Current Status and Recommendations for Compliance of New Energy Vehicle Power Battery Recycling Service Outlets

Guohua Zhang, ZiyaoWang*, Hao Yin
Automotive Data of China Co., LTD, Tianjin, China
**Corresponding Author.*

Abstract: In recent years, China's new energy vehicle (NEV) production and sales have maintained rapid growth, and power batteries are about to face a large-scale retirement wave. This paper reviews the layout and compliance status of NEV power battery recycling service outlets in China. By studying the challenges faced by the recycling industry and the problems in construction and operation, recommendations are proposed to address these issues, providing a reference for the sustainable development of the NEV recycling industry.

Keywords: New Energy Vehicles; Power Batteries; Recycling Service Outlets; Compliance

1. Introduction

With the transition of the new energy vehicle market from policy-driven to market-driven, China's NEV production and sales have grown rapidly. According to data from the China Association of Automobile Manufacturers (CAAM), in 2023, China's NEV production and sales reached 9.587 million and 9.495 million units, respectively, accounting for 31.6% of total vehicle sales [1]. The NEV ownership in China has climbed to 20.41 million units. According to data from Gaogong Lithium, from 2017 to 2023, China's power battery installation capacity reached 36.39, 56.98, 62.38, 62.85, 139.98, 260.94, and 359.7 GWh, respectively [2].

The average service life of NEV power batteries is about 6-8 years, and it is expected that a large-scale retirement wave of power batteries will occur in the next 1-2 years [3].

China has established a relatively complete power battery recycling system, with the number and coverage of recycling outlets reaching a considerable scale. However, the safety and environmental impacts of retired power batteries cannot be ignored, and the standardized development of power battery recycling service outlets is urgent [4].

2. Current Status of Power Battery Recycling Service Outlets

2.1 Layout of Power Battery Recycling Service Outlets

Since 2018, China has successively issued laws and regulations related to the recycling of retired power batteries, initially establishing a "top-level system-traceability management-industry standards-pilot demonstrations-in-process and post-event supervision" framework for power battery recycling management. Under the guidance of policies, production enterprises have actively fulfilled their recycling responsibilities and built power battery recycling systems [5]. By June 2024, a total of 9,950 recycling service outlets had been established nationwide, covering 327 prefecture-level administrative regions in 31 provinces. These recycling service outlets are mainly built by automobile manufacturers, with 98% relying on automobile after-sales service institutions, 0.6% co-built with power battery comprehensive utilization enterprises, 1.0% co-built with end-of-life vehicle recycling and dismantling enterprises, and 0.4% co-built with other enterprises. As of June 2024, there are 9,950 outlets nationwide, mainly distributed in the Beijing-Tianjin-Hebei region, the Yangtze River Delta, the Pearl River Delta, and the central region as shown in Figure 1 [6].

2.2 Construction and Issues of Recycling Outlets

Although China has initially established a retired power battery recycling service system [7], from a compliance perspective, there are still many problems with existing outlets:

Site Construction Issues: Some recycling

service outlets do not fully understand the "Standards," and the ground has not been treated for anti-corrosion and anti-seepage. Warning signs are incomplete, and most outlets do not display prompt information such as "Retired Power Battery Recycling Service Outlet."

Operational Processes and Staff Training Issues: Some vehicle manufacturers and echelon utilization enterprises, as the reporting entities for power battery recycling service outlets, have not effectively trained and supervised their outlets, resulting in a lack of understanding of the recycling process among outlet staff. Additionally, detailed recycling operation procedures are not standardized in prominent locations or operational documents [8].

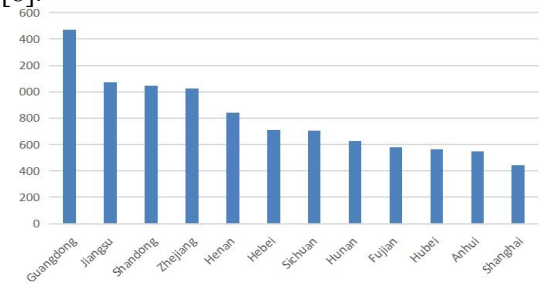

Figure 1. Distribution of Power Battery Recycling Service Outlets in China (Source: China Automotive Data)

Safety Management Issues: Most outlets perform well in terms of firefighting equipment, but some outlets cannot provide fire acceptance records, or the factory building grade and fire resistance rating do not meet the "Standards." Some enterprises did not consider adding power battery recycling business when renting factory buildings early on, and the current profit from power battery recycling is far less than the cost of fire protection renovation, resulting in low willingness for compliance renovation [9].

Traceability Information Management Issues: Some outlets have established retired power battery system accounts but do not actually use them or upload information to the national traceability management platform. Reporting entities lack supervision and training for outlets, and outlets do not know how to upload power battery information to the national traceability management platform.

Transfer Management Issues: The main issues in transfer management are concentrated in transportation and disposal. Some outlets do not verify whether the entrusted party has hazardous material transportation qualifications during the transfer of retired power batteries [10]. Outlets usually transfer transportation risks by requiring the buyer of retired power batteries to find transportation companies and vehicles to take the battery packs away from the outlet, and the outlet is not responsible for the transportation of power battery packs, posing safety hazards.

3. Industry Development Issues and Recommendations

3.1 Analysis of Industry Development Issues

Currently, the difficulty of power battery recycling is a major challenge faced by outlets. In the maintenance sector, power battery packs replaced by maintenance companies are mainly returned to vehicle manufacturers, battery manufacturers, or directly collected by insurance companies. Retired power batteries from operating companies are usually directly purchased by comprehensive utilization enterprises through bidding due to the large quantity. However, scattered retired power batteries from individuals or enterprises face certain recycling chaos, with a large proportion being collected by unqualified or non-compliant recycling traders. This is mainly because these non-compliant recycling traders have lower compliance costs, resulting in lower operating costs. On the other hand, these recycling traders raise recycling prices in the market, while compliant outlets have higher compliance costs and relatively lower recycling prices, making compliant outlets uncompetitive. The main reason for this phenomenon is the low entry threshold for power battery recycling, and it is necessary to strengthen the supervision of recycling traders.

3.2 Recommendations

Strengthen Policy Guidance and Supervision: Due to the low entry threshold for the power battery recycling market, the flow of retired power batteries to non-compliant recycling traders is severe, and compliant outlets face the dilemma of high investment costs but inability to collect batteries. Therefore, it is recommended that relevant national departments formulate policies and regulations to standardize the power battery recycling industry, and stipulate that the traceability

management of comprehensive utilization enterprises should be linked with recycling outlets, meaning that the batteries by comprehensive utilization enterprises should correspond to the batteries by recycling outlets.

Establish Battery Scrapping with Vehicle Regulations: Currently, most retired new energy vehicles collected by local vehicle scrapping and dismantling enterprises in the Beijing-Tianjin-Hebei region are missing batteries. The main reason is that the residual value of retired power batteries is high, and before the vehicles are scrapped, the batteries have already flowed into non-compliant recycling channels through reporting battery loss. This undoubtedly poses significant safety and environmental hazards. Therefore, it is recommended that relevant national departments formulate policies and regulations to improve the regulations on battery scrapping with vehicles, to a certain extent preventing batteries from flowing into non-compliant channels.

Guide and Publicize to Consumers, and Implement the Retired Power Battery Traceability Information Upload System: Introduce a compliance certification system for outlets, and prioritize outlets certified by relevant national departments. When batteries need to be replaced or scrapped, consumers can file cancellation information through the platform or mobile terminal, achieving full traceability of the power battery's use and scrapping cycle.

Establish a Regular Supervision Mechanism for Recycling Service Outlets, and Strictly Implement the Extended Producer Responsibility System: Currently, some outlet enterprises have weak compliance awareness, insufficient compliance willingness, and inadequate implementation of compliance requirements. Therefore, it is recommended that the state ensure the flow of retired batteries into correct recycling channels from the source, and strengthen the supervision of vehicle manufacturers and battery recycling enterprises in implementing the extended producer responsibility system, urging reporting enterprises to strengthen compliance training and guidance for outlets, enhance the recycling safety awareness of front-line personnel, and urge outlets to rectify non-compliant items.

References

[1] Huang Juan, Liu Shiqi, Yang Lu, et al. Analysis of the Current Status of New Energy Vehicle Power Battery Recycling. China Storage & Transport, 2023(5):73-74.

[2] Zhang Zeming. Battery Recycling Takes a Key Step. Resource Recycling, 2018(10):2.2018-10-013.

[3] Yang Zihua. Power Battery Traceability Management Launched: Can "Battery-Separated Vehicles" Solve the Recycling Dilemma?. Financial World, 2018(11):2.DOI:CNKI:SUN:JRSJ .0.2018 -11-064.

[4] Wang, X., Zhang, Y., & Li, Z. Challenges and Opportunities in Recycling Lithium-Ion Batteries for Electric Vehicles. Journal of Cleaner Production, 2022, 330: 129836.

[5] Liu, H., & Chen, W. Policy Analysis on the Recycling of Retired Power Batteries in China. Environmental Science and Pollution Research, 2023, 30(15): 43210-43220.

[6] Chen, Y., & Li, X. Sustainable Recycling of Lithium-Ion Batteries: A Comprehensive Review. Renewable and Sustainable Energy Reviews, 2021, 137: 110464.

[7] Li, J., & Wang, Q. Development of Power Battery Recycling Industry in China: Policy, Technology, and Market. Energy Policy, 2020, 144: 111623.

[8] Zhang, L., & Liu, Y. Environmental Impacts and Recycling Technologies for Retired Lithium-Ion Batteries. Waste Management, 2021, 120: 765-775.

[9] Xu, M., & Zhao, R. Economic and Environmental Assessment of Lithium-Ion Battery Recycling in China. Resources, Conservation and Recycling, 2022, 176: 105919.

[10] Gao, S., & Li, H. A Review of Recycling Technologies for Retired Power Batteries from Electric Vehicles. Journal of Power Sources, 2021, 491: 229569.