ISSN 2616-5783 Vol.8, Issue 11: 12-16, DOI: 10.25236/AJHSS.2025.081103

Study on the Current Situation and Development Direction of Electric Vehicle Service System in Henan Province

Lin Shi[1,a], Yuquan Chai[2,b], Lingling Wu[3,c,*]

[1]Regional Economic Department, Henan Institute of Development Strategy and Industrial Innovation, Zhengzhou, Henan, China
[2]Teaching and Research Section, Party School of Wensu County Committee of CPC, Wensu County, Aksu Prefecture, Xinjiang, China
[3]Xuancheng East New City Investment and Development Co., Ltd., Xuancheng, Anhui, China
[a]1440746537@qq.com, [b]chaiyuquan@163.com,[c]443630128@qq.com
**Corresponding author*

Abstract: *Taking the current situation of the electric vehicle (EV) service system in Henan Province as the starting point, this paper analyzes the causes of insufficient third-party socialized services, high thresholds for EV maintenance, low support capacity of charging infrastructure in counties and rural areas, and shortage of professional talents through on-site surveys, expert interviews and other methods. It also puts forward the future development direction of the EV service system. The research in this paper can provide reference for the construction of a high-quality EV service system in the province, help solve the drawbacks of the existing system, and provide efficient and convenient services for consumers.*

Keywords: *Electric Vehicle, Service System, After-Sales Service, Current Situation and Development Direction*

1. Introduction

Compared with traditional fuel vehicles, electric vehicles have prominent economic and environmental advantages, and are supported by national policies. In recent years, with the continuous improvement of industrial development level, shortcomings such as driving range and vehicle purchase cost have been continuously overcome, attracting more consumers to purchase electric vehicles [1]. As a major province in terms of population and economy in China, Henan Province ranks among the top in terms of sales volume and ownership of electric vehicles. However, at this stage, the EV service system is far less mature than that of fuel vehicles, which affects the healthy development of the industry. Henan Province urgently needs to solve the problem of the lagging service system.

2. Current Situation and Existing Problems

The EV service system has broad and narrow senses. In the broad sense, the service objects include not only users but also enterprises and other relevant stakeholders; this paper only refers to users. The EV service system refers to a series of systematic and professional service and management solutions provided by enterprises and society for users around the whole life cycle of electric vehicles. It covers pre-sales service, in-sales service, charging service, maintenance, spare parts supply, after-sales service network, battery recycling and other aspects. Its purpose is to protect the rights and interests of users, improve user satisfaction, and promote the healthy development of the EV industry.

China has ranked first in global EV sales for 10 consecutive years and is the country with the largest global EV consumer group. According to the statistics of the China Association of Automobile Manufacturers, the sales volume of passenger cars in China was 27.563 million in 2024, among which the sales volume of electric vehicles was 12.866 million, with a penetration rate of 40.9%. In 2024, the sales volume of passenger cars in Henan Province was 1.398 million, among which the sales volume of electric vehicles was 685,000, with a penetration rate of 49%.

As shown in Figure 1, Henan Province was behind the national average level before 2022.In the past

ISSN 2616-5783 Vol.8, Issue 11: 12-16, DOI: 10.25236/AJHSS.2025.081103

three years, driven by government policies such as trade-in subsidies and fuel vehicle restrictions, led by leading enterprises such as BYD Zhengzhou Base and Yutong Bus, and catalyzed by the transformation of consumers' awareness, the sales volume of electric vehicles has increased rapidly, far exceeding the national average level. As a major province in terms of population and economy in central China, Henan Province will undoubtedly become a super province in terms of EV ownership in the future.

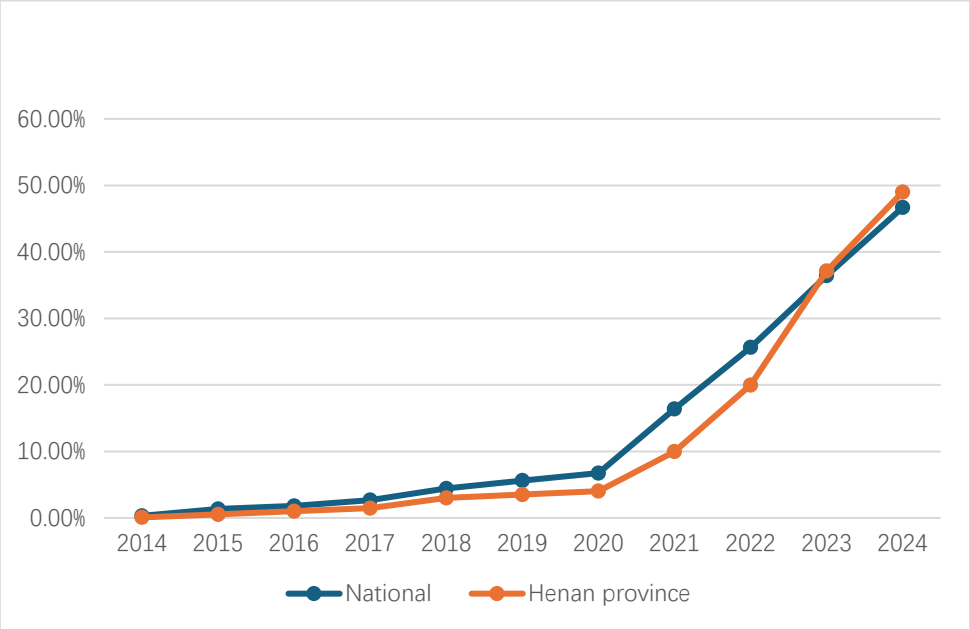

Figure 1 National vs, Henan Province EV Penetration Rate

The EV service system has been gradually established with the growth of the consumer group, and has only a development history of more than ten years so far. It is far from being as perfect as the fuel vehicle service system [2]. Since 2020, the penetration rate of electric vehicles in Henan Province has increased sharply. In the next few years, a large number of electric vehicles will exceed the warranty period, the demand for the service system will expand rapidly, and the contradiction between consumers' demand and the imperfection of the existing system will be exposed quickly [3]. It is necessary to plan in advance to solve the problem. Electric vehicles need a service system as large and efficient as that of fuel vehicles.

At present, scholars' research on the EV service system often focuses on the after-sales service of automobile manufacturers. Liu Ying [4] described the current situation of after-sales service; Liao Yanling [5], Du Xiang [6] and Wang Feilong [7] put forward improvement plans for after-sales service respectively. Few scholars have approached the analysis of EV service systems from the perspective of social resources. In fact, this perspective best reflects the maximization of benefits for society, enterprises, and consumers under conditions of equilibrium. This paper takes the overall service system including third parties as the starting point, adopts sampling surveys and expert interviews to discuss the characteristics, shortcomings and development direction of the EV service system, aiming to provide reference for the development of the industry.

3. Characteristics of the EV Service System

After more than 100 years of development, fuel vehicles have a mature service system. Although electric vehicles have the same basic functions as fuel vehicles, their structure and principle are different, so their service systems are quite different.

Table 1 shows that both vehicles share similarities in tire maintenance, braking systems, air conditioning systems, and exterior upkeep. However, EVs eliminate engine-related maintenance requirements but necessitate specialized battery and electronic control monitoring, along with compatible charging infrastructure. The EV service system is characterized by continuous upgrading based on data and technology. Like the overall performance of electric vehicles, it is developing in the direction of digitalization and intelligence.

ISSN 2616-5783 Vol.8, Issue 11: 12-16, DOI: 10.25236/AJHSS.2025.081103

Table 1: Differences and Similarities between EV and Fuel Vehicle Service Systems

Similarities	Unique to Electric Vehicles	Unique to Fuel Vehicle
● Tire Maintenance and Replacement	● Battery Inspection and Management	● Engine and Fuel System Inspection and Maintenance
● Brake System Inspection and Repair	● Motor and Electronic Control System Inspection and Repair	● Gas Stations
● Air Conditioning System Maintenance	● Charging Infrastructure Construction and Maintenance	● Daily Maintenance of Fuel Vehicles
● Exterior and Bodywork Maintenance and Repair	● Central Control and Software System Upgrades and Fault Diagnosis	
● Financing Support and Insurance Services	● Daily Maintenance of Electric Vehicles	
● Sales Network and After-Sales Facilities		

4. Development Dilemmas

4.1 Weak Service System Infrastructure in Counties and Remote Rural Areas

Henan Province has 158 counties and 1,791 towns. Charging piles are popularized in county areas, but professional maintenance stores cannot meet the demand. Although charging piles are available in every town, they cannot meet the requirements of convenience and speed. The rural power grid cannot meet the load requirements for installing a large number of fast charging piles. The funds required for power grid transformation and charging station investment are huge, so the progress is slow. According to statistics, it is still impossible to have a fast charging station in every town at present. The ratio of public DC charging guns to vehicles in areas below the county level is about 166:1, which is much higher than the 10:1 ratio in cities and also higher than the bottom line of "50:1 in towns" proposed in the “2027 Doubling Action” of the Ministry of Industry and Information Technology.

In some remote rural areas, the coverage of charging facilities is not comprehensive enough. In some areas, there may be insufficient charging piles and unbalanced distribution. Especially during peak travel periods such as holidays, there may still be a shortage of charging services.

4.2 OEMs Dominate, and Third-Party Socialized Services Are Insufficient

In the service system, manufacturers play a key role, and the bargaining power of third-party independent maintenance is greatly reduced [8]. The three core components (battery, motor, electronic control) and software of electric vehicles are highly centralized, and the diagnosis authority, accessory codes and maintenance manuals are locked by the OEM cloud. Third-party independent maintenance must obtain the OEM "digital key" from the manufacturer to get maintenance permission. Under this model, it is difficult for socialized independent maintenance to expand its share, and it is hard to form a fully competitive pattern. Expert interviews show that the number of third-party EV maintenance providers is less than 20%, and they are mainly distributed in large and medium-sized cities, with few distributed in counties and rural areas.

4.3 Waste of Resources in the Existing Social Automobile Maintenance System

Traditional fuel vehicles have formed a very mature maintenance service support system. For the parts shared by fuel vehicles and electric vehicles, such as tire maintenance and replacement, brake system detection and maintenance, air conditioning system maintenance, appearance and sheet metal painting, existing automobile maintenance shops are difficult to receive orders. The reason is the difficulty in obtaining accessories. Many new energy vehicle enterprises implement the "self-operated after-sales" model, and accessories can generally only be obtained from brand-designated maintenance points. Traditional fuel vehicle maintenance shops are difficult to buy new energy vehicle-related parts through normal channels. Even if problems are found, maintenance may not be possible due to the lack of accessories. In addition, many automobile manufacturers and 4S stores have many restrictive clauses on external maintenance in their warranty policies. Car owners are worried about losing the warranty and dare not choose external maintenance. The market pattern without sufficient competition leads to high

ISSN 2616-5783 Vol.8, Issue 11: 12-16, DOI: 10.25236/AJHSS.2025.081103

prices and low quality of third-party services.

4.4 High Technical and Capital Thresholds for the EV Maintenance Industry

The transition from traditional fuel vehicle maintenance to EV maintenance is a leap from "mechanical maintenance" to a composite system of machinery + intelligent technology + high-voltage electricity [9]. EV maintenance involves technical fields such as high-voltage electricity safety and electronic diagnosis. In addition to auto repair qualifications, traditional auto repair practitioners also need to master the constantly updated intelligent technology. According to regulations, EV maintenance requires an electrician certificate. Even ordinary daily maintenance, such as the inspection of the cooling system and electric drive system, requires professional training. Therefore, it is difficult for traditional maintenance personnel to switch to EV maintenance.

In addition, EV maintenance requires professional equipment and technical diagnosis methods, with large investment. Coupled with the fact that technical diagnosis requires authorization from manufacturers, it is difficult for existing auto repair enterprises to transform to EV maintenance.

4.5 Weak Talent Supply System for EV Marketing and Maintenance

The EV industry is an emerging industry with high technology content and rapid technological updates, which has high requirements for teaching staff. Expert interviews show that the current vocational education and training system in China has relatively lagged behind in specialized training courses for electric vehicles [10]. The curriculum of many vocational colleges still focuses on traditional automobile maintenance, lacking training content for new types of vehicles such as electric vehicles and intelligent vehicles. The technical standards and specifications of the automobile industry are still being developed and improved. Especially, the maintenance standards vary among different brands and models, which further increases the difficulty of technical learning for maintenance personnel. Moreover, not only is it difficult for students to learn, but many vocational schools also lack relevant professional teachers [11]. The supply of professional talents in links such as EV sales and maintenance cannot keep up with the market demand.

4.6 Intractable Problems in the Used Car Service System

The EV industry has relatively new technology, and there is no unified system for used car evaluation standards. Differences exist among different evaluation institutions and methods, leading to inconsistent evaluation results. At the same time, the evaluation technology is relatively backward, making it difficult to accurately evaluate the performance and service life of core components such as batteries and motors. In addition, the professional quality of evaluators varies, which affects the reliability of evaluation results. Consumers have limited understanding of vehicle performance, retention rate and other aspects, leading to a serious information asymmetry. Coupled with the false information and publicity of some businesses, consumers find it difficult to identify the real value during the car purchase process.

Most used cars have been in use for a long time. Some models have been discontinued, and some vehicle manufacturers have closed down. Article 21 of the “Measures for the Administration of Automobile Sales” stipulates that suppliers shall promptly announce the models that have been discontinued or stopped selling to the public, and ensure the supply of spare parts and corresponding after-sales services for at least 10 years thereafter. However, in reality, existing automobile enterprises cannot accurately estimate the subsequent demand for spare parts. After the closure of manufacturers, it becomes even more difficult to obtain spare parts and carry out maintenance [12]. The rights and interests of consumers cannot be effectively protected [13].

5. Prospect of Development Trends

With the economy, intelligence and policy protection of EV products, more consumers will be attracted to purchase electric vehicles in the future. The EV market will maintain a growth trend for a long time, and its ownership will increase year by year. The EV service system has a huge market space and potential.

Only by improving the EV service system can the market demand be effectively met, the high-quality vehicle experience of consumers be satisfied, and the healthy and sustainable development of the industry be promoted. In the future, not only will the after-sales service system of automobile enterprises be

ISSN 2616-5783 Vol.8, Issue 11: 12-16, DOI: 10.25236/AJHSS.2025.081103

strengthened, but the social service system represented by third parties will also expand rapidly. The government, enterprises and consumers will work together to promote the introduction of industry standards and local standards for after-sales service, accelerate the training of professional talents, promote information disclosure and resource sharing, and finally form an efficient, convenient and mature EV service system.

References

[1] Ji Xijun. Feasibility Analysis of Constructing an Upstream and Downstream Linked Service System for New Energy Vehicles [J]. Automobile and New Power, 2024, 2: 85-88.
[2] Zhang Yongwei. From Purchase to Use: Multi-Dimensional Construction of New Energy Vehicle Service System [M]. China Machine Press, 2023.
[3] Feng Yetao, Zhang Yu, Wang Qian, Luo Xiao. Analysis on the Current Situation of After-Sales Service Development of New Energy Passenger Vehicles in Chengdu [J]. New Energy Vehicles, 2023, 24: 21-24.
[4] Liu Ying. Brief Analysis of the Current Situation of After-Sales Service of New Energy Vehicles in China [J]. Southern Agricultural Machinery, 2021, 52(11): 128-129.
[5] Liao Yanling. Research on Countermeasures to Improve Customer Satisfaction with Automobile After-Sales Service [J]. Automobile and New Power, 2022(3): 67-69.
[6] Du Xiang. Analysis on the Construction of New Energy Vehicle After-Sales Service System [J]. Automobile Knowledge, 2025, 2: 235-238.
[7] Wang Feilong. Research on Problems and Optimization Strategies of New Energy Vehicle After-Sales Service [J]. Automobile Test Report, 2024(14): 65-67.
[8] Hao Wenli. When Will the Monopoly of New Energy Vehicle Maintenance Be Broken [N]. China Automotive News, 2025, 5(26): 036.
[9] Ning Bo. Analysis on the Current Situation of New Energy Vehicle After-Sales Service [J]. Modern Economic Information, 2019(3): 395.
[10] Huang Yu, Wu Jinyu. Exploration on the Talent Training Mode of New Energy Vehicle After-Sales Service [J]. Automobile Test Report, 2023(3): 119-121.
[11] Wan Yuchu, Shi Yanyan. Exploration and Practice of the "New Energy Vehicle After-Sales Service Workshop" Teaching Mode [J]. Internal Combustion Engines and Parts, 2024(22): 141-143.
[12] Pei Jianru. Tail Automobile Enterprises Fall into Crisis or "Exit", and the After-Sales Maintenance of Vehicles Must Be Considered [N]. National Business Daily, 2024, 2(29): 001.
[13] Yao Meijiao, Yang Zi, Zhao Qiong. Difficulties in After-Sales Service of Power Batteries, How to Protect Consumers' Rights and Interests [N]. China Energy News, 2024, 3(18): 013.