The Impact of China's New Energy Vehicles on the Realization of Carbon "Zero-emission" and Future Trend Analysis

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ABSTRACT
The "green earth" is the common home for human survival and development. Climate change is a serious challenge to the earth's ecosystem since global industrialization and energy is the fundamental problem of human society. Under the pressure of energy crisis and environmental pollution, it has become an inevitable choice to find new energy vehicles to replace fuel cars, however, the new energy vehicles, mainly pure electric vehicles and hybrid vehicles, are not completely harmless to the environment. The reason is that China's thermal power generation method is also very polluting, and the power industry has become one of the largest polluting industries in China.
Based on the meaning of carbon neutrality, this paper explores the impact of new energy vehicles in China on the market to achieve carbon "zero emissions", and analyses the contribution of new energy vehicles to the reduction of oil consumption and carbon emissions generated during battery power generation by accounting for the carbon emissions of new energy vehicles, providing a practical and effective solution to seek green development of the new energy vehicle industry from the top level. This paper argues that to achieve the goal of carbon neutrality by 2060, China needs to continuously optimize the supply and demand structure of new energy vehicles and vigorously develop the photovoltaic industry, which will be a huge driving force for achieving a low-carbon economy.

Keywords: *China new energy vehicles, Carbon neutral, Carbon emissions, Traditional energy, New energy, Photovoltaic.*

1. INTRODUCTION

1.1. Background

As global warming intensifies and countries become more environmentally conscious, the concept of "carbon neutrality" is being accepted by more and more countries. Simply put, carbon neutrality is the "break-even" of carbon dioxide. On September 22, 2020, the Chinese government proposed at the 75th session of the United Nations General Assembly to reach the peak of carbon dioxide emissions by 2030 and strive to achieve carbon neutrality by 2060. To achieve carbon neutrality, the top priority is to control carbon dioxide emissions. With 281 million vehicles in China in 2020, the automotive industry has been the hardest hit by CO2 emissions. To reduce carbon emissions, people need to make full use of new energy sources. In China, the new energy source with the largest reserves and strongest availability is solar energy. China has abundant silicon resources, which can produce sufficient monocrystalline silicon and polysilicon, and abundant solar energy resources in western China, which can drive the rapid development of the photovoltaic industry and promote the utilization of solar energy in the automotive field. At present, new energy vehicles have had an initial development in China, mainly pure electric vehicles and hybrid vehicles, using thermal power, the solar photovoltaic industry is not currently widely used in the automotive field.

1.2. Objective

The main objective of this article is to investigate the impact of new energy vehicles on zero carbon emissions

in the Chinese market. The analysis will be carried out from the perspective of carbon neutrality and new energy vehicles to investigate which aspects of new energy vehicles have an impact on achieving zero carbon emissions.

1.3. Related Research

With the increase of environmental degradation, nowadays many countries joined into an organization or they signed some treaties that have a goal of protecting the environment, by some technology called environmental friendly technology. This essay is about how those different countries improve their technology to form this goal. And mainly for China is analysis how they planting to achieve the goal by continuing carbon neutral, also compared with other countries' benefits to set Chinese future strategic deployment. All the passages were used to measure the amount of PCT patent application and tex clustering as methods to evaluate the Strategic objectives and layout [1]. In China, the auto industry represents a large market share also China provides a huge market for them, but it causes hardly environmental problems. To achieve the goal of carbon-neutral, technology needs to be improved to a better level. Meanwhile, it's a chance for the new energy automobile industry. This essay analyses the market demand, government policy and also provide some future plans in both industry side and the government side. The new energy automotive industry is such a new area, if set in the right direction of development, there will be a nice prospect [2]. With the environmental degradation and short of resources, new energy automobiles become an emerging industry based on their energy conservation and emission reductional production system. This passage collected some information from America, Japan, and European countries about theirs supply policy from the government, also analysis their countries' strategic deployment. Essay neaten those countries government budgets, taxation, and investment decisions aspects to analysis theirs advantages and what they need to do in the future [3].

Global warming has already become a severe problem for the whole world. The low carbon economy system turns into the best economic system to reduce carbon emissions. Low carbon system economy includes greenhouse gas reduction, reduce high carbon energy consumption,these 2 aspects. This article analyzes the Chinese present situation of climate that can be solved by specific development low carbon economy methods and also introducing low carbon economy theory and practice [4]. Based on analyzing the broad connotation of green manufacturing, Cao et al. elaborated the main contents of green manufacturing from several aspects, such as green manufacturing innovation model, product green evaluation, green design, green manufacturing process, and resourcefulness and remanufacturing, and analyzed the development strategy of green manufacturing, green manufacturing innovation institutions, green manufacturing standard system and norms, and green manufacturing enterprise practices at home and abroad. It also analyzes the current situation of green manufacturing development in several aspects, and finally gives the proposed strategies for the future development of green manufacturing in China [5]. Yu points out that among the various environmental crises faced by human beings, carbon emission is one of the more special ones, and the growth of carbon emission has a profound inner connection with the economic growth, public politics, and consumption culture of human society. To reduce the damage of carbon emissions to the ecological environment, people must try to break this linkage, replace "growth economy" with "ecological economy", replace "regional governance" with "global governance", and replace "regional governance" with "global governance". It should replace "growth economy" with "ecological economy", "regional governance" with "global governance", and "consumerism" with "low-carbon concept", to build a low-carbon society oriented by ecological civilization [6].

From the perspective of low-carbon transportation, Yan analyzed the reality of China's current transportation carbon emissions and growth trends that are causing serious harm to the environment, and reveals the importance and inevitability of developing new energy vehicles in China; he compares the development status of new energy vehicles at home and abroad and draws inspiration from foreign experiences for the development of new energy vehicles in China. China needs to address the healthy development process from the government-dependent "policy market" to the "mass consumption market" so that the development of the new energy vehicle industry can achieve the strategic goals set by the country [7]. Dixon presents an investigation of the potential for electric vehicles to i) reduce the CO2 emissions associated with their charging by selectively charging when grid carbon intensity (gCO2/kWh) is low and ii) assist in further 'greening' the grid by using excess wind generation in times when it would otherwise be curtailed due to lack of local demand and transmission capacity to transport the power elsewhere. It is shown that there is significant potential to absorb excess RES generation from the flexibility of electric vehicle charging [8]. Zhu reveals that China made progress towards its carbon neutrality target during the pandemic, and suggests the potential for substantial further de-carbonization in the next few years if the latest trends persist. Zhu evaluates the short- and long-term impact of COVID-19 on the energy structure and power-related emissions (nuclear power, hydropower, solar power, wind power, geothermal, biomass burning, waste burning, and other renewables). The driving factors behind power-related emissions are evaluated by decomposing changes in energy structure and electricity demand from each of the four main economic

sectors. The COVID-19 pandemic will have a long-lasting effect on the electricity system [9].

Zhou points that considering the immaturity of the market and supporting policies, it is important to study the effect and influencing channels of the emission trading pilots. The effectiveness of the national market may occur through different influencing channels, and researching the influencing channels can assist policymakers in further ameliorating the national market. Overall, China's emission trading pilots have driven a significant decline in the carbon intensity, resulting in an average annual decline of approximately 0.026 tons/10,000 yuan in the pilot provinces. Then, in the sample period, emission trading pilots had a sustained and stable effect on carbon intensity with no time lag. Finally, mission trading pilots reduce the carbon intensity by adjusting the industrial structure. In contrast, energy structure and energy intensity channels have not yet been realized [10]. Cao conducts a multi-model comparison of a carbon tax policy in China to examine how different models simulate the impacts in both near-term 2020, medium-term 2030, and distant future 2050. Cao finds substantial differences in the change in energy use and economic activity in response to a steadily rising carbon tax. The fall in GDP due to a carbon tax is modest, across these eight models the range is from 0.1 to 2% after 20 years of a medium-level carbon tax. The different models also show that if carbon tax revenues were recycled to households instead of tax cuts for enterprises, then consumption would suffer a smaller reduction, but investment and long-run growth might be depressed. The analysis of China's carbon tax using eight different CGE models also shed some light on the likely range of carbon tax policy impacts on the economy, energy system, and carbon reduction performances for the mid-term 2030 and long-run 2050 horizons [11].

2. CARBON NEUTRAL BACKGROUND AND CURRENT DEVELOPMENT OF NEW ENERGY VEHICLES IN CHINA

2.1. Requirements For Carbon Neutrality

Carbon neutrality refers to the total amount of carbon dioxide or greenhouse gas emissions produced directly or indirectly by a country, enterprise, product, activity, or individual over a certain period, which can be offset by using low-carbon energy to replace fossil fuels, planting trees, saving energy and reducing emissions, to offset the carbon dioxide or greenhouse gas emissions produced by itself, achieving positive and negative offsets and achieving relative "zero emissions".

To achieve carbon neutrality there are generally two approaches. Firstly, through carbon offsetting mechanisms, so that the carbon emissions they generate are equal to the carbon emissions they reduce elsewhere. For example, planting trees, purchasing renewable energy vouchers. Secondly, using low or zero carbon emission technologies (see low carbon economy). The ultimate goal is to use only low-carbon energy sources, not fossil fuels so that the amount of carbon released and absorbed back into the earth does not increase. Paying other countries or regions for the right to emit carbon dioxide through carbon trading can save money while keeping the emissions reduction target intact; however, it is often criticized for not achieving a reduction in total carbon dioxide emissions.

2.2. Development Of New Energy Vehicles

New energy vehicles were originally born out of energy scarcity and high prices, and as the global environment deteriorated people became aware of the dangers posed by traditional vehicles. There are many types of new energy cars, such as solar cars, clean energy cars, gas cars, hydrogen cars, and so on, all of which use the original charcoal-burning method of power generation to achieve the same effect. However, new energy vehicles have been slow to take up most of the market share, for two main reasons. First of all, as an emerging industry, its core technology is not mature enough, now it has not completely solved the problem of car charging or refueling, there is no way to set up so many refueling or charging stations like traditional cars, and equipment like charging piles are not always available in the market leading to a series of range problems. Secondly, the price is expensive, like clean energy is low in production and expensive, without solving the problem of providing resources before his cost is not reduced. There is also the national environmental awareness is insufficient, in the face of price, convenience, ancient cognition and a series of impact on, people usually no longer care whether it helps the environment they will only consider their convenience and affordable use. But national government agencies are supporting this industry, such as tax breaks and subsidies to support research. If these basic problems are solved, the development prospects of new energy vehicles are still very broad, and in the long run it seems that this is the industry that will focus on development, after all, the environmental problems have been so serious can not be allowed to continue to deteriorate, between countries will be involved in the development and competition.

2.3. The Relationship Between The Two

In general, new energy vehicles and carbon neutrality are mutually reinforcing. Firstly, the development of new energy vehicles can promote the achievement of carbon neutrality. The biggest difference between new energy vehicles and traditional vehicles is the difference in power source. The power source of a conventional car is the engine, which requires petrol or diesel to run and emits a large number of harmful substances such as suspended solid particles, carbon monoxide, carbon dioxide, hydrocarbons, nitrogen oxides, lead, and sulfur oxides.

New energy vehicles, however, are powered by batteries, with sources of electricity, such as solar and hydrogen energy. Electric vehicles do not produce exhaust fumes when they are in operation, thus significantly reducing emissions and contributing to carbon neutrality.

Conversely, achieving carbon neutrality will also promote the development of new energy vehicles. To achieve carbon neutrality, the most important thing is to reduce carbon emissions. Nowadays, cars have become a common means of transport, and the exhaust emissions they produce cannot be ignored. New energy vehicles, on the other hand, have no exhaust fumes. Therefore, to achieve carbon neutrality, the state will increase its investment in the field of new energy vehicles, which has facilitated the development and breakthrough of this industry.

However, there are still many imperfections in new energy vehicles. With electricity, mainly coming from thermal power, fuel-efficient, but power-hungry long-mileage pure electric vehicles do not reduce carbon emissions. And, waste batteries can be extremely polluting to the environment if not disposed of properly.

3. CARBON EMISSIONS FROM NEW ENERGY VEHICLES

3.1. Reduction Of Oil Consumption

As a poor oil country, China is not rich in oil resources. The growth rate of newly identified oil resources is slow, with an annual growth rate of less than 1% from 2018 to 2020. China's oil reserves have not changed much, fluctuating around 3.5 billion tons since 2015. However, with little change in the total value of oil reserves, China's oil consumption has been growing year by year, with a year-on-year growth rate of more than 5%, much faster than the growth rate of oil resources.

Under the circumstance that the supply of petroleum resources in China is less than the demand, China's oil imports are very large, and its external dependence is increasing year by year, which poses a huge strategic resource risk.

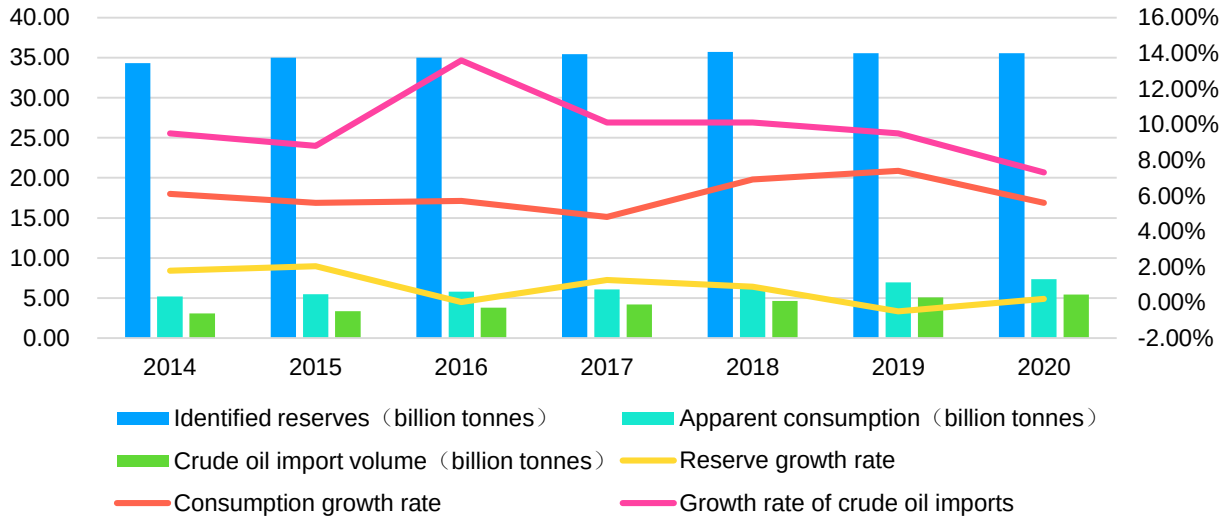

Figure 1 China Oil Identified Reserves, Apparent Consumption and Growth Rate, Crude Oil Import Volume and Growth Rate, 2014 - 2020 [12]

New energy vehicles generate electricity through batteries, saving a lot of oil resources. It is known that the annual fuel consumption of fuel vehicles in 2019 is 1.3 tons, new energy vehicles only consume 0.23 tons of gasoline a year, and new energy vehicles can save 1.07 tons of gasoline every year. From 2020 to 2030, new energy vehicles can save 300 million tons of gasoline.

Figure 1 shows China's determined oil reserves, apparent consumption and growth rate, crude oil imports and growth rate. China's oil reserves have barely budged, at around 3.5 billion tons. China's oil consumption is increasing year by year, and the growth rate is generally on the rise. China's crude oil imports are rising year by year. Crude oil import growth rate peaked in 2016 and began to decline in 2018.

3.2. Thermal Power Supply

The emissions of a vehicle consist of two phases - the fuel generation and the running phase. In the running (driving) phase, the new energy vehicle is powered by an on-board power source, with an electric motor instead of a fuel engine, and electrical energy is converted into kinetic energy instead of heat to drive the wheels forward form, in which no fuel is burned and no exhaust gases are emitted. Therefore, the emissions of new energy vehicles

are closely related to the fuel generation (power generation) stage, which means that the power generation method directly determines the emissions of pollution.

According to data from the China Energy Statistics Yearbook 2017 and the China Electricity Industry Annual Development Report 2018, in 2017, the country's full-caliber electricity generation was 6,417.1 billion kWh, of which 4,149.8 billion kWh was generated by coal power, accounting for about 64.67% [13,14]. Since electricity production in China is still dominated by coal power generation, the pollution generated in the process of power generation must be involved as an important factor in the calculation of the emission reduction effect of new energy vehicles.

Among the many discussions on the emission reduction effect of electric vehicles, one of the more mainstream is the Report on the Evaluation of Life Cycle Greenhouse Gas and Air Pollutant Emissions from Vehicles, published by the Chinese Society of Automotive Engineering in September 2018. The Report concluded that the GHG emission reduction benefits of purely electric passenger cars are 35% better than those of oil vehicles over the vehicle fuel cycle (including the upstream and operational phases of the vehicle fuel cycle); and purely electric passenger cars can significantly cut emissions of VOCs and NOs, helping to improve urban air quality[15]. However, as coal-fired power generation is currently the mainstay of domestic electricity generation, the PM2.5 and SO2 emissions from some pure electric passenger cars are no less than those from fuel vehicles during the fuel cycle.

4. FUTURE AND TREND ANALYSIS

4.1. Traditional Energy

The traditional energy used in the automotive field is mainly coal and oil. The future development of the automotive sector is inseparable from traditional energy sources. The market share of new energy vehicles is still small. New energy vehicles accounted for only 1.75 percent of China's car ownership in 2020. Most owners still own traditional fuel cars.

For a long time, pure electric new energy vehicles cannot be widely promoted mainly because of low battery power, high power consumption, and short driving range. These technical shortcomings cannot be greatly changed in a short time, and are far inferior to traditional fuel vehicles in terms of convenience and endurance. On the other hand, many people subconsciously recognize more traditional fuel vehicles, and they are still in a wait-and-see state of new energy vehicles. Therefore, even though the ownership of new energy vehicles has been growing, its market share is still small in recent years.

New energy vehicles still need to rely on traditional energy. The vast majority of new energy models currently on the market are pure electric (EV) or hybrid (HEV) models. HEV refers to a vehicle that uses both gasoline and electric drives. When the vehicle starts and stops, it only relies on the motor to drive it. If it does not reach a certain speed, the engine will not work. Therefore, the engine can always be maintained in the best working condition, with good power performance and low emissions. However, HEV only saves energy and does not achieve real zero pollution, zero emissions.

Electric vehicles are primarily electric vehicles, most of which are driven directly by electric motors. From the point of view of direct use of energy, Electric vehicle is environmentally friendly. Its energy comes from electricity, which does not consume traditional energy and does not produce waste gas pollution. However, the generation of electricity consumes conventional energy. The main source of electricity in China is thermal power generation, which accounts for 72.4% of China's power structure. And thermal power is burning coal.

To sum up, traditional energy will still play an important role in the automotive field for a long time in the future.

Figure 2 illustrates the ownership and the proportion of new energy vehicles in China. Although the ownership of new energy vehicles in China is increasing year by year, the proportion is still very small. In China, new energy vehicles are not yet popular, and most users still use traditional energy vehicles.

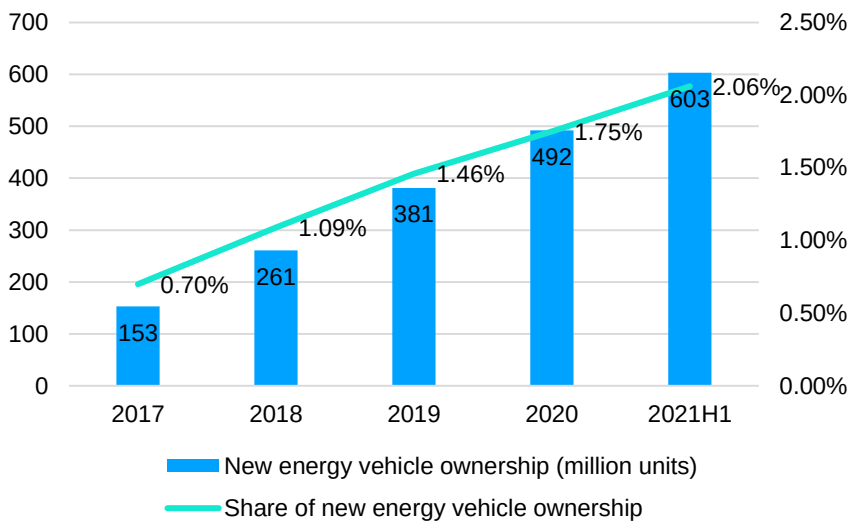

Figure 2 China's new energy vehicle ownership and share (2017-2021H1) [16]

4.2. Photovoltaic Industry

The solar photovoltaic effect is a phenomenon that creates a potential difference between a semiconductor or a combination of semiconductor and metal parts by using uneven sunlight. Simply put, this is what the public usually understands as solar power generation, and one of the ways to charge new energy vehicles is to use solar charging piles. The biggest advantage of this method is that it does not use conventional energy. Conventional energy sources have a low regenerative capacity, such as coal and oil and gas, which are formed in the earth's crust over millions of years. Like China has only enough proven coal reserves to mine for a few decades, so the traditional energy shortage type needs the attention of society. This is the time to consider the new energy, like wind power light, etc. Among them, the photovoltaic industry is the new energy industry with the least carbon emissions, as the input of a degree of electricity can be recovered in the whole cycle of 30-40 degrees of electricity, is good to achieve a low-carbon economy and the development of the use of photovoltaic industry to a certain extent to slow down environmental pollution at the same time with solar power generation mode can enhance the utilization of resources. And now new materials such as silicon wafers discoveries will drive the future development speed and development direction. If China conquers the difficult problems of technology and storage, the development prospects and investment potential of photovoltaic power generation are great.

5. CONCLUSION

This paper analyzes the current carbon neutral policy and the development status of new energy vehicles in China, and analyzes the carbon emissions of new energy vehicles from an energy perspective. It is concluded that new energy vehicles only have the advantage of saving carbon when driving compared with traditional vehicles, but they still emit carbon when manufacturing. At the same time, it should be believed that the development of photovoltaic industry has a great potential to achieve zero carbon emission of new energy vehicles. From the research results, it is clear that new energy vehicles cannot achieve zero carbon emissions yet, and it is necessary to keep exploring how to reduce carbon emissions during the manufacturing process in the future, and the photovoltaic industry can continue to explore and utilize it in a deeper way.

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