

Analysis on the Current China NEV Traction Battery Recycling System and Suggestions for Future Improvement

Rui Wang, Song Hu, Fengyun Zhao

Automotive Data of China (Tianjin) Co.,Ltd., Tianjin, China

Abstract: In order to learn about the implementation of the policy on the establishment of the corporate recycling system, to gain an accurate grasp of the current status of China's NEV traction battery recycling system, and to help improve China's traction battery recycling system, this paper analyzes in detail the current status of the establishment of the recycling system as well as existing problems in terms of scale, standardized establishment, and so on, and puts forward targeted suggestions for improvement.

Keywords: New Energy Vehicle, Traction Battery Recycling System, Traction Battery Recycling Service Outlets.

1. Policy Background of Construction of Traction Battery Recycling Service Outlets

As global resource and environmental problems become increasingly prominent, the NEV industry has become a major strategic development orientation in China. Since traction battery is the key component of NEV, traction battery recycling has a bearing on the sustainable development of the NEV industry. In recent years, the state has attached great importance to the recycling of traction batteries. The 2021 report on the work of the government stated for the first time the need to "speed up the establishment of traction battery recycling system". Documents released in 2022 including the Circular on the Implementation Plan for Accelerating the Comprehensive Utilization of Industrial Resources and Implementation Plan for Peak Carbon Dioxide Emissions in the Industrial Sector made suggestions for promoting the establishment of recycling system for NEV traction batteries to achieve efficient recycling of renewable resources.

In 2014, the Ministry of Industry and Information Technology initiated research on the recycling of NEV traction batteries. Initial progress has been made in the establishment of a policy system framework for the recycling of NEV traction batteries with the extended producer responsibility system as the basic principle^[1], which stipulates that automobile manufacturers assume primary responsibility for the recycling of NEV traction batteries. In February 2018, seven ministries and commissions including the Ministry of Industry and Information Technology and the Ministry of Science and Technology, issued the Interim Measures for the Administration of the Recycling of NEV Traction Batteries, requiring automobile manufacturers to fulfil producer responsibility, establish recycling service networks, and take the responsibility of collecting waste traction batteries, and encouraging relevant entities in the industrial chain to jointly build and share waste traction battery recycling channels. The Guidelines for the Establishment and Operation of NEV traction battery

Recycling Service Networks (hereinafter referred to as "the Guidelines") were released and implemented in October 2019, providing standardized technical guidance for the establishment and operation of recycling service networks^[2]. The Guidelines stipulate that automobile manufacturers are obliged to build recycling service outlets in prefecture-level cities where NEVs are sold, and establish at least one centralized storage outlet in prefecture-level cities where more than 8,000 vehicles are sold. At the same time, it clarifies the requirements for network establishment, operation, as well as safety and environmental protection. Existing recycling service networks that do not meet the relevant requirements should complete rectification within six months from the date when the Guidelines become effective. According to the policy, enterprises are required to report the information of their recycling service outlets to the Ministry of Industry and Information Technology and make it public. This paper carries out an analysis based on the information on recycling service outlets of NEV traction batteries as published on the official website of the Ministry of Industry and Information Technology.

2. Current Situation of NEV Traction Battery Recycling System

By the end of September 2022, more than 150 automobile manufacturers and more than 30 echelon utilization enterprises had set up a total of 10,257 recycling service outlets, covering 326 prefecture-level administrative regions in 31 provinces and municipalities. Thereinto, 2,566 outlets were jointly built by two or more enterprises, accounting for 25.1 percent of the total. Recycling outlets are primarily concentrated in the Pearl River Delta and Yangtze River Delta regions, as shown in Figure 1; the number of recycling outlets in Beijing-Tianjin-Hebei region, Yangtze River Delta, Pearl River Delta, Central China and other regions is shown in Figure 2. Among all the provinces, Guangdong Province ranks first, with 1,062 recycling service outlets. The top 10 provinces had a total of 6,116 networks, accounting for 59.70 percent of the total, as shown in Figure 3.

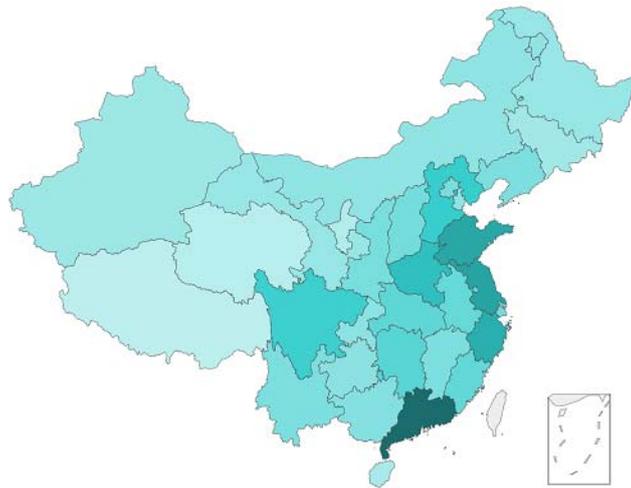


Figure 1. Establishment of recycling outlets in provinces and municipalities

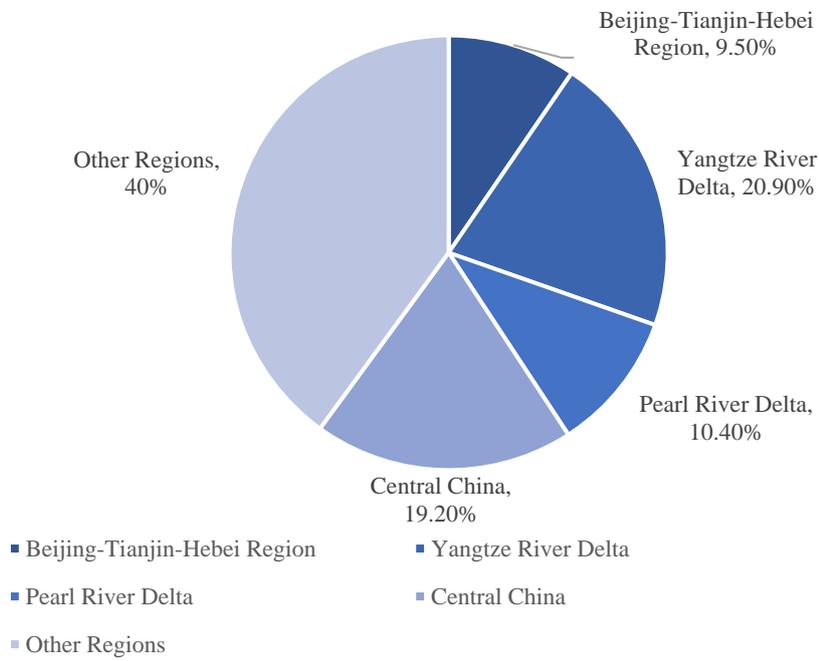


Figure 2. Proportion of recycling networks by region

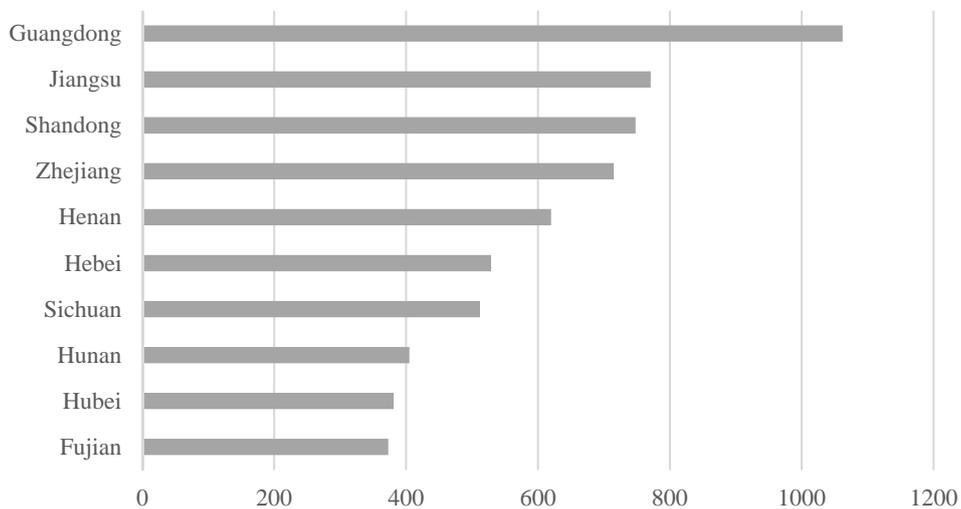


Figure 3. Number of recycling service outlets in the top 10 provinces

At present, recycling service outlets are primarily built by automobile manufacturers, over 98 percent of which are based on automobile after-sales service agencies. The number of outlets jointly established by automobile manufacturers and comprehensive traction battery utilization enterprises or end-of-life vehicle recycling and dismantling enterprises account for less than one percent. The top 20 enterprises in terms of the number of networks have set up a total of 8,811 outlets, accounting for 85.90 percent of the total .

3. Normalization of Current Recycling Service Outlets

In order to learn about the Normalization of Current Recycling Service Outlets, we organized an on-site survey of 32 outlets in the main sales territory for the top manufacturers (including importers) of NEVs. The survey covers three forms of establishment: self-built, co-built and authorized outlets, and in another degree two types of networks: collection type and centralized storage type. The survey reveals that only 25 percent of the networks meet the

requirements of the Guidelines in terms of the standardized establishment. The problems mainly fall into three categories (see Table 1): First, about 79 percent of the outlets have a working environment that does not meet the standards. For example, battery storage areas and office areas are mixed; Class A, B, and C batteries are stored together indiscriminately or the ground is not treated with anti-corrosion and anti-seepage hardening. Second, about 83 percent of the outlets are not fully equipped with facilities. For example, outlets are not equipped with temperature and humidity monitoring devices, brine tanks, discharge cabinets, sprinkler equipment, or explosion-proof tanks, etc. Third, about 58 percent of the outlets have flawed systems and processes, such as a lack of records or incomplete records of battery warehousing, a lack of records of battery safety judgment, or a lack of regular self-inspection. Comprehensively, the outlets co-built by automobile manufacturers and comprehensive utilization or logistics enterprises are more standardized in terms of facility configuration and operation management.

Table 1. Reasons for non-compliance with normative requirements and proportion of networks

No.	Reasons for non-compliance	Proportion of networks	Specific reasons
1	The working environment of the outlet does not meet the standards.	79%	The doorplate “Waste traction battery Recycling Service Outlet” is missing or is not placed in a conspicuous position.
2			Task instruction information is not placed on the working site.
3			The office space, storage site and treatment site are not separated.
4			The ground is not hardened, or is not treated with anti-corrosion and anti-seepage process.
5			The battery storage spacing is too small.
6			Warning signs are not provided.
7			Class A, B, and C batteries are not stored separately.
8			There is a lack of separate battery storage and processing sites.
9			The storage time does not meet the requirements.
10			No firefighting qualification is obtained for the factory.
11			Temperature and humidity monitoring devices are not installed.
12	Facilities are not well equipped	83%	Emergency treatment facilities such as brine tanks and discharge cabinets are not set up for Class B and C batteries, or the brine tank is too small in size.
13			There are no ventilation facilities or temperature and humidity regulation facilities.
14			There is no explosion-proof tank.
15			There are no battery code acquisition tools.
16			It is not equipped with a sprinkler system.
17			The waste liquid collection device does not meet the requirements or is not equipped.
18			It is not equipped with shelves.
19			There is a lack of storage signs for different types of batteries
20			It is not equipped with a smoke alarm and infrared thermal imaging monitoring device.
21			There are no records or incomplete records of battery warehousing.
22	Flawed system and processes	58%	Records of battery safety judgment are not set and filed.
23			Self-inspection is not carried out regularly or relevant documents are kept.
24			No documents such as work procedures and work safety manuals are prepared.

4. Major Existing Problems

Through the industry survey, this paper summarizes the problems that exist in China NEV traction battery recycling system.

4.1. Recycling service networks are rarely used

Enterprises mainly establish their own recycling service outlets, and different enterprises often set up networks in the same area. Currently, about 78 percent of retired batteries are generated by group users such as buses and taxis, while individual consumers provide a small number of retired batteries. Therefore, existing outlets actually collect few retired batteries, and outlets are rarely used. According to the survey, only 34 percent of outlets offer the service of recycling and restoring retired batteries.

4.2. There is a lack of effective penalties for the management of recycling service outlets

The management system lacks explicit penalty measures for enterprises that do not set up outlets or have outlets that do not meet the standards, and therefore lack institutional binding force. To meet the policy requirements, some NEV manufacturers only value the number and coverage of outlets, but do not act as a gatekeeper of the quality of outlet establishment. Moreover, they fail to provide training and publicity on the responsibilities and operation management requirements for outlet workers. As a result, these recycling service outlets are unable to play their due role, and this goes against the policy objectives for the outlet establishment.

4.3. There is a lack of sound operation mechanism for recycling service outlets

It is costly to establish outlets, and financial and labor costs are needed to ensure their standardized operation. At present, however, recycling service outlets do not achieve profitability yet because of the few retired traction batteries, which dampen enterprises' enthusiasm to set up outlets. Although some enterprises begin to consider cooperative establishment, most vehicle enterprises have misgivings about the compliance of co-built and authorized recycling outlets due to a lack of an industry mutual trust mechanism.

5. Recommendations for Improvement

5.1. Further strengthen the verification and management of outlets.

Given the fact that there is a lack of publicity on the responsibilities of recycling service outlets, management training is not provided, and the filing information is not updated in a timely manner, the government departments should conduct the survey and supervision of automobile manufacturers regarding recycling service outlets, launch self-inspection of outlet registration, strengthen the dynamic management of information on outlets, as well as function and operation training, further underline the role of outlets, and guide and regulate the market sales, storage, transportation, etc.

5.2. Move faster to set standards for relevant areas.

It is necessary to improve the establishment of the standard system for traction battery recycling, and promote the preparation of the national recommended standard under the "Recovery of traction battery used in electric vehicle – management specification - Part 2 recycling service outlets". The standard is currently in the process of examination and approval. It will provide detailed guidance for the establishment of traction battery recycling service outlets nationwide after release.

5.3. Promote the "co-building and sharing" of recycling service outlets in the industry

In view of the industry's pain points such as high establishment cost and low utilization level of outlets, third-party research institutions can work with relevant enterprises upstream and downstream of the industrial chain to leverage the resource advantages of standardized comprehensive utilization enterprises as well as third-party warehousing and logistics companies in packaging, transportation, safe storage, etc., to explore the establishment of a "co-building and sharing" recycling service system, continue to incorporate recycling service outlets that meet the regulations and standards, gather resource pool of compliant networks, share the resources of compliant outlets for automobile manufacturers, promote the filing of compliant outlets, help automobile manufacturers meet regulatory requirements at low cost, and ensure compliance with China's traction battery recycling system.

5.4. Continue to promote the voluntary certification of recycling service outlets

Automotive Data of China Co.,Ltd. cooperates with CATARC Huacheng Certification (Tianjin) Co., Ltd. in formulating the Certification Rules for NEVs Traction Battery Recycling Service Outlets and the System for Establishment of NEVs Traction Battery Recycling Service Outlets and Operation Management and carrying out the recycling service outlet certification through the filing with Certification and Accreditation Administration of China (CNCA), with a view to establishing an industry mutual trust mechanism through third-party certification and improving the compliance rate of outlets establishment. At present, a total of six enterprises in two batches in 2022 have passed the voluntary certification of recycling service outlets, playing a positive demonstration role for the industry.

5.5. Carry out research on the optimal layout of enterprise recycling system

It is recommended that third-party institutions in the industry conduct in-depth research on the optimal layout of corporate-level recycling system, and establish a model for optimal distribution of traction battery recycling service system based on the influencing factors of traction battery decommissioning, transport capacity and cost, and traffic infrastructure in light of the production and sales of NEVs, the distribution of back-end enterprises in China, so as to help the industry establish a national low-cost, efficient traction battery recycling service system that allows optimal allocation of resources.

References

- [1] Li Yuke, Li Zhenbiao. Current status and problems of NEV traction battery recycling in China as well as suggestions [J]. Resource Recycling, 2019(08):32-37.
- [2] Wang Pan, Li Longhui, Xu Shujie. Study of the development of China's NEVs traction battery recycling industry [J]. Auto Time, 2019(21):36-37. Amjady N. Short-term hourly load forecasting using time series modeling with peak load estimation capability. IEEE Transactions on Power Systems, 2001, 16(4): 798-805.