggest change is that the premium of new energy vehicles is rising, especially since the insurance cost of electric vehicles is more expensive. The commercial insurance

structure of insurance companies, commercial insurance for electric vehicles begins to pay attention to the safety of the vehicle itself, especially the safety of the battery, as well as the possible losses caused to other vehicles by the occurrence of spontaneous combustion and deflagration. Therefore, under the new exclusive insurance, the battery, electric control, electric drive, as well as charging pile outside the car are covered by the insurance! And the maximum three insurance coverage of new energy vehicles can be increased to 40 million CNY. In fact, from the point of view of insurance companies, electric vehicles based on new energy vehicles substantially increase the premium, because electric vehicles related to accidents or unilateral accidents, easy to cause greater losses, such as the general fuel car parked in the parking space, after the flare out, generally there is no potential danger; However, when a new energy vehicle is parked in a parking space for charging, it is normal for the car to be burned down in case of fire or deflagrate, which will also damage other vehicles. To reasonably avoid risks, the premium of the new energy trolley rises. However, the comprehensive annual use cost of fuel vehicles and new energy electricity will find that the use cost of new energy tram for owners with small vehicle demand will be higher than that of fuel vehicles, so the advantage of low expenditure of new energy vehicles will be lost, which will affect the choice of consumption.

### 5.3 Social environment

China, the third largest country in the world, is in the east of Asia. The terrain of China declines from west to east, and the terrain is complex and diverse: plains, hills, mountains, pelvic floor, plateaued, depressions and other different topographies are intricately alternating. The density of population is a state of population distribution gradually decreasing from the southeast coastal zone to the interior. The dense population in the southeast coastal zone and the mature highway planning in the flat plain and hilly areas are well developed. The economic development of the provinces in the southeast is far beyond the economic development of the inland areas. Therefore, the objective geographical location factors have led to the unbalanced development of China's urban economy, and the degree of urban economic development has gradually decreased from developed to backward from the southeast coastal areas to the inland areas. As a result, the consumption ability of southwest, central, and northwest China is limited, the ability to buy transportation tools is insufficient and the market potential is low. In addition, in China's northeast and northwest regions,

new energy electric vehicles do not perform well in adapting to harsh natural conditions. In winter, the temperature in northeast China can reach below zero. According to the test results of current new energy trams, vehicle endurance and power are facing great challenges. In the face of the hot weather conditions, the power consumption of the new energy car project increase, and the vehicle's power output more, less range, in addition, most of the new energy car range is provided by the company under the condition of the ideal state of the argument, once the vehicle within open most of the electronics to produce electricity can influence range, There is a risk that the vehicle will stall or stall during use. Therefore, in the face of a complex geographical environment, the labelled range is not consistent with the actual mileage, and most fuel vehicles have been proven to have better performance in the face of these special road conditions after decades of practice. According to the winter endurance performance of six pure electric cars released by the China Automobile Research Institute, the winter endurance decline rate of electric cars is more than 30%, among which the standard endurance of Model 3 models is 36.9%; The endurance decline rate of NIO EC6 was 42.1%; Byd Han endurance decline rate of 30.9%; Xpeng P7 endurance drop rate is 42.3%; The BMW iX3's range drop rate was 36.6%; Ne Zha Pro 500 lunar version has an endurance drop rate of 42.4%.

China is the biggest developing country in the world, starting in the 1980 s reform policy development to the present, the urban planning layout is affected by the original backward city layout, only in the original city based on improvement and adjustment, optimize the structure of urban planning and so most of the layout of the city is limited by the past layout, There is a shortage of charging piles and parking Spaces in cities.

With the development of China's new energy tram market, car sales are also increasing year by year. However, with the development of new energy trams, supporting facilities in cities need to be improved, such as the development of charging piles. The endurance of the new energy tram relies on the output of electricity to provide the power source of the vehicle running, which is the core of the tram moving forward. Therefore, to ensure the endurance and normal use of the vehicle, it is necessary to timely charge the new energy tram. Due to the surging development momentum of new energy electric vehicles, the demand for charging piles also increases, and the growth rate of vehicles exceeds the growth of supporting facilities, resulting in the phenomenon of more charging piles and fewer charging piles for new energy electric vehicles. The

high installation cost of private charging piles will increase the car cost for customers, which will increase their concerns when buying cars. In addition, when installing private charging piles, it is necessary to declare with the local community and property management, and the complicated handling process will also affect the car purchase choice.

In the planning of supporting facilities in the city, there are few public charging piles, and public transportation tools such as buses need to be met first, while the charging demand of private new energy trams cannot be met. China is also a highway power, by 2021 China's highway traffic mileage of 169100 kilometres, inside of highway service area for charging pile supporting is less, can meet a lot of new energy car on the highway in the demand for charging, so often appear in the service area in long lines such as charging pile. These objective conditions also affect the choice of new energy electric cars for potential customer purchases.

And after 2008 years in China, the real estate industry is developing rapidly, but at the time parking planning is designed based on per capita vehicle ownership at that time, which also led to the many old residential space planning in China can't keep up with the growth of the vehicle speed, parking is always difficult for owners can become a headache problem, when can meet the case, car parked The charging demand of electric cars is more difficult to meet. In cities with a large proportion of old urban areas, it is difficult to effectively increase the sales volume and market share of electric cars. These objective infrastructure conditions also hinder the promotion of new energy electric cars in many areas. In addition, private charging pile installation is difficult, such as the capital of China, Beijing residents install private charging pile is the premise of the need for charging pile installation by means of a lottery, then also need and residence of the residents' committees and the examination and approval, after multiple processes to install personal charging pile, so private charging pile installation process is complicated, Multiple installation conditions. Also led to the low enthusiasm of many residents to buy new energy electric cars. For the installation of private charging piles, a sum installation fee is generally between 3,000 and 5,000 RMB, and the owner of the tram also needs to pay the installation fee personally. There are still many challenges in the installation of public charging piles in communities. According to the national conditions of China, parking Spaces in most communities belong to community owners rather than individuals, and the disassembly and installation of public facilities can only be carried out with the consent of

all community owners or more than 80% of owners. Due to the inconsistency between the interests of fuel car owners and the interests of new energy electric car owners, as well as the normal social problem of tight parking spaces, public charging piles in many communities are not installed and popularized. This means that when it comes to charging new energy electric cars, owners need to go outside the community for charging. The owner of the new energy tram needs to pay more effort into successfully charging the vehicle to meet the normal use of the next day.

#### 5.4 Technical environment

The production of new energy vehicles in China's car companies, the new energy car battery life, and charging capability has been the development of new energy car, Tesla, GM and so on the international big group for China's car companies for new energy car battery technology limited, contributed to the local Chinese car company's market competitiveness, Therefore, China's new energy electric car company still has great room for improvement in the competitiveness of transnational electric car in the world [32]. Over the past decade, electric vehicles, driven by rapid advances in lithium-ion battery technology, have dramatically transformed the automotive industry globally. However, fire risks and hazards associated with high-energy batteries have become a major safety concern for electric vehicles, where thermal runaway or fire can occur due to extremely abusive conditions, which can result from faulty operations or traffic accidents. Then, the failure of the battery can be accompanied by the release of toxic gases, fires, jet flames, and explosions. Common causes of electric vehicle fires include spontaneous combustion of parked vehicles due to arson or continuous abuse, such as fire during charging, spontaneous combustion while driving, and fire after traffic accidents such as high-speed collisions. Social security factors caused by these batteries are all important factors affecting car buyers' purchase choices [33]. As an inevitable choice for the future development of new energy trams, safety investigation in the driving process is the priority. At present, Chinese automobile enterprises lack the technical level to solve the fire caused by lithium batteries. At present, the charging technology of new EV can be divided into DC fast charge and AC slow charge [34]. However, the difference between a fast charge and the slow charge is that the slow charge uses standard charging current for charging, while a fast charge uses several times or even tens of times of current higher than the standard charging current for charging. AC charging pile,

commonly known as "slow charge": mature technology [35], low barriers, low construction cost, but low charging efficiency, suitable for public parking lots, large shopping centres, and community garages, AC pile has low requirements on the transformation of the power grid. It needs to change voltage and rectify the AC power of the power grid through the vehicular charger first, and then charge the car battery after converting it to direct current. Therefore, the charging speed is slow, and it usually takes 6 to 8 hours to be fully charged. DC charging pile, commonly known as "fast charging": high power, fast charging, but complex technology and high cost, suitable for professional centralized operation and maintenance scenarios, such as buses, taxis, etc. The DC charging pile can complete voltage converter rectification through its own AC/DC charging module and convert the input AC power into the DC power required by the trolley. The power of the DC pile is usually above 60KW. In 2020, the power of the newly added DC pile reaches 131KW. Dc piles have high requirements on the power grid, which requires the construction of a special network and equipment such as harmonic wave suppression devices. Therefore, they are mostly installed in centralized charging stations and managed by operators.

The vehicle pile ratio is one of the key indicators to measure the degree of charging pile construction. Since China National Point Network fully opened the construction of public piles in 2014 and The State Council put forward the strategic target of a 1:1 vehicle pile ratio is 2015, the proportion of the market retention rate of new energy trams and charging piles, From 8.8:1 in 2015 to 3:1 in 2021, the charging support has been significantly improved. Although there is still a gap between the 1:1 vehicle pile ratio and the target proposed earlier, the enterprise has verified the rationality of the vehicle pile ratio in practical application by adjusting the way of construction. With the increase in battery capacity and DC charging pile power, the user's focus will change from charging pile quantity to charging pile quality.

Reasonable public charging pile layout, power charging piles, and piles of private construction will offset part of the demand on public charging pile number [36], pile than expected, according to the ownership change car hard to volatility in the short term, medium and long term considering the sustained and rapid growth of new energy car ownership, so charging pile of form a complete set of equipment will be as the growth of the time will be improved [37].

## 6 Conclusions and Recommendations

China's market is too large, which also leads to the fact that once the Chinese government announces new policies, the desired effect cannot be achieved in a short period of time. In addition, China's national conditions determine that The State Council, after issuing new policies, conducts macro-control on the market and sets the general direction. Each provincial administrative department will need a policy based on the local actual situation of specialized processing, and every city in China does not match the demand for the new trolley, city of supporting facilities, such as China's Shenzhen, as a small fishing village from the last century 80 developed into China's cities, The reserve of urban planning and urban allocation facilities is more in line with the requirements of modern development. China's Xinjiang has a vast landform, and the desert adjacent occupies most of the area, so the local demand for vehicles is mainly SUVs with excellent endurance and off-road ability. Most cities are tens of kilometres apart, and most of them are deserted deserts. Therefore, the implementation of policies in these special areas is less than expected [38].

It takes too long for China's policy implementation to be effective. European countries can quickly make plans to achieve zero carbon emission according to their own conditions, while China's huge volume needs a long transitional period to achieve a zero-carbon emission target.

Battery charging technology, the core technology of new energy trams, is not perfect. As the largest developing country, the allocation of charging piles in most cities of China cannot meet the changing needs of all new energy trams, and the scarce parking Spaces in big cities cannot meet the changing needs of new energy trams. In addition, drivers need to waste a lot of time and energy in the process of looking for charging piles and waiting for charging. These objective factors will affect the subsequent choices of other potential car buyers. Therefore, the research and development and breakthrough in battery technology of new energy trams are the power source of the development speed of the tram market.

China's government and new energy car enterprises should develop new energy cars in strategic decisions in the target customer purchase priority, the government on policy support, enterprise in technology and service in the industry to improve the service quality and optimize the product efficacy, from upstream to downstream industry chain in all aspects of upgrading and development, shake to the dominance of traditional fuel cars at present.

## 6.1 Key Recommendations

### ***Publicize the advantages of new energy vehicles.***

The popularity of new energy trams is the trend of the future development of The Times. Therefore, the government and enterprises need to do a good job in publicity and make the advantages of new energy trams:

- [1]. Use electricity as the power source, instead of non-renewable fuel, reduce the consumption of non-renewable fuel, and save energy.
- [2]. Reduce automobile exhaust emissions and contribute to the protection of the environment.
- [3]. With the fluctuation and rise of international oil prices, the use of new energy trams can effectively reduce the use cost per kilometres.
- [4]. The noise of new energy electricity is low, and the noise pollution in the society is reduced. Publicity was carried out through social media and public platforms to improve the public's awareness and popularity of new energy trams.

### ***Improving the technical research and development of enterprises and improve the defects of new energy vehicles.***

New EV companies need to spend more on R&D funds and manpower to improve the enterprise's core technology, the purpose is to improve the shortage of the new energy car: charging low speed, low car battery life, trams for environmental adaptability of the weak, the autopilot of artificial intelligence, emergency auxiliary safe driving, automotive electronic components failure rate higher. Improve the market competitiveness of new energy trams compared to traditional fuel cars, seek more market share of sales, and become leading car industry.

New EV enterprises should also actively respond to local policies and policies and interpret the development direction and profit points of enterprises from the new policies issued by the government. While gaining more economic benefits, they should also continuously assume social responsibilities, save energy and reduce emissions, and make their contribution to the mitigation of global warming and greenhouse benefits.

In terms of the endurance capacity of new energy vehicles, automobile enterprises can actively research and develop electric changing technology. Compared with the energy replenishment of batteries of new energy trams by charging piles, the popularization and research, and development of electric changing technology is a more excellent choice. So far as the new energy car market share increase year by year, the popularity of charging pile speed and urban coverage are unable to meet the objective demand of residents use the user and the

contradiction of charging is increasingly intensified, charging and slowing the development of new energy car is the limited and short board, Tesla, BYD, xiao peng, the new energy car super-fast charging device, Compared with the previous slow charging equipment, the charging time is reduced and the charging efficiency is increased, but it is followed by the acceleration loss of the Dianchi lake of the new energy trolley and the increase of the charging cost. The appearance of the invisible super-fast charging cannot solve the core problems of charging difficulty and slowness. In addition to the uneven distribution of the public charging pile, super quick charge involves many on behalf of the interests, the interests of the distribution of meeting, cannot be obtained by slow speed for the popularity of the market, so in the way of a battery, appear have a reasonable opportunity for the development of electrical technology, also cannot leave China local policy support and huge capital market to promote.

According to the latest financial statements and annual summaries of new energy companies, Xinneng Electric Car company attaches great importance to the research and development of core technologies. Research and development costs account for a large proportion of sales revenue. Companies with a high proportion of the electric car market will devote more resources to technology research and development.

### ***Strengthen the infrastructure construction of charging supporting facilities.***

The urban planning department of the Chinese government needs to actively carry out urban planning in line with the needs of The Times. Reasonable planning should be carried out for supporting municipal facilities based on urban foundations such as urban changing stations, charging piles, and public parking lots, to improve the popularity rate of supporting facilities for new energy trams in inland cities. Starting from the government's upper-level design, public charging facilities should be improved to improve more convenient charging services for the people. According to the current world economic situation, the Chinese government can upgrade and construct supporting facilities in batches according to the needs of different regions for supporting electric cars, strengthening cooperation with social capital, and encouraging more private capital to participate in supporting infrastructure construction of new energy with policy support.

### ***Strengthen the construction of the power replacement stations.***

The battery technology of new energy trams has always been a social problem, and it cannot make a great breakthrough in a short time. Therefore, the core problems of battery life and charging, such as too long charging time, uneven distribution of charging piles, few charging Spaces, and the contradiction between the parking space occupied by fuel cars, are difficult to be fundamentally changed in a short time. The construction of the replace power station can meet the demand for rapid charging of most trams in a short period of time. The advantages are as follows;

- [1]. The power replacement mode realizes the separation of electric power and is conducive to reducing the cost of car purchase. With the reduction of subsidies for new energy vehicles by the Chinese government, the price of new energy vehicles at the same level is higher than that of fuel vehicles at the same level, relative to fuel vehicles with more mature technology and industrial chain. Under the power replacement mode, users can rent the power battery, which greatly reduces the cost of buying a car [39].
- [2]. The consumption time of battery replenishment is short. Taking the current power replacement station in Beijing, China as an example, EV can complete battery replacement in 2 minutes. Compared with the charging demand of 6-8 hours for slow charging and 0.5-1 hours for fast charging, the power replacement station has a better performance in time saving.
- [3]. It is conducive to the battery safety and service life extension of new energy batteries. The batteries of the power station are monitored, managed and maintained by the battery company, so that the batteries of EV can be more professionally maintained and more professional and reasonable.
- [4]. It can solve the voltage load requirements of many old residential areas in China, so that these residents can get effective power supplement. To solve China's livelihood problems [40].

### **6.2 Key Research Limitations**

The promotion and development of new energy trams will inevitably face some social and moral problems. For example, while new energy trams provide high-quality services, personal information and data will also be collected by new energy trams, and personal

privacy security will be ensured: The security protection of personal data such as a home address, common routes, and emergency contact information of family members, as well as the huge supporting industrial chain of fuel vehicles and corresponding social work positions in China, because most of the positions of new energy trams rely on big data analysis and artificial intelligence services [41]. This has led to a significant reduction in the number of jobs available for employment compared to those available for conventional fuel vehicles, and the social employment rate is also part of the ethical considerations.

The data in this paper are mainly secondary, and the data sources are mostly official data statements: Ministry of Communications of China, Ministry of Industry and Information Technology of China, Although the data of the National Bureau of Statistics, China Passenger Car Industry Association, and the annual statements of enterprises are highly credible and credible, the data are delayed to a certain extent, and the optimal solution cannot be obtained according to the latest national conditions.

As a developing country, China's city development is not balanced, charging infrastructure of the city construction and reconstruction is significant fiscal spending, for the local government's budget is a great challenge, in the prophase of in power station built huge investment, need the financial support of local government and private capital to cooperate, otherwise only on unilateral fastidious cannot meet the needs of urban planning Design needs, as well as the needs of residents to change electricity [42].

Different brands of new energy car battery design inspiration are not the same, also contributed to different specifications and installation guidelines, no uniform industry standard on the market at present, has led to the part in power station need only provide models as the place of the battery, there is no guarantee that all the models can enjoy the advantage of the benefits in the power station. The battery model reserve of the electrical charging station needs to conduct big data analysis and demonstration according to the reserve quantity of new energy trams in different regions, to obtain the ideal distribution quantity and meet the demand of the local market. Therefore, the calculation volume of these data is large, the data changes quickly, and the matching degree of the market is low. In terms of the later operation cost, the electrical charging station needs higher technical services to maintain, maintain and upgrade the equipment during operation.

The challenges faced by the power replacement station are the large capital investment needed in the early stage, the constantly changing market matching degree, the difficulty to unify the battery standard, and the low market compatibility, it can only solve most owners' charging demands. There will be less room for small businesses and less enthusiasm for research and development. Therefore, The establishment of the power replacement station has advantages and disadvantages, which should be decided by combining with the actual development situation of local electric vehicles.

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### Conflict of Interest

The authors have no conflicts of interest to declare that are relevant to the content of this article.

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