

New Energy Vehicles in Zibo City from the Perspective of Intercity Comparison Exploration of the Path of Industrial Development

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Abstract:As a crucial component of strategic emerging industries, new energy vehicles play a significant role in advancing China's green energy transformation, ensuring energy security, and achieving the goals of carbon peaking and carbon neutrality. The municipal government of Zibo places great emphasis on the development of the new energy automobile industry, viewing it as a vital means to promote industrial transformation and upgrading. To gain a comprehensive understanding of the city's new energy automobile industry and the challenges faced by relevant enterprises, we recently conducted a special study on its development. We now present our findings on the promotion of high-quality development within the city's new energy automobile industry.

Keywords: New Energy Vehicles; Industrial Development; Zibo

1. Current Situation of Industrial Development

In recent years, the municipal party committee and municipal government have consistently implemented policies to support the development of the new energy automobile industry, positioning it as a crucial sector for promoting new industrialization and expanding new sources of economic growth. They have issued several key documents, including the "Zibo Intelligent Networked Vehicle Industry Development Plan (2021-2025)" "Notice on the Implementation of Opinions on Accelerating the Popularization and Application of New Energy Vehicles. city's new energy automobile industry is projected to achieve operating revenues of 9.59 billion

yuan in 2022, representing a year-on-year increase of 34.6%; 15.16 billion yuan in 2023, reflecting a 48.8% year-on-year growth; and 15.83 billion yuan from January to September 2024, surpassing the total revenue of the previous year. Additionally, the number of enterprises within the industry chain is expected to grow from 34 in 2022 to 86 in 2024, indicating a doubling of the growth rate.

(i) Solid foundation for industrial development, supporting capacity "beads into a chain". The city's manufacturing industry categories are complete, the system is complete, the formation of a light cargo vehicles, low-speed electric vehicles, special purpose vehicles and other vehicle products and leaf springs, motors, gears and other parts and components as a feature of the more complete automotive industry chain, and new energy vehicles with a long industry chain, product relevance is strong, supporting the requirements of the industry characteristics of the high match. 2020, Geely's new energy high-end commercial vehicle project was established within the city's automotive industry, transitioning from low-end to middle and high-end market opportunities[1]. This shift in the automobile industry from low-end to high-end presents significant prospects. Currently, a relatively complete automotive industry chain has emerged, featuring new energy passenger cars, new energy pickup trucks, light-duty trucks, special purpose vehicles, and various components such as leaf springs, battery materials, motors, electronic controls, and gears.

(ii) The development of industrial agglomeration is evident. In recent years, the city has continued to expand its automotive industry through new forms and modes, leading to the gradual development of the

Zichuan District. This includes the emergence of new energy commercial vehicles and new energy passenger cars in the high-tech zone, as well as two vehicle manufacturing bases: the Zichuan Economic Development Zone and the Boshan District. Additionally, Baita Town is spearheading two major automotive support industry bases, while Huantai County is establishing a hydrogen fuel cell engine and core materials production base. The Linzi Economic Development Zone is also developing an intelligent network and unmanned industrial R&D production base. These automotive industry agglomeration areas facilitate a relatively concentrated distribution of the industry, which fosters collaboration and innovation among enterprises. This concentration provides favorable conditions for enhancing the overall development level of the industry and creating a high-quality new energy automobile industry cluster.

(iii) The early and robust development of hydrogen fuel cell vehicles and intelligent networked vehicles is underway. Hydrogen fuel cell vehicle technology is at the forefront of this field. Dongyue Group's hydrogen fuel cell proton exchange membrane mass production technology has achieved a world-class standard, with the first phase of its 1.5 million square meter proton exchange membrane production line now operational. The city boasts abundant hydrogen resources and a leading edge in proton exchange membrane technology, making it the only city in China selected as one of the five demonstration cities for fuel cell vehicles, alongside Beijing-Tianjin-Hebei, Shanghai, Guangdong, and Henan. To date, the city has promoted over 300 fuel cell vehicles and established seven hydrogen refueling stations, effectively integrating the "production, storage, and distribution" of hydrogen. The intelligent connected vehicle sector is rapidly advancing its development. Leveraging the Zibo Intelligent Connected Vehicle Industry Park, with Shuntai Automotive Company and Ruiyi Technology Company as leaders, we are utilizing our technological strengths in intelligent line control chassis, power execution, and environmental perception. This enables us to expedite the implementation of various characteristic application scenarios in fields such as smart traffic management,

environmental cleaning, security inspection, mobile retail, and sightseeing shuttles. We have also successfully completed pilot projects for national smart city infrastructure construction and the coordinated development of intelligent connected vehicles.

2. The Primary Challenges and Issues Confronting the Development of the New Energy Automobile Industry in Our City from the Perspective of Intercity Comparison.

(i) The overall level of industrial development in the city is relatively low. Although the automobile industry was established earlier, it has not evolved into a robust sector due to both external environmental factors and inherent limitations. Consequently, the city has failed to secure a leading position in the traditional automobile industry as well as in the emerging new energy vehicle sector. In 2023, Shenzhen emerged as the largest producer of new energy vehicles in the country, with an output of 1,786,000 units, reflecting a remarkable year-on-year increase of 110.4%. In contrast, Zhengzhou ranked tenth, producing 316,000 new energy vehicles, which represents a staggering year-on-year growth of 351%. This indicates a rapid development momentum in Zhengzhou[2]. However, the production of new energy vehicles in our city reached only 83,000 units in 2023, marking a year-on-year growth of 37.4%. This figure highlights a significant gap when compared to more advanced cities in the country.

(ii) Slow development of the vehicle manufacturing industry. The level of vehicle manufacturing serves as a significant indicator of the development of a city's automobile industry. Currently, cities in China with a developed automobile industry, such as Jinan and Qingdao, produce at least one million vehicles annually. These cities have also enhanced their industry competitiveness through the introduction of various vehicle projects. Prior to the Geely project, the city lacked high-level vehicle manufacturing enterprises, resulting in a small-scale vehicle industry with limited competitiveness. The primary focus of the industrial layout was on commercial vehicles, which highlighted a clear disadvantage compared to the broader passenger car market. Before Tangjun OuLing was acquired by Geely, its vehicle products

primarily targeted the low-end market, with an annual output of approximately 18,000 vehicles. Geely has a production capacity of around 14,000 units in the first phase, achieving an output of 6,600 units in 2023 and setting a target of 9,000 units for 2024. Guogin Auto has struggled to scale up production due to constraints such as capital, costs, and brand recognition. Suntech Automobile has an annual production capacity of 10,000 units; however, after 2023, it will cease the production of complete vehicles, shifting its focus to modified vehicles. The four automobile manufacturers in the city have a capacity utilization rate of less than 50 percent.

(iii) The insufficient competitiveness of supporting industries is a significant concern. According to a report by "China Automotive News" published in 2023, among China's top 100 auto parts enterprises, Shandong Province is represented by 10 companies, including 4 from Qingdao and 2 each from Yantai, Weihai, and Weifang. Only a few enterprises, such as Raypad and Tai Zhan Electromechanical, have successfully integrated into the supply chain systems of well-known companies like China National Heavy Duty Truck and FAW. Many auto parts enterprises produce products with low technological content and a high degree of similarity, leading to severe homogeneous competition. Consequently, these companies have limited scale effects and minimal influence in the market. Enterprises primarily operate at the lower end of the industrial supply chain, often focusing on single components. There are relatively few companies engaged in the production of high-value-added, high-tech key components such as engines, transmissions, and suspensions. Even fewer enterprises possess the research and development, design, and production capabilities for system assembly in areas like power, suspension, and transmission. In the realm of new energy vehicles, components related to the "three electrics" and intelligent network systems are predominantly in the design, development, or experimental trial production stages.

(iv) New industries and modes of operation have yet to be developed and expanded. The promotion of the fuel cell market has not met expectations. Although the city has a framework in place, it has yet to establish a complete industrial chain or develop industrial

clusters. Dongyue's proton exchange membrane technology has achieved large-scale production; however, market promotion has not reached anticipated levels. The Edelman hydrogen fuel cell engine project has either just commenced production or is still under construction. Geely's commercial vehicle project has allocated space for the production of hydrogen fuel cell models, but these models have not yet been incorporated into the production plan. The intelligent network sector remains in its infancy. The city's foundational research in common basic technologies and key core technologies is weak. Compared to the domestic advanced level, the automobile manufacturing industry is still positioned at the low end of the industrial and value chains. Suntech Automotive has made some technological advancements but remains in the product development and market promotion stage. The emergence of driver-less, intelligent networks represents a new frontier in the automotive industry, attracting numerous automotive and internet giants vying for market positioning, the starting stage competition has been very fierce, as a far from the harvest period of the industry, enterprise development by the capital, talent and other elements of the resource constraints are greater, the future of the existence of a number of uncertainties[3]. The development of new business models remains largely unexplored. Research shows that the future of automotive software can be sold, paid subscription, limited time use and other new business models originally belonging to the field of consumer electronics will gradually penetrate into the automotive industry, but the city in the automotive services in the car service innovation of new modes is basically in a blank state.

3. Recommendations for Countermeasures

Overall, the most favourable opportunity for the city to build a high-quality modern new energy automobile industry system is the trend of new automobile energy, and staggered competition in the new energy automobile track; the most core advantage is the high starting point, fast progress and outstanding advantages in proton exchange membrane and hydrogen fuel cell engine; the most solid foundation is the complete industrial categories and complete system, which can

provide relatively complete industrial supporting support; the most powerful leader is Geely new energy commercial vehicle project. The most powerful leader is Geely new energy commercial vehicle project, so that the city has the opportunity to leverage to enhance the level of industrial development, and gradually build up the horizontal advantages of industrial clusters and vertical leading industrial chain, innovation chain, value chain, ecological chain, to achieve new energy automotive industry bends the road to overtake, and later to catch up.

(i) Staggered competition in the field of new energy commercial vehicles

Creating leading commercial vehicle models. The latest data shows that the domestic retail penetration rate of new energy vehicles reached 47% in the first five months of this year. According to the classic "S-curve" theory in economics, when the market penetration rate of an innovative product exceeds 20%, it means that the product enters a high-speed growth period from the initial market introduction period, which is characterized by a basically fixed competitive pattern[4]. Compared with passenger cars, new energy commercial vehicles are still in the "night before the outbreak". 2022 new energy commercial vehicle sales of 338,000 units, a year-on-year growth of 78.9%, the annual penetration rate of 10.2%. The penetration rate of medium and heavy-duty new energy trucks is even lower, still less than 3%. The city happens to have good industrial advantages in the field of commercial vehicles. Zibo Geely project positioning is a commercial vehicle base, Geely remote commercial vehicles with strong competitiveness, and the city's automotive supporting industries rely on commercial vehicle supporting the development of the more likely to form industrial synergies.

Layered layout to guide the diversified development of the industry. First, based on Geely's new energy high-end commercial vehicle project, support Geely Automobile to continuously enrich the model categories, develop highly competitive new energy commercial vehicle products, and improve the capacity utilization rate. The second is to guide smaller local special vehicle and modified vehicle enterprises to actively research and develop new energy models and develop in the

direction of personalized customization, overall solutions and "speciality, speciality, speciality, speciality, speciality, speciality, speciality, speciality, speciality, speciality". Third, actively introduce vehicle enterprises in the city layout of high-end passenger car models, and strive to introduce 1-2 new energy vehicle head brand, and further enhance the city's new energy vehicle industry scale. Fourth, to improve the capacity utilization rate of existing vehicle enterprises, encourage commercial vehicle enterprises to do a good job in fuel, LNG (liquefied natural gas), CNG (compressed natural gas) and other products on the basis of accelerating the exploration of pure electric (including electricity), hybrid, hydrogen fuel power and other diversified technology routes, and continue to increase market share[5].

(ii) Strengthening the hydrogen fuel cell industry chain

Firstly, we will achieve breakthroughs in key technologies. Introducing and absorbing advanced technologies from home and abroad, increasing R&D investment in core technologies, key materials and high-end equipment, and transforming the results, to further consolidate the domestic leading position in the field of membrane materials such as proton exchange membrane for fuel cells and ceramic membrane for solid fuel cells, and to realize breakthroughs in "necked-in" key technologies such as fuel cell engine technology and stack, bipolar plate, catalyst, carbon paper, and so on, as soon as possible. "The key technology breakthroughs and bipolar plates, catalysts, carbon paper and other key technologies will be achieved as soon as possible, and batch production capacity will be formed gradually. Second, the development of district and county leading industry planning according to local conditions. With Zichuan District, Boshan District, Huantai County as the main focus, focus on the introduction of fuel cell vehicles and key parts and components manufacturing enterprises, the establishment of a complete fuel cell automotive industry chain, the construction of a fuel cell commercial vehicle industry base, and promote the development of fuel cell commercial vehicles, fuel cells and systems industrialization. Thirdly, we will strengthen industrial attraction. Actively introduce hydrogen fuel cell vehicle

enterprises with international advanced level, promote vehicle integration cooperation between vehicle enterprises and hydrogen fuel cell enterprises, take the lead in the development of independently controllable and highly reliable hydrogen fuel cell passenger cars, and accelerate the progress of commercialization of hydrogen fuel cell passenger cars. Vigorously introduce enterprises and scientific research teams with independent innovation achievements and core technologies to build an industrial base for manufacturing fuel cell commercial vehicles and core components, and encourage the development of hydrogen fuel cell buses, logistics vehicles, sanitation trucks, dump trucks, forklift trucks, intelligent network cars and other complete vehicle products and key components such as power systems.

(iii) Enhancement of coordinated supporting capacity for parts and components

First, vigorously promote the transformation and upgrading of the traditional automobile industry. Accelerate the optimization of the structure and transformation and upgrading of the commercial vehicle parts industry in Zichuan District and Boshan District, introduce domestic and foreign key auto parts leading enterprises, and vigorously develop the power-train, electronic control system, lightweight parts, and other high-end parts and components industry in synergistic support of commercial vehicles, and continuously improve the supporting capacity of the vehicle. Second, accelerate the formation of new energy automobile core parts advantage. Relying on the existing Kaisheng, Yonghao, Huaxia Shenzhou and other enterprises in the field of lithium battery new material technology research and development advantages, and actively seek cooperation with Ningde Times, BYD and other head enterprises, and strive to enter its supply chain system. Focusing on key areas such as automotive-grade IGBT chips, power battery materials, electronic control systems, electric drive systems, intelligent wire control chassis, fuel cell proton exchange membrane, air suspension systems, shock absorbers, etc, we will promote the backbone parts and components supporting enterprises to increase the research and development and industrialization process, and focus on occupying the high-value-added, high-growth

potential market segments to accelerate the formation of incremental advantages[6].

(iv) Supporting the development of new automotive industries and models

First, step up the layout of intelligent network application demonstration. Enhance the intelligent level of road infrastructure in our city, and create conditions for the application demonstration of intelligent networked vehicles. Strengthen the cultivation of industrial talents, and actively attract leading enterprises or R&D teams of intelligent network connection. Vigorously carry out complex system architecture, complex environment perception, intelligent decision-making control and other forward-looking technology research, and gradually realize the integration and application of basic data in the fields of vehicles, infrastructure, traffic environment, etc, and strive to promote the latest technological achievements in our city to land transformation. Second, early entry into the complementary energy industry. Early selection and breeding of charging pile construction and operation, energy digital management, standard battery pack production, charging equipment, power exchange equipment, battery recycling, battery life cycle management and other areas of potential enterprises. Encourage social capital to participate in the construction of hydrogen refueling stations, charging piles (stations), power exchange stations and other energy-supplementing infrastructure networks. Third, strengthen technological research and development innovation. Deepen the strategic cooperation with top universities and research institutions at home and abroad, give full play to the advantages of Shandong University of Technology's traffic and vehicle engineering disciplines, build a new energy automobile industry technology innovation platform, focusing on supporting the industrialization of new energy automobile major scientific and technological achievements, major application demonstrations, the construction of public technology service platforms, etc., to build a new energy automobile key core technology support system and industrial innovation platform support system. Fourth, actively guide enterprises to the whole chain system transformation. Guiding the automobile industry from traditional automobile

manufacturing to "manufacturing+service supply" whole chain system transformation.

(v) Actively expanding the application scenarios of new energy vehicles

First, accelerate the promotion and application of new energy vehicles in the city. Seriously implement the municipal government on the promotion and application of new energy vehicles implementation views, strengthen the implementation of policies and assessment and supervision, to eliminate the worries of operating companies and owners. Explore the further introduction of support policies in the commercial promotion of hydrogen fuel cell vehicles, continue to increase the demonstration and application of hydrogen fuel cell vehicles in the city, accelerate the hydrogen energy of sanitation, gardening, municipal and scenic vehicles, and create a more suitable "microclimate" for the promotion and application of new energy vehicles and industrial development.. Improve the city's complementary energy infrastructure construction and operation service system, explore the "oil, gas, electricity and hydrogen service" integrated complementary energy station model, deepen cooperation with industry leading enterprises, market-based charging and switching stations, hydrogen refueling stations and other construction. Second, actively explore the vast rural market. Rural areas have the basis for the use of electrified products, especially the high demand for passenger and cargo electric vehicles. The city's focus on the development of commercial new energy vehicles such as electric pickup trucks and other just to meet the county and rural residents of production and life multi-purpose needs. Leading car companies can follow up in the economic new energy vehicles, focusing on the introduction of range of 120 to 400 kilometers, the price of 3 to 80,000 yuan between the models, in order to further meet the needs of the rural market. Third, actively explore foreign markets such as ASEAN. The ASEAN region has a vast market for new energy vehicles, and the ASEAN

electric vehicle market reached about \$1.14 billion in 2024, and is expected to climb to \$4.7 billion by 2029, with a compound annual growth rate of 32.7% during the period. The city should seize the opportunity to actively develop new energy vehicle exports to ASEAN, preferably Thailand, Malaysia and Indonesia as the export destination, around the promotion of new energy vehicles set port, inspection, crating, shipping "one-stop" centralized operations, and constantly reduce export costs, improve export efficiency, expanding the scale of new energy vehicle exports.

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