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The Driving Effect of Charging Station Infrastructure Deployment on Employment of New Energy Vehicle Industry

Falei Li

Shenzhen Longgang Longcheng High School, Shenzhen, China
Ra15220179420@outlook.com

Abstract. The new energy vehicle, more and more emissions containing carbon elements, people start to come up with the awareness of preserving the environment. Because of the support from government and the prevail of green and environmentally friendly lifestyle, new energy vehicle industry (NEVI) have become core area of global green transformation and industrial upgrading. Besides, possessing high status in social development, economics is essential topic among humans' lives, while in this huge topic, employment is an important index. This article mainly studies the driving effect of charging station infrastructure deployment, which is relative to energy supply of the vehicles, on the potential employment in new energy vehicle (NEV) sector. The influence exerted by charging station deployment to employment of new energy vehicle industry would be illustrated in two aspects, direct and indirect. Finally, after analysing, it is found that development of charging station infrastructure would drive employment of new energy vehicle industry by directly increase the requirement of labor in pile construction, operation and relative industries, as well as indirectly increase it by first stimulating the growth of NEVI.

Keywords: Charging station deployment, employment, infrastructure, new energy vehicles.

1. Introduction

During the rapid advancement of industrialization, energy use has grown sharply in China. In 2020, China imported more than 540 million tons of crude oil (General Administration of Customs of the People's Republic of China (GACPRC). China has also seen dramatic rise in nation carbon emission by the years. According to the data collected by Energy Institute, the carbon emissions caused by burn of petroleum, natural gas and coal in 2022 exceed 10.5 billion tons in mainland of China. The government of China is also enlightened by the pandemic Covid-19, which broke out at the turn of 2020s, that green work and lifestyles are required urgently, in order to form an environment friendly civilization and build a beautiful Earth. The Chinese government set a target of reaching maximum carbon emission by 2030, while setting a target of achieving carbon neutrality before 2060 [1]. NEV is considered as a credible way of reducing energy use and pollution in transportation, since electricity is not a product of a single source of energy [2]. This is one of the reasons why the NEVI has developed so fast in China, which is now the dominant producer as well as consumer among the worlds. In the first eleven months in 2024, the total production of NEV is 0.35 million more than

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eleven million while 11.26 million of new energy vehicles are sold China Association of Automobile Manufacturers (CAAM).

As the popularity of NEV, there will be a potential growth in charging station because of the lack of endurance capability of NEV [3]. Investment in charging stations is more effective in reducing carbon emission than investment on new energy vehicles [4]. However, this does not mean that there is not challenge. The effect of public charging infrastructure to the market of NEV is limited because of the cost of battery [5]. Besides, It is proved that a positive correlation exists between efficient deployment of infrastructure in charging facilities and how frequent the use of NEV is [6]. In terms of the impact on employment, some agree that necessary recharging infrastructure would provide potential jobs, while having positive impact on carbon and PM2.5 emissions reduction [7]. For example, in the case of California, it is estimated that approximately 9100 jobs will be produced due to the growth of electric vehicles in 2020s [8]. However, there is also argument that building more charging and swap stations would not significantly increase employment since those facilities usually do not require human staff to guard. This is because, instead, they only need occasional inspection, which has less time constraints for the staff [9].

In this article, the author will analysis the potential outcome of infrastructure investment in charging stations on employment of NEVI, by researching previous articles. The promotion of job creation will be interpreted in two flow paths. One is how the benefits of investing in charging stations are directly passed on to employment rate in an area, majorly in the process of construction, maintenance and parts manufacturing. Those actions result in mainly shout-run outcomes in limited sectors. Another aspect is the long-term effects contributed second hand. For example, with the variation of layout of the charging systems, closer or more independent to other stations or facilities, sales of NEV might be stimulated, thereby creating jobs like manufacturers in factories or sellers in NEVI.

The article aims at providing solutions to policy makers who are focusing on employment improvement through energy supply process of NEV, offering ideas on how to address the current deployment of charging station. Besides, as employment is an essential topic in macroeconomics, this article is also expected to help scholars to identify the role specific infrastructure investment may play on an important macroeconomic concept, as well as the process of delivery.

2. Recent situation of charging pile facilities deployment and employment in NEVI

2.1. Recent situation of charging pile facilities deployment

Generally, China is now experiencing rapid development on its charging station construction. Number of charging stations in the country has been growing rapidly over the years. In 2024, there are charging stations in total of 12.8 million in China, with a growth rate of 49.1% compared with that in 2023. Among these charging stations, nearly 3.6 million are owned by public sectors, mostly support passenger cars and buses, while others are owned privately. The ratio of publicly and privately owned charging stations is approximately 3:7. The increase in individuals' charging piles represents a trend of growth in individuals owned new energy vehicles.

In terms of reginal layout of current charging station, non-uniform distribution exists. For instance, more charging facilities are located in the southeast part of China, especially in Guangdong, Jiangsu, Zhejiang province, among which, Guangdong province is the largest consumer of charging stations. In addition, there is other evidence showing that almost 70% of the public owned charging stations located in the top ten provincial level administration regions, while none of them is in the most western or northern parts of the country. What's more, there is another biased

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distribution between urban and rural areas [6]. Response of accessibility of charging facilities from residence with low income or those living in rural areas are also not known sufficiently [10].

The main construction entities present a diversified pattern. The public charging network led by the government is mainly distributed in public areas such as transportation hubs and municipal parking lots, focusing on ensuring people's travel needs. On the other hand, social capital has become the main force in construction. Among them, car companies' self-operated piles have performed well, such as Tesla Supercharger and BYD Dynasty series charging piles, forming an exclusive service network relying on brand user groups. Third-party operators such as Teld and Star Charge have occupied more than 60% of the public charging pile market through large-scale layout, promoting market-oriented competition in charging services.

2.2. Employment status of NEVI

In terms of labor scale, the number of employees in the whole chain-industry of NEV has exceeded 15 million. Among them, the vehicle manufacturing link employs about 4 million people, covering production positions such as stamping, welding and assembly, while the parts industry contributes more than 5 million jobs, including the researching and developing and production of major units like batteries. The number of employees of sales and service links exceeds 6 million, involving 4S store sales, charging pile operation and maintenance, vehicle maintenance and other fields. With the improvement of industry penetration, the employment scale is still growing at a rate of more than 10% per year.

The job structure presents the characteristics of "technology-oriented and service extension". In the production and manufacturing posts, there is a strong demand for battery manufacturing engineers and motor assemblers. The power battery field alone has more than 2 million employees. The technical research and development posts are growing the fastest, and there is an obvious gap in high-paying posts such as charging technology research and development engineers and intelligent networked system developers. Some enterprises offer annual salaries of one million to attract talents; service posts continue to expand, and emerging occupations like operation and maintenance engineers of charging stations and new energy vehicle maintenance technicians have emerged. The operation of charging station and maintenance field alone has formed an employment group of more than 500,000 people, and the demand is still growing rapidly.

3. Mechanism analysis of charging station infrastructure layout driving employment in NEVI

3.1. Direct employment-driving effect

The construction of charging piles directly creates a large number of short-term jobs, including electricians, engineering supervisors and cable laying workers. A medium-sized charging pile construction project can drive 50-100 construction workers to employment. In 2024, the construction of new charging piles nationwide directly drove more than 200,000 people to employment.

The operation and maintenance link has spawned stable long-term jobs. Operation and maintenance engineers are responsible for daily equipment maintenance and fault handling, and data monitoring personnel monitor the operation status of the charging network in real time through the platform. At present, there are more than 800,000 charging pile operation and maintenance posts in the country, and with the intelligent upgrading of equipment, the demand for compound technical talents in this field will continue to increase.

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The upstream charging pile equipment manufacturing link of the industrial chain has driven the expansion of parts enterprises such as charging modules, contactors and cables. The charging module production enterprises alone have provided about 300,000 jobs, forming an employment chain of "equipment production-assembly-sales".

3.2. Indirect employment conduction effect

The improvement of charging station deployment would promote the growth of NEV sales. In 2024, the total number of NEV being sold in China exceeded 11 million, driving the addition of about 500,000 new jobs in vehicle manufacturing and assembly. Some car companies have added production lines through capacity expansion, and the employment scale of a single factory has increased by more than 30%.

The extension of charging service scenarios has spawned new jobs. Occupations such as power swap station operators and optical storage and charging integration project managers have emerged. The demand for digital service posts such as charging APP operation and user service specialists has surged. Only the leading charging platforms have more than 100,000 people engaged in online service-related work.

Employment in related industries has been further activated. Growth in NEVI would drive the growth of ancillary industries, improving the employment of such industries [9]. The battery recycling field has added 150,000 jobs due to the expansion of industry scale. Cross-border posts such as new energy vehicle used car appraisers and charging insurance consultants have emerged, forming an employment conduction chain of "charging infrastructure-automobile consumption-industry extension".

4. Suggestions for optimizing charging station deployment to expand employment

4.1. Coordinate regional layout

Increase the allocation of charging station construction resources to the northern, western regions and rural areas. For example, charging stations into part of development strategy in rural aeras. Build drive industrial parks in areas that have developed advanced skills of charging station construction, operation and maintenance to guide rural areas around with those issues.

4.2. Strengthening skills training and improving job adaptability

Promote cooperation between vocational colleges and charging operators. For instance, set up majors such as operation and maintenance of charging stations and charging technology research and development, with enterprises bearing some of the teaching expenses as well as government support. In this way, students can directly enter the job just after graduation, ensuring the development of charging industry. In addition, promote the "work-based training" model in rural charging station construction projects by giving priority to absorbing local farmers to participate in construction, and those who complete skills training and pass the assessment during the project period can be converted into long-term operation and maintenance workers or new trainers.

4.3. Diversified construction modes to expand employment space

Promote the combination of charging stations with commercial sectors and community car parks, and support convenience stores, car beauty and other services at charging stations. Each station can

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drive a few workers for employment, forming an employment ecosystem of "charging plus service".

5. Conclusion

This study combines both quantitative analysis and qualitative analysis to systematically explore the driving effect of charging pile infrastructure layout on the employment rate of the NEVI. It is found that China's charging pile construction has achieved remarkable results, with a significant increase in scale, but there are still obvious uneven distribution problems regionally and those between areas with distinct economic development. The NEVI have a huge employment absorption capacity, and the job structure is constantly optimized towards technology and service.

The analysis above shows that the deployment of charging piles has two main driving aspects to affect employment in the NEVI. What's more, it directly creates a large number of jobs in construction, operation and maintenance and equipment manufacturing in related industries. On the other hand, it indirectly promotes employment growth in the whole industry chain by promoting consumption of new energy vehicles and expanding related industries.

In the future, it is suggested to improve the regional layout of charging facilities, the training of professional expertise, and the mode of the manufacturing and operation in charging stations, in order to play full role in driving the significant effect to NEVI. It is also expected that with the continuous improvement of the charging infrastructure system, the NEVI will still stabilize employment and promote economic development in the future, also providing useful experience for the global new energy industry development.

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