Problems and solutions in the development of new-energy vehicles in China

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Abstract: Over decades of development, China has topped the world in energy generation and consumption. Despite the great achievements that China has made in the development of energy, there remain salient problems, such as energy shortage, unreasonable energy structure, and environmental pollution, making it imperative to develop new energies. This paper analyzes the development status-quo of new-energy vehicles (NEVs), unveils the problems in the development of the NEV sector, and puts forth solutions to these problems from both the microscopic and macroscopic angles, with a vision to find a path of development featuring higher production, increased prosperity, and ecological well-being.

1. Introduction

The advances in ecology and society have increased people’s aspirations for a life of better quality. As a result, vehicles have become a necessary tool for travel in households, and the automobile industry has played a crucial role in economic and social progress. In the context of energy crises, China encourages energy conservation and emission reduction, making new-energy vehicles (NEVs) a new trend of development. NEVs not only alleviate energy crises but also reduce pollution, which is in line with the national endeavor of developing ecological civilization. Since the 18th National Congress of the Communist Party of China, the central government has made much effort to push forward the development of NEVs: providing policy support, investing labor, materials, and money, and enabling technical breakthroughs… Nonetheless, a range of constraints still exist to curb the progress of NEVs. As pointed out by President Xi, to move toward the new age of ecological civilization, we need to promote green development and low-carbon development, integrating ecological civilization into economic and social development [1]. While solving the problems in the development of NEVs and moving towards high-quality development, we need to pay attention to ecological civilization, so green development has become a mission needing prompt attention and actions.

2. Development Status-quo of NEVs

Over this decade, China has been holding up to the notion of green development, and on its way towards the goal of high-quality development, it has made enviable achievements in the development of NEVs. In July 2023, as reported in the Eco Forum Global Guiyang 2023, China has become the world’s largest producer of NEVs for eight years straight, and the inventory takes up over half of the world’s total, indicating that NEVs are gaining momentum across the nation.

2.1. Governmental support and favorable policies

As energy shortage and ecological civilization begin to gain public attention, the Chinese government has issued a range of policies to boost the development of NEVs. On Jan. 14th, 2009, the State Council passed the “Plan of Revitalization of the Automobile Industry” and proposed implementing the strategy of developing NEVs. On Feb. 17th, 2009, the central financial administration provided a one-time fixed amount of subsidy for pilot cities and demonstration organizations to buy or use energy-saving vehicles and NEVs, which marked the first time that the government promoted NEVs by way of direct financial subsidies. In 2011, the nation issued the need to initiate new pilot programs for the promotion of energy-saving or new-energy vehicles. In 2013, the policies that provide subsidies for NEVs were adopted across China. In November 2020, the “Development Plan for the NEVs Industry (2021-2035)” was released, which marked the start of the national policy to develop into a strong country of NEVs. The issuance of these policies encouraged more investment of automobile companies, and meanwhile boosted the progress of NEVs.

2.2. Technological innovation and progress

Technological progress is the key to the development of NEVs. For the time being, the NEV market is at its growing stage, though the trends differ among countries. The main NEVs on the market include the battery electric...
vehicle (BEV), the fuel cell electric vehicle (FCEV), and the plug-in hybrid electric vehicle (PHEV). In China, the BEV sector is well-developed, and the PHEV sector is gaining increasing momentum. The PLUS DM-i model of BYD, a typical model of PHEV, amassed the largest sales in 2022 among other PHEV models. Advances in NEV technologies, such as technologies regarding battery technology, electric control, and smart driving, have improved the performance and security of NEVs. China’s NEV policies have resulted in the emergence of domestic companies with strong technological capabilities in the production of core components such as rechargeable batteries[2]. Consequently, NEVs are becoming the leading trend in the automobile industry, providing a cleaner and more efficient way of traveling, thus enjoying a bright future.

2.3. Expanded market

The market need is the very drive that pushes forward the NEV sector, and now the NEV sector is heralding its prime age. With the support of policies, the NEV sector is seeing increasing needs, driving the NEV industry forward. As reported by China Automotive Industry Association, China’s NEV sector is undergoing exponential growth and now China ranks first in the world in terms of its NEV sales for eight years straight. In 2022, China produced about 7 million NEVs and sold 6.88 million NEVs, a year-on-year growth of 96.9% and 93.4%, respectively. The sales of NEVs in China took up 60% of the world’s total sales. In the next few years, as the public awareness of environmental protection and energy conservation increases, the NEV sector is bound to witness substantially stronger growth.

3. Problems in the development of NEVs

3.1. Technological limits and bottlenecks

As President Xi pointed out in the 20th National Congress of CPC, there are still bottlenecks in the high-quality development of NEVs and the industry falls short of technological innovation. Despite the steady growth of the NEV sector, China is a latecomer in this sector and faces technological bottlenecks. Besides, in the domain of mainstream NEVs, such as FCEVs and hybrid electric vehicles (HEVs), China is short of the core technologies and has a large gap with the leading countries in this domain. In terms of technological innovation, China is at the stage of technological improvement, and the innovative strength differs considerably among the subjects in this sector; research institutes and universities are in want of stronger capacities for innovation. In particular, the national strength in innovation of battery technology is weak. Though China has invested much into research on electric energy, batteries, and electro-motor, it is still seeing a wide gap with developed countries in terms of battery endurance, battery power, charging accessibility and security, energy-saving performance, and the engine system of vehicles. To resolve the problems that confront China’s NEV sector and grow into a world leader in the NEV domain, we need to overcome the technological bottlenecks before reaching healthy and sustained development.

3.2. Overdependence on governmental and market subsidies

The key drive behind the rise of NEV sales in China is policy support. However, over-reliance on policy support and governmental subsidies will put many Chinese self-developed NEV brands in an awkward situation. The average price of Chinese NEVs is around 200,000 RMB, and it is because of the governmental subsidies that the price reduces to a price slightly higher than 100,000 RMB. On one hand, cost control is challenging because of the high price of the batteries; on the other hand, market acceptance remains a concern. The price control of NEVs can only rely on the government. In 2023, the central government withdrew the subsidies for the NEV sector, posing a blow to the sales of NEVs.

3.3. Insufficient supportive facilities

At present, the supportive facilities for NEVs are insufficient, which hampers the promotion of NEVs on the market. Facilities like hydrogen refueling stations and gas stations are lacking; there are problems like insufficient fuel, crippled accessibility to fuel, and a shortage of maintenance stations that need to be solved. Allocation of charging piles is the foundation for the development of NEVs. Thus, to boost the healthy development of the NEV market, we need to rapidly increase the number of charging piles to remove the concerns about the development of NEVs.

4. Solutions for sustained development of NEVs

As President Xi has pointed out, we need to move steadily toward the carbon-neutrality goal and promote clean and efficient use of energy; in 2035, we will embrace a green lifestyle, secure reduction in carbon emissions after reaching the peak, and the ecology will improve substantially, reaching the goal of creating a beautiful China [3]. Developing NEVs is a crucial part of our initiatives to boost social and economic progress, and it is an indispensable section of our effort to reach the goal of creating a beautiful China.

4.1. Increasing governmental support and being market-oriented

4.1.1. Identifying the market position and making an effort on both the supply and demand sides

To create a high-level socialist market economy system, we need to make the market a decisive role in resource allocation while leveraging the power of the government.
We need to identify the market position of the NEV industry, find the point to make breakthroughs, and by taking into account the technical and financial factors, determine which vehicle models should be the focus of development. On the supply side, we need to avoid the repetitive construction of homogenous models while boosting market needs on the demand side. In general, the technology for the PHEV is maturing, and thus this model of the vehicle should be the focus of promotion; the PEV enjoys great potential, and the lithium batteries it uses have good performance, so it should be the optimal model for public transport, given its endurance mileage. The FCVE, which is more expensive and has less mature technologies, is not suitable for broad promotion in China.

4.1.2. Improving policy support and increasing R&D investment

The development of NEVs requires full-scale policy support. In the NEV industry, the government encourages its market expansion by issuing supportive policies. Specifically, the government can provide subsidies for NEV manufacturers or provide consumption subsidies for consumers to boost production and sales of NEVs. They can also enlarge the adoption of NEVs on the market by providing incentives or cutting taxes. For example, the South Korean government provides subsidies and tax reductions in the new energy vehicle industry, enhancing its price competitiveness, attracting customers to purchase cars, and promoting large-scale production of cars[4]. Moreover, the government needs to invest more money into research on the batteries of NEVs, create a battery industry chain for NEVs, and promote the upgrading of NEV technologies to ensure the healthy development of the NEV industry.

4.1.3. Improving supportive facilities and creating a complete service chain

The development of NEVs requires a complete system of supportive facilities, such as charging stations, charging piles, battery renting stations, and gas stations, and intensify the construction of charging facilities, which provide the most basic supporting facilities for the NEVs to displace traditional vehicles. It is necessary to provide an overall plan for allocation and the construction of maintenance service stations of NEV, and increase the accessibility of these facilities, thus solving the users’ problems in finding charging piles or stations. Meanwhile, we need to leverage all resources available and direct more social capital to engage the private capital in the construction of supportive facilities. More supportive facilities need to be allocated in highly-populated areas like bus stations, parking lots, and shopping malls to play a demonstrative role in increasing the accessibility and availability of NEVs.

4.2. Breaking walls between industries and increasing inter-industry collaboration

4.2.1. Creating an ecosystem of healthy competition and adjusting the competition mode

The market competition can be fierce. In the bidding process, the integrators who hope the suppliers can win the bidding at a lower cost will lead the suppliers to bid by offering a lower price, which results in vicious competition. The suppliers should prioritize performance over the price, and overemphasis on the price is likely to cause problems like reduced quality and safety risks. Moreover, some companies compete by offering a price lower than its cost, which is suicidal. Companies need to adopt the strategy of differential competition and take a path that provides quality products at high prices instead of offering low-quality products at lower prices. Only in this way, can the NEV industry achieve healthy and sustained development.

4.2.2. Improving technological innovation and increasing corporate competitive force

In the new notion of development, innovation is defined as the primary drive of development. Innovation comes as the key that we can take to open the door for social and economic progress [5], and this is also true for NEVs. Invest more resources in the research and innovation of NEVs technology, especially achieving breakthroughs in battery technology, charging technology, and intelligent technology. Companies need to invest more in R&D of core technologies and extend the adoption of NEVs by technological innovation. For instance, innovation in the battery technology will increase the endurance mileage of NEVs and reduce the overall cost of the vehicle; innovation in the charging technology will enhance the efficiency and accessibility of charging; innovation in the smart driving technology will enhance the overall performance of the vehicle and provide better driving experience. More initiatives for technological innovation need to be performed to create a good environment of innovation. We also need to draw lessons from the developed countries, and in light of the national actualities, provide more assistance to the NEV industry and increase the competitive force of Chinese NEVs in the market.

4.2.3. Expanding global capacity cooperation and removing obstacles in the domestic-international dual cycle

As the NEV sector moves fast forward in China over these years, more and more investments have gone into this sector because of favorable policies and market directions. However, the global market of NEVs does not go well, leading the sector into overcapacity. Expanded global capacity cooperation is hence required to address the problem of overcapacity. First of all, we can transfer some overcapacity to developing countries in Southeast Asia, and Central and East Africa; we can also invest directly in the US or Europe to capture more shares in the local
markets. Besides, we need to give more boost to the domestic market and create a greater market to mine more chances in the domestic market, building a domestic-international dual cycle with the domestic market as the focus. Be it in the cooperation or in the initiatives to boost circulation, research, and development of cutting-edge technologies of NEVs remain the kernel. Thus, we need to invest more in the NEV sector, build technical alliances[6], integrate capital and technological resources to create regional and professional research and development bases and realize open cooperation in innovation of core technologies by way of reasonable allocation of resources. Meanwhile, we also need to learn advanced technologies and experience in a targeted manner to increase the kernel competitive force of the NEV sector.

4.3. Increasing promotion and providing a good environment for development

4.3.1. Relying on governmental guidance and promotion to improve the environment of development

The development of ecological civilization is closely related to every one of us. The government needs to increase public awareness of environmental protection and enhance education about ecological civilization. We need to “increase the promotion of scientific and environmental protection of NEVs and provide more favorable policies for the NEV sector” [7], and allocate more supportive facilities to remove the concerns of citizens in green traveling. The NEV sector should invest more in the research and development of cutting-edge technologies to resolve technological bottlenecks, increase the public acceptance of NEVs, and enhance their willingness to buy and use NEVs.

4.3.2. Encouraging green production and consumption to promote a green and low-carbon lifestyle

China has been making an effort to increase the population’s awareness of ecological civilization. In June 2023, the Third Convention of the Standing Committee of the 14th National Congress decided to make the 15th day of August the National Ecology Day, with a vision to achieve a carbon neutrality target by 2060? An asymmetrical based study in China. [J]. Environmental science and pollution research, 2022.07, p.590

5. Conclusion

The ecological environment is the basis for human survival and development[9], and ecological civilization is the foundation for the sustained development of mankind. China's new energy vehicle industry still has great potential for development. With the continuous progress of technology and the increasing maturity of the market, new energy vehicles will become one of the mainstream modes of transportation. We hope that in the near future, China can find a way to develop new energy vehicles with higher output, higher prosperity and better ecology, and make important contributions to global energy transformation and sustainable development.

References

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