Development trend of electric vehicles in China

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Abstract: This paper discuss why Chinese government promotes the development of electric vehicles in this way and what benefits it can bring to the country and people. The purpose of this paper is to demonstrate that the development of new energy vehicles, led by electric vehicles, at this stage is a direction of development that is beneficial to the country and its people. The data in this article was collected by mean of quotations from other relevant papers, real-time news and the author's own experience. The article concludes that from the national level, it is a right decision to insist on vigorously developing new energy vehicles, led by electric vehicles, which can put China in the leading position in the global trend of electrification. From the people's level, the increasing popularity of electric vehicles has led to better air quality in cities, lower car costs, and other benefits.

1. Introduction

As early as 2001, the new energy vehicle research project was included in the "863" major scientific and technological topic during the Tenth Five Year Plan period. Since the eleventh five-year plan, China has put forward the strategy of "energy saving and new energy vehicles". The government attaches great importance to the industrialization of new energy vehicles, and new energy vehicles have successfully entered the Chinese market. In 2009, under the background of intensive support policies, China's new energy vehicles entered the track of rapid development. Although the proportion of new energy vehicles in China's automobile market is still very small, its growth potential in China's commercial vehicle market has begun to release. Compared with the cold reception in the passenger car market, "new energy vehicles" have begun to grow rapidly in China's commercial vehicle market. In 2010, China increased its support for new energy vehicles. Since June 1, Chinese government has started the pilot work of subsidies for the private purchase of new energy vehicles in five cities, including Shanghai, Changchun, Shenzhen, Hangzhou and Hefei. In July, Chinese government increased the number of pilot cities for the demonstration and promotion of 1000 energy-saving and new energy vehicles in ten cities from 20 to 25. Five cities were selected for the pilot of subsidies for the private purchase of energy-saving and new energy vehicles. New energy vehicles are entering the stage of comprehensive policy support. The first vehicles to enter the subsidy list include BAIC BAIC group new energy EV electric vehicle series, including BAIC new energy ev150 and ev160. In the next five years, new energy vehicles will begin to enter the industrialization stage, and will promote new energy city buses, hybrid cars and small electric vehicles in the whole society. With the support of national policies, new energy electric vehicles have developed rapidly and become more popular in China. This is a trend from fuel vehicles to trams. This is a policy implemented at this stage for the country, and it is gradually implemented from top to bottom. For ordinary people, they can now enjoy many preferential policies from the state, so that people can buy electric vehicles with less money.

This paper analyze the trend of the development of electric vehicles in China. Using draw the conclusion that its advantages outweigh its disadvantages. Data sources include papers from China, real-time Newsweeks,personal actual observations and surveys.

2. Advantages of electric vehicles

2.1. Benefits to the people

For the public, the advantages of electric vehicles themselves are: no exhaust pollution, less noise, less expenditure and less energy cost. Environmental protection: According to the calculation of the World Resources Research Institute and China environmental testing station, China accounts for 7 of the 10 cities with the most serious air pollution in the world, part of the reason due to the environmental pollution caused by automobile exhaust [1]. However, electric vehicles will not emit toxic gases and cause air pollution, which is the first advantage of electric vehicles compared with cars and other means of transportation. National Grid's estimates for electric vehicles show by 2010, the annual consumption of refined oil will be reduced by about 75,245 tons, the emission of carbon dioxide will be reduced by about 157,000 tons, the emission of carbon monoxide will be reduced by about 2104 tons, and the emission of carbon hydrogen compounds will be reduced by about 252 tons [2].

Besides, some people may say that after the battery of electric vehicles is worn out, it will also cause pollution. This view is no longer in line with reality. Because there is already a battery repair technology, which can quickly repair the old batteries. The old batteries can still be purchased and sold for money. At the same time, it can realize the unified management and treatment of waste batteries. Therefore, electric vehicles are a green means of transportation that will not pollute the environment. Although this technology is not widely used, it is still in the testing stage. However, the existing battery technology has been mature in vehicle installation. Vehicle electrification technology has entered the initial stage of popularization because of its significant energy-saving and emission reduction effect, low use cost and easy maintenance. Japan plans to have all the hybrid diesel engines on the Chinese mainland market by 2020. From 2009 to 2011, Mitsubishi, Nissan and GM began to sell mass-produced electric vehicles using lithium-ion batteries. The demand for power storage capacity during renewable energy utilization, the prospect of joint use of vehicle network and power grid, and the role of electric vehicles as emergency power supply in case of major natural disasters have further improved people's expectations for electric vehicles [3].

Energy saving: for the same journey of 100 kilometers, cars generally need 5-15 liters of gasoline and motorcycles also need 2-6 liters of oil, but electric vehicles only cost about 1-3 kwh. Due to energy conservation, the use of electric vehicles is much cheaper than other means of transportation. For example, for the same distance (about 1000 kilometers per month), it costs 600 yuan to use a car.Motorcycles cost 200 yuan, while electric vehicles cost 30 yuan. In addition, electric vehicles also enjoy the preferential treatment of government subsidies. There is no need to pay vehicle purchase tax when buying a car. At the same time, there will be subsidies for buying electric vehicles.

The average monthly use cost of electric vehicle owners in the first three months was $123 (about 787.81 yuan) and $306 (about 1959.93 yuan) in the first year. In contrast, the average monthly use cost of fuel vehicles in the first three months was $53 (about 339.46 yuan) and $189 (about 1210.54 yuan) in the first year. The average use cost of electric vehicles in the first three years is $514 (about 3292.17 yuan), while that of fuel vehicles is $749 (about 4797.34 yuan) [4]. However, over time, the use cost of electric vehicles will become cheaper and cheaper. Traditional fuel vehicles will need to replace more parts and accessories in the later stage, and the engine is more expensive than the battery.

The national government will increase or reduce the subsidy policies for some electric vehicles every year and quarter. Residents who buy electric vehicles will first be exempted from vehicle purchase tax, and then receive cash subsidies according to the purchased models. The findings show that the relationship between the new energy vehicle (NEV) market share and the NEV purchase subsidy, tax exemption, policy prohibiting the purchase of internal combustion engine vehicles (ICEVs), and the removal of traffic restrictions for NEV is positively co-integrated [5]. In comparison to the subsidy modifications in 2019 and 2018, the new policy will continue to enhance the technical index of endurance requirements in 2020, but the subsidy amount will decrease again, with a reduction range of 10% (pure electric) to 15% (all other) (plug-in hybrid). Furthermore, the findings suggest that implementing a NEV subsidy program might dramatically enhance urban air quality in

general, with a 1 percent increase in the subsidy scale resulting in a 0.15 percent reduction in air pollution [6]. For example, for models with a endurance of 300-400km, the subsidy will be reduced from 18000 yuan to 16,200 yuan. However, if you want to enjoy the subsidy this year, the price before vehicle subsidy should be within 300,000 yuan (including 300000 yuan) [7].

Therefore, for ordinary people, they can actually feel the benefits of electric vehicles.

2.2. Government policy

China government policies are also more inclined to electric vehicles than fuel vehicles. Electric vehicle has been assigned a top priority in the future development of the automobile industry in China [8]. Policy guidance and planning has played a vital role to the growth of new energy vehicle industry. They not only have direct concessions when purchasing, that is, reduction and exemption of vehicle purchase tax, but also can be directly licensed and unrestricted. They will be very practical in big cities such as Beijing and Shanghai. This list is also constantly improving and increasing. According to the catalogue of new energy vehicle models exempted from vehicle purchase tax (the 31st batch) [9] , as of April 2020, tens of thousands of models of pure electric and hybrid vehicles have enjoyed preferential policies. At the same time, in order to expand the proportion of tram market in the total automobile sales market, since the eleventh five-year plan, China has put forward the strategy of "energy-saving and new energy vehicles", and the government attaches great importance to the R & amp. In 2017, the state gave certain support to new energy vehicles from the aspects of production, sales and use. As shown in Table I, With the preferential and preferential policies, the sales of electric vehicles is very high in January 2021. In this year, the national policies mostly started with favorable environment to promote the development of new energy vehicles. Elon Musk, chairman and CEO of Tesla, said that Tesla will build the first super factory outside the United States and the most advanced electric vehicle factory in Shanghai, hoping to build it into a model of sustainable development [10]. Thus, under the current policy formulated and implemented by the Chinese government, electric vehicles will gradually replace fuel vehicles. This national policy has proved correct under the current circumstances.

Table.1. List of electric vehicle/ plug in hybrid vehicle sales in China Jan 2021 [11]

Pl.	Model	Num.
1	Wuling HongGuang Mini EV	36,762
2	Tesla Model 3	21,589
3	Tesla Model Y	9,597
4	BYD Han EV	9,289
5	GW ORA Black Cat	6,092
5	GAC Aion S	6,092
7	Chery eQ	5,379
8	Li Xiang One EREV	5,379
9	SAIC Roewe Clever EV	5,176
10	BMW 530e/Le	4,327

[a.] Source from: APSOLO

Therefore, with the Chinese government's strong and firm policy of gradually replacing fuel vehicles with electric vehicles, it will have a direct impact on the environment. The plan formulated by China's Hunan provincial government mentioned that it will completely replace and prohibit the sale of fuel vehicles as early as 2030. If this plan is widely implemented throughout the country, the

urban pollution caused by fuel vehicles will be completely solved. The surface transportation system accounts for approximately 85 percent of greenhouse gas emissions from the transportation sector [12]. Transport contributes around a quarter of global GHG emissions, and substantially more to urban air pollution. While heavy industry continues to pollute the air in China, the effects of these sources are steadily decreasing in cities, while traffic-related pollution is increasing [13].

At the same time, there is another reason why China adheres to the transformation from fuel vehicles to electric vehicles, which will have a far-reaching impact on China. That is to inquire about the long-standing oil shortage's impact on China's development. Finding alternatives to fossil-fuel-powered cars is one of the most pressing issues facing the globe today [14]. Vehicles that are both energy efficient and new energy vehicles are critical in tackling China's energy and environmental issues [15]. The main reason is that China can get rid of a series of energy supply problems caused by lack of oil by changing the fuel drive of fuel vehicles to electric drive. Although China is the second largest oil consumer and one of the largest producers in the world, it has no right to price oil. Moreover, China's oil source is extremely dependent on imports. At present, China's dependence on foreign oil has reached 72.45%. If we import 200 million tons of crude oil every year at an average price of US $75 per barrel, China's annual payment for imported crude oil is more than US $100 billion.

Table.2. China’s Crude Oil: Imports from 1980 to 2020 [16]

Channels	Barrel/Day
2009	8,240.409
2010	9,389.606
2011	9,738.767
2012	10,170.046
2013	10,667.760
2014	11,120.417
2015	12,066.485
2016	12,499.284
2017	13,137.010
2018	13,575.819
2019	14,005.099
2020	14,224.627

[b.] Source from: CEIC

Table.3. China's Oil Consumption from 2009 to 2020 [17]

Channels	Barrel/Day
2009	4,084.219
2010	4,766.664
2011	5,066.916
2012	5,423.805
2013	5,657.655
2014	6,177.503
2015	6,730.948
2016	7,625.353
2017	8,425.684
2018	9,260.166
2019	10,180.467
2020	10,852.615

[c.] Source from: CEIC

Compared with the shortage of crude oil, China has sufficient coal resources to generate electric energy. The country started to develop electric energy early, with a wide distribution and sufficient coal resources, so the new energy vehicles driven by electric energy are more favorable to the country. Electric energy substitution projects and quantity continue to increase. Since the guidance on electric energy substitution was issued by the state in 2016, there have been frequent electric energy substitution implementation schemes, rapid growth of projects, continuous expansion of the scope of involved fields, and rapid growth of electric energy substitution.

2.3. Preferential policies of each country

Globally, like the policies formulated by the Chinese government, Europe, for example, have formulated preferential policies on electric vehicles. For the purchase of electric vehicles by ordinary people, for example, the Belgian government has given individual car purchase subsidies of 4000 euros, purchase tax exemption, reduction of car registration tax from 1900 euros to 74 euros and so on. In addition to this, some governments have given subsidies to car manufacturers.From the perspective of automobile manufacturers, the production of electric vehicles can obtain environmental protection points and direct government subsidies.

Therefore, almost all countries are reminding of the preferential policies on electric vehicles. Furthermore, not only the preferential policies for purchasing electric vehicles, the government has also formulated policies for charging stations.

Table.4. Summary of major national-level charging infrastructure programs in selected markets, including budget [18]

Country	Program	Budget	Mechanisms of support
China	State Grid National fast charging corridors City government-funded construction in pilot cities		State-owned utility programs Public-private partnership Grants to local governments
France	Funding given 3,000 cities for 12,000 charge points EDF power company building nationwide DC fast charging network		Local governments apply for grants
Germany	€300 million for 10,000 Level 2 and 5,000 DC fast charging stations	€300 million($ 285 million)	Subsidies for 60% of costs for all eligible businesses
Japan	Next Generation Vehicle charging infrastructure Deployment Promotion Project	Up to 100 billion($ 1 billion)	Grants to local governments and highway operators Public-private partnership
Netherlands	“Green Deal”(curbside chargers on request)	€ 33 million($ 31 million)	Contracts tendered to businesses on project-by-project basis
Norway	Enova grant scheme from 2009 onward		Quarterly calls for proposals for targeted projects
United Kingdom	Curbside station for residential areas Highways England building DC fast charging stations along major roads in England	£ 2.5 million($ 2million) £ 15 million ($ 12 million)	Municipalities apply for grants; installers reimbursed Grants and tenders administered by public body

United States	Grants for funding public charging stations through American Recovery and Reinvestment Act	$ 15 million	Matching grants for local governments

[d.] Source from: PDX scholar

3. Electric vehicles short board

At present, electric vehicles still have shortcomings: they are not environmentally friendly enough and there is chaos in the industry. Although the text on the disadvantages of electric vehicles has increased in recent years after the gradual increase in the popularity of electric vehicles, I think these articles only see part of things and do not analyze them from a correct angle. Under the background of rapid economic development, China is facing many challenges, and countries all over the world are paying close attention to China's development. Seeking new energy driven by electricity can free China from many shackles. More than 70% of China's electricity comes from thermal power. In addition, there is a conversion rate at the battery charging point. Therefore, from the perspective of energy source, at least at present, the environmental protection of new energy vehicles and ordinary fuel vehicles do not have great advantages. Let's look at the layout of the automobile industry. It is true that new energy vehicle enterprises such as Weilai, Xiaopeng and Weima are in the design capacity In terms of technology reserve, it has its own place, but there are still a large number of "ppt new forces", in which a large number of national subsidies and policy preferences have not been in equal proportion in exchange for the vigorous development momentum of the desired industry. Two years ago, car making was still a sacred thing, "ppt car making" was an industry joke. Today, from the scandal of Ranger car to the appearance of LETV super car to the mass production and launch of Alibaba Internet car, the concept of "Internet car" is becoming more and more pragmatic [19]. Rich tycoons and start-ups from all walks of life flocked to embrace this emerging market. Although the attention of new energy vehicles is very hot, looking at the whole automobile industry, new energy vehicles are still a niche product, to become a prairie fire, it still needs a long time of market cultivation, supporting improvement and technological development. Therefore, the goal of improving oil import through new energy vehicles cannot achieve great results for the time being. According to national plans, there are four phases: the initial pre-development phase (2001–2011) protects nascent innovations; the take-off phase (2012–2020) develops core technologies and expands market share; the acceleration phase (2021–2035) strengthens the trend by encouraging key technological breakthroughs, infrastructure construction, and international cooperation; and the final sprint phase (2036–) further develops the low-carbon transition in Ch; and the final sprint phase (2036–) further develops the low-carbon transition [20]. In the process, the Chinese government has also adopted different policies to deal with these potential problems. The Chinese government has issued numerous policies to promote the development and adoption of new energy vehicles (NEVs) to address the problem of excessive energy consumption and environmental pollution. These policies were categorized into seven areas in this study: macro, demonstration, subsidization, preferential tax, technical support, industrial management, and infrastructure. Subsidies, technical assistance, and infrastructure policies are among the seven categories that need to be improved the most: Subsidies, technical assistance, and infrastructural policies all need to be improved immediately [21]. In summary, in the long run, with the emergence of more efficient battery technology and more environmentally friendly ways to obtain electricity, electric vehicles will gradually replace fuel vehicles and become the main communication tool in people's daily life.

4. Conclusion

In total, this paper indicates China's full development of electric vehicles according to its national conditions is a correct development strategy in the current environment. The development trend of new energy vehicles led by electric vehicles in China is gradually increasing speed, a correct development direction. The benefits to the public are a better urban environment (exhaust, air and

noise pollution), lower car costs (electricity and maintenance) compared to fuel cars, and purchase and subsequent tax benefits from the national government. For the government, insisting on vigorously promoting new energy vehicles, led by electric vehicles, will enable the country to gain a head start in the global trend of electrification and win a technological lead, as well as improve the domestic environment and make China's energy status higher in the international arena, freeing it from the shortage of crude oil. So far, the development of new energy vehicles in China is at an accelerated stage, meaning that the national government will continue to favor the development and support the development of electric vehicles, especially domestic car manufacturers. Under the accelerated development stage, China's electric vehicle market will further expand and the share of electric vehicles will become higher and higher, currently replacing fuel vehicles by 2050 and preparing for the arrival of the carbon neutral era in terms of commuting. Finally, the country's development of electric vehicles is also in line with the international trend, in the creation and innovation to obtain a breakthrough, leading the global development of electrification.

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