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Development of the Chinese Automotive Industry on New Energy

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Abstract

China has been the largest exporter and manufacturer of motor vehicles in the world for the past few years. The automotive industry in China has been developing for several decades, and from absolute zero. The rapid economic development of China over the past three decades has led to a manifold increase in the consumption of energy resources, primarily oil. A significant increase in the income of the population of the country stimulated a sharp increase in the volume of production and sales of cars, especially in large cities in China. Today, the Chinese leadership recognizes that the era of cars with internal combustion engines is coming to an end. These factors led not only to the country's strong dependence on the import of petroleum products, but also exacerbated the environmental situation in China's major cities. Aware of global challenges, the government of the country has developed a program for the development of the automotive industry based on energy saving and new energy, aimed at creating an innovative vehicle fleet and related infrastructure of a new generation. An increase in the production of innovative electric and hybrid vehicles will enable China to increase the share of renewable energy sources, as well as significantly reduce its dependence on imported petroleum products, and secure a significant share of the world market for high value-added NEV sales.

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Keywords

China, energy security, environmental pollution, energy saving, new energy, alternative energy, hybrid cars, electric cars, technology improvement, transport infrastructure.

Introduction

In China, sales of new energy vehicles (NEV) increased from 12.8 thousand in 2012 to 3.52 million in 2021, ranking first in the world in production and sales for seven consecutive years. Over the past decade, China's automotive industry, operating on new energy sources, has developed rapidly [China punishes automakers for environmental offences, www].

NEV Industry Development Plan 2021-2035 was published by the State Council of the People's Republic of China on November 2. In it, the authorities have high hopes for NEV technologies and call them "the main direction in the transformation of the global automotive industry" [China's endeavor to build clean…, www]. In the conditions of the Chinese economy, this plan provides additional incentives for growth, planning, distribution of finance and the creation of a new market.

The authorities see the NEV revolution as an opportunity to create strong domestic car brands that will dominate the domestic market and compete abroad. In June, Chinese President Xi Jinping visited the factory of China's oldest automaker FAW and said the country should develop its brands. Chinese quality brands should be able to compete equally with international counterparts, the plan says. This applies to the Beijing Electric Vehicle Company (BJEV) and Nio brands. According to the plan, China should "reach the international advanced level in key NEV technologies" by 2035 [Wu Yiyao, www].

The rapid development of the automotive industry on alternative energy sources is primarily due to government support. Back in 2009, China launched the Automotive Adjustment and Recovery Plan, which proposed developing a strategy for the development of vehicles using new energy sources and expanding the use of this car model in large cities in a pilot mode. In the same year, 13 cities including Beijing, Shenzhen and Hangzhou launched the first electric vehicles and plug-in hybrids in the public transport, taxi and urban sanitation industries. Central and local governments have provided tax incentives to automakers and subsidies to consumers. A year later, preferential policies for new energy vehicles began to be extended to private cars in cities such as Shanghai and Changchun. In 2013, vehicles powered by new sources have already been distributed to all corners of the country. At that time, the maximum subsidy for the purchase of a passenger electric car was 60 thousand yuan, for a hybrid passenger bus – 250 thousand yuan, for an all-electric bus – 300-500 thousand yuan per unit [Wang Cong, www].

Government support has accelerated the electrification transformation of fossil-fuel auto companies and brought many new players into the auto industry, which has helped push the Chinese auto market into a fast growth track. In 2017, in order to stimulate the healthy development of the auto industry, subsidies for the purchase of electric vehicles began to decrease annually. It is expected that by the end of 2022, the policy of financial subsidies for electric vehicles will be completely abolished. In the future, in-house new energy vehicle companies will rely entirely on innovation and product quality to survive and thrive in a highly competitive environment.

Today, the development of cars on new energy sources is a priority for the transformation of economic development and the "green" development of the global automotive industry. More than 60 concessional measures have been adopted in China to encourage the development of this sector and the scientific and technological innovation of enterprises. China, before other countries, realized the importance of the development of the electric car industry and supported their promotion in the domestic market. The development of electric cars today is a global trend: Germany, the UK, the USA, Japan and other countries are paying more and more attention to the spread of electric vehicles. This is a general trend for all developed and actively developing countries.

Methods

In the study, the authors used some methods such as analysis and synthesis, induction and deduction, historical and logical, abstraction and concretization.

Results

In recent years, many traditional Chinese automakers have been reoriented to the production of electric vehicles. There are new players in the country, such as NIO, Li, Xpeng. In addition, the American car giant Tesla, German Volkswagen and a number of foreign car companies have started producing electric cars in China, and Chinese Internet companies Baidu and Xiaomi have entered the smart grid.

Li Auto is a strong player in the new energy vehicles (NEV) market in China, specializes in hybrid crossovers and SUVs, and plans to take a 20% share of the NEV market in China by 2025. Three models announced in 2022 will complement the offer of the flagship Li ONE, and the commissioning of a second production site in Beijing in 2023 will increase production. The tailwind for the electric vehicle industry is subsidies and benefits for buyers of vehicles using new energy sources, the development of infrastructure by the state.

One of the features of Li Auto is that its cars can be charged, or you can replace a dead battery with a new one. Li Auto has opened about 160 stations in almost 70 Chinese cities, where batteries are changed in less than three minutes, and is building all new ones. This is invaluable for transport services – in particular, taxis – and convenient for ordinary customers whose power supplies have failed or are obsolete. For example, Li Auto has released a new high-power battery for 100 kWh, which can be replaced with the old one for a certain surcharge at the company's stations.

The car is equipped with a hybrid power plant with the ability to recharge the battery from an external power source (plug-in system). A small three-cylinder turbocharged engine with a volume of 1.2 liters rotates the generator. The electric energy generated by it, the Li One crossover accumulates in a powerful lithium-ion battery. Li Auto cars are more expensive. But this year they have an option "battery as a service" [Li Fusheng, Hao Yan, www]. Today Li Auto has more than 300 patents for battery replacement technology.

By now, Chinese car brands have already mastered the basic technologies for the production of battery, electric motor and electronic control and have a complete production chain and supply chain. For 7 years in a row, China has been leading the world in terms of production and sales of electric vehicles. The cost of the battery – the “soul” of an electric car – is more than 40% of the cost of the car as a whole.

In 2012, the first high-performance lithium battery was developed in China. Today, Chinese battery manufacturing technology occupies a leading position in the world, and China has become the world's largest battery manufacturer. Among the world's 10 largest battery manufacturers in 2021, Chinese companies occupy 6 places, the Chinese company CATL is the leader. European car giants BMW and Volkswagen, as well as Tesla, which has a factory in Germany, are potential customers of the foreign CATL plant. Other Chinese battery manufacturers have also opened or are ready to open their factories in Europe and the USA for localized production [China's new energy vehicle industry on fast lane for growth, www].

Recommendations and conclusions

The Chinese electric vehicle industry is developing rapidly due to new requirements related to energy saving and emission reduction. Vehicles powered by new energy sources have become a priority for transforming the global automotive industry and achieving green and low-carbon development. By 2035, all-electric vehicles will become the mainstream in new car sales [Li Fusheng, www].

The Chinese province of Hainan has unveiled a plan to ban sales of gasoline-powered vehicles by 2030. The EU, Japan, UK, India and other countries have also set deadlines for a full transition to electric vehicles. These measures will greatly expand the market space for new energy vehicles, and the huge market will undoubtedly stimulate innovation potential and investment demand [Ma Si, Cheng Yu, www].

A practical, economical, high-tech and energy-saving car powered by new energy sources is gradually becoming the new choice of Chinese buyers.

Chinese auto brands entered the markets of Belgium, Great Britain, Germany, France, Australia and other developed countries, gaining recognition from local consumers. Many Chinese auto companies continue to make efforts to enter the global market.

The NEV boom in China has also been supported by an increase in charging stations. According to the China Alliance for the Promotion of Electric Vehicle Charging Infrastructure, there were 2.617 million charging points in the country as of the end of 2021, up 70.1% from 2020. China added 936,000 charging stations in 2021, including 340,000 public chargers and 597,000 home chargers. The number of new home charging points increased by 323.9% compared to 2020 compared to a 90% increase for public points [Chinese electric vehicle market sees more investment, www]. The increase in charging stations gives consumers the confidence to buy cars.

Under a plan released in January by the National Development and Reform Commission (NDRC), China aims to meet the charging demand of more than 20 million electric vehicles by the end of 2025.

As of the end of 2021, a total of 7.84 million electric vehicles were in use in the country, meaning there was one charging point for every three vehicles. But uneven distribution across the country has resulted in less than 10% of public charging stations being used [Electric car industry shares boom on government plan, www].

Home charging of electric vehicles is the main focus, as public charging stations and battery swaps only operate as an emergency. Home charging is also cheaper than public charging because owners only have to pay for electricity, and public charging stations charge a service fee. Consumers using private sockets benefit from low electricity costs and overnight parking, and charging does not require additional time.

But it still remains a challenge to install private charging stations in older urban areas where parking spaces are scarce. The National Energy Administration and the NDRC are developing guidelines for building charging stations in communities.

It will be difficult to rely solely on the public sector to solve the problem. With the increase in NEVs, commercial EV charging and property management companies can profit from collaborating on solutions [Li Fusheng, www].

As the number of cars in the Middle Kingdom itself is growing rapidly, the Chinese government is actively promoting the development of environmentally friendly technologies and the creation of electric cars. Such a government program was adopted back in 2012. It was after its approval that new brands began to appear, such as Weima, Byd, Nio, in which the design of machines involves the use of scientific developments in the field of "green" energy and renewable energy sources. Therefore, many

Chinese brands today are a serious competitor to Tesla cars. The use of the latest technologies is likely to allow China to maintain a leading position in the future [China has one million new energy vehicles, www].

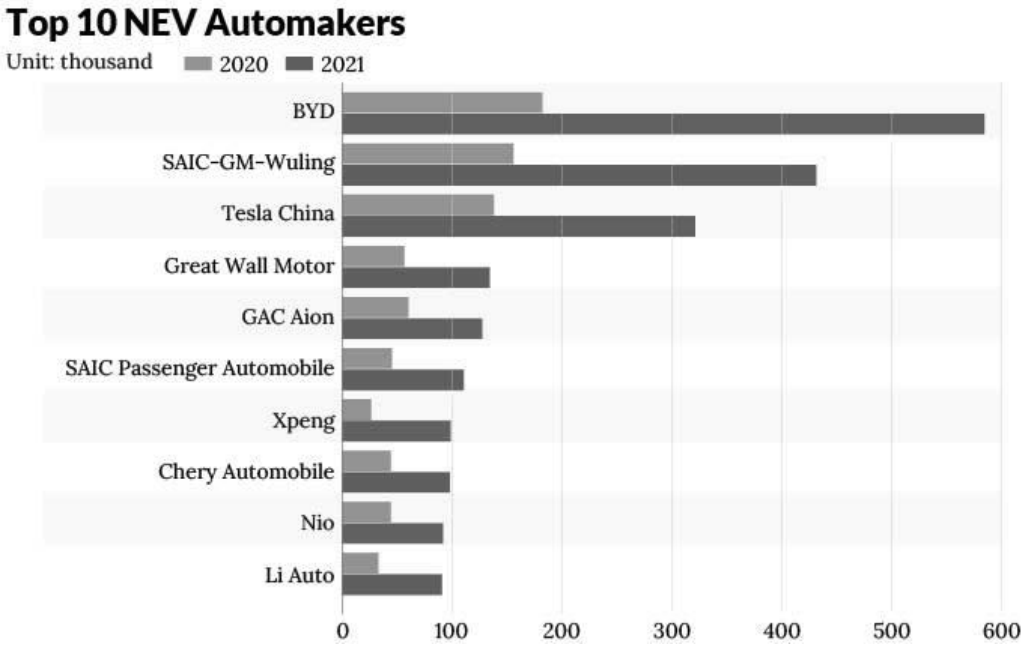

Figure 1 - Based on 2021 NEV sales [China to build more charging points for electric vehicles, www]

Conclusion

The rapid development of the production of vehicles using alternative energy sources not only generates a significant multiplier effect in related industries, but also becomes one of the most important drivers of innovative development in Chinese industry. Based on the accumulated technological and intellectual potential in the framework of improving artificial intelligence systems for a new generation of smart cars, leading Chinese manufacturers generate innovative developments that become a tool for technological development in other sectors of the PRC national economy within the digital economy. The growth in production volumes and, as a result, the fleet of environmentally friendly and energy-efficient vehicles also solves other important socio-economic problems that require immediate attention.

An increase in the production of innovative electric and hybrid vehicles will enable China to increase the share of renewable energy sources, as well as significantly reduce its dependence on imported petroleum products, and secure a significant share of the world market for high value-added NEV sales. All this will help solve one of the main tasks set by the Chinese leadership, to drastically reduce the level of anthropogenic impact on the environment and significantly improve the ecological situation in the country.

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Развитие китайского автопрома на новых источниках энергии

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Аннотация

Китай последние несколько лет является крупнейшим экспортером и производителем автомобилей в мире. Автомобильная промышленность Китая развивается уже несколько десятков лет, причем с абсолютного нуля. Бурное экономическое развитие Китая за последние три десятилетия привело к многократному увеличению потребления энергоресурсов, в первую очередь, нефти. Значительный рост доходов населения страны

стимулировал резкое увеличение объемов производства и продаж автомобилей, особенно в крупных городах Китая. Сегодня китайское руководство признает, что эра автомобилей с двигателями внутреннего сгорания подходит к концу. Эти факторы привели не только к сильной зависимости страны от импорта нефтепродуктов, но и усугубили экологическую ситуацию в крупных городах Китая. Осознавая глобальные вызовы, правительство страны разработало программу развития автомобильной промышленности на основе энергосбережения и новой энергетики, направленную на создание инновационного автопарка и сопутствующей инфраструктуры нового поколения. Увеличение производства инновационных электромобилей и гибридных автомобилей позволит Китаю увеличить долю возобновляемых источников энергии, а также значительно снизить зависимость от импортных нефтепродуктов и обеспечить себе значительную долю мирового рынка с высокой добавленной стоимостью. продажи.

Для цитирования в научных исследованиях

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Ключевые слова

Китай, энергетическая безопасность, загрязнение окружающей среды, энергосбережение, новая энергетика, альтернативная энергетика, гибридные автомобили, электромобили, совершенствование технологий, транспортная инфраструктура.

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