Analysis on the Status Quo of Traction Battery Recycling of New Energy Vehicles and Suggestions on Incentive Measures

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Abstract. The management policies of traction battery recycling of new energy vehicles have been released, and relevant enterprises have responded positively. The traction battery recycling industry has developed rapidly and achieved remarkable results. In order to further promote the enthusiasm of traction battery.

Keywords: Traction battery, recycling, incentive measures.

1. Status Quo of Traction battery Recycling of New Energy Vehicles

1.1. Background of the Industry
In the past five years, with the introduction of a series of supporting policies such as national subsidies for new energy vehicles and exemption from purchase tax, China's new energy vehicle industry showed a trend of vigorous development [1]. With the promotion of various favorable national policies, the output of new energy vehicles in China had been increasing year by year and had entered a period of rapid development. According to the statistics information network of the China Association of Automobile Manufacturers, by the end of September 2020, China's cumulative output of new energy vehicles had exceeded 4.8 million, ranking first in the world in terms of the scale of promotion for three consecutive years, and China had become the world's largest new energy vehicle production and sales country. The development of new energy vehicles had entered the fast lane, which immediately drove the strong demand for traction batteries. The traction battery industry had begun to expand on a large scale. By the end of September 2020, the accumulative supporting volume had exceeded 230GWh, and the industrial scale ranked the first in the world.

The supporting volume of traction batteries is increasing year by year. However, due to the limited-service life of such batteries and therefore their large-scale decommissioning, a series of safety, environmental and resource problems will arise, and the recycling of decommissioned traction batteries is becoming increasingly urgent [2]. Ensuring efficient recycling of traction batteries is an important basis for the healthy development of the new energy automobile industry. Solving the problem of traction battery recycling is conducive to coordinated development with the environment, easing constraints of strategic resources, and ensuring people's safety [3].

1.2. Status Quo of the Industry
The Ministry of Industry and Information Technology attaches great importance to the issue of traction battery recycling, and has been doing a good job in the research on exhibition policies and trade
management. It has issued more than 10 policy documents and established a normalized working mechanism of "top-level system-traceability management - industry norms - pilot demonstration - in-process and post-event supervision". With the implementation of management policies and the promotion of pilot works, China has made remarkable achievements in the construction of the traction battery recycling system, the declaration of traceability information, the disclosure of technical information, the research on the echelon utilization of key generic technologies, etc.

Enterprises dealing in recycling of traction storage batteries of new energy vehicles shall build up their recycling service network by self-building, co-building, authorizing or other means, gradually improve recycling channels for waste traction batteries, and thus promote the construction of China's traction battery recycling system. With the volume of decommissioned traction batteries gradually increasing, enterprises are actively exploring and practicing in echelon utilization, taking the lead in realizing commercial application in the fields of standby traction for communication base stations, electric energy storage and low-speed vehicles. Recycling enterprises keep up with the pace of development, and the recycling industry has achieved a certain scale of industrialization [4-6].

2. Problems Facing Traction Storage Batteries Recycling

Recycling of traction storage batteries of new energy vehicles involves many links in the industrial chain. It is a complex systemic project, and there are still a series of problems to be solved [7, 8].

First, the volume of decommissioned batteries is small and unable to form scale effect, so economic benefits are not good. At present, the volume of decommissioned traction batteries is small, far lower than the planning and processing capacity of comprehensive utilization enterprises, thus scale effect cannot be formed and cost cannot be recovered. The recovery of valuable metal elements contained in lithium iron phosphate batteries with large decommissioned volume is not economically efficient, and the recycling value is low, so recycling enterprises are almost in deficit. Although ternary batteries have certain economic value, their decommissioning volume is low, so recycling enterprises cannot achieve good economic benefit.

Second, there are safety and environmental hazards, and input cost is high. The electrolyte of traction battery is highly corrosive, which will decompose and produce poisonous gas when it meets water. If it is discarded at will, it will cause serious pollution. Therefore, enterprises need to invest special funds for environmental protection and harmless disposal of waste such as electrolyte. In addition, as dangerous goods, used traction batteries must be strictly packaged and safely handled in the process of transportation. Specialized vehicles must be used for transportation. The cost of specialized transportation is 5~6 times that of ordinary transportation, which increases the cost of traction battery recycling.

Third, the recycling system is not perfect, and the recycling efficiency needs to be improved. Traction battery recycling enterprises have been engaging in the construction of the recycling service network in accordance with the requirements of the "Guide for The Construction and Operation of Traction Battery Recycling Service Network for New Energy Vehicles", but it has not yet achieved full coverage [9], and the recycling system needs to be further improved. Due to improper competition of informal enterprises and weak awareness of environmental protection of waste traction battery owners, the function of recycling service outlets is not obvious; therefore, the stability and effective recycling of waste traction batteries cannot be guaranteed, and economic benefits are directly affected.

Fourth, key technologies of echelon utilization need a breakthrough; and echelon products are facing competition pressure. During the earlier stage, enterprises needs to invest a lot of manpower, material and financial resources to carry out the research work, and key technologies for echelon utilization of traction batteries need to be conquered and industrialized, resulting in costs of some echelon utilized traction batteries being even higher than those of new batteries, thus echelon utilized batteries are not competitive and upfront costs of research and development of enterprises involved cannot be recovered.
3. Status Quo of Implementation of Existing Incentive Policies

Recycling of traction batteries of new energy vehicles has been carried out in an orderly manner. State and local governments have issued relevant incentive policies to provide financial support for traction battery recycling, so as to ensure the smooth and efficient implementation of traction battery recycling.

3.1. National Level

On November 24, 2016, the Ministry of Finance, the Ministry of Industry and Information Technology issued "Notice Regarding Organizing and Carrying Out the Integration of Green Manufacturing System" (Cai Jian [2016] No. 797), making clear the need to establish an incentive constraint mechanism, and requiring the central government to provide support to those consortiums that undertake the green manufacturing system integration project through the transformation and upgrading of industry (Made in China 2025) and other funds. The Ministry of Industry and Information Technology will organize the selection of "Green Manufacturing System Integration Project" every year, and now more than 10 enterprises dealing in the recycling of traction batteries of new energy vehicles have received special fund support.

The Green Development Plan for Industry (2016-2020) (Ministry of Industry and Information Technology Regulation No. 225 [2016]) requires the implementation of fiscal and tax policies and the development of green finance. The Catalogue of Preferential VAT Policies for Products and Services of Comprehensive Utilization of Resources (Cai Shui [2015] No. 78) integrates and adjusts preferential VAT policies for products and services of comprehensive utilization of resources. The Catalogue of Enterprise Income Tax Preferences for Special Equipment for Energy and Water Conservation and Environmental Protection (2017 edition) (Cai Shui [2017] No. 71) implements the preferential policy of income tax credit for special equipment for energy and water conservation and environmental protection purchased and actually used by enterprises.

3.2. Local Level

On November 27, 2019, the Industry and Information Office of Hunan Province issued "The Implementation Plan of Hunan Province for Tackling Key Problems in Integration of the Traction Battery Recycling System of New Energy Vehicles", specified the inclusion of the project of "Tackling Key Problems in Integration of the Traction Battery Recycling System of New Energy Vehicles" into the scope of support of special-purpose fund of the strong manufacturing province. At present, the "The 2020 Integrated Solution Project of Hunan Province for Recycling of Traction Batteries of New Energy Vehicles" has been officially launched; this project aims to guide and support in-depth integration and synergy among upstream and downstream enterprises of the traction battery recycling industry, promote technological progress and business model innovation, and explore and formulate typical experience and business model of in-depth integration of the whole industry chain that can be copied and generalized.

The Interim Measures of Shanghai Municipality on Encouraging the Purchase and Use of New-Energy Vehicles (Hu Fu Ban Fa (2014) No. 21) clearly stipulates that for each set of new-energy vehicle traction battery recovered, Shanghai municipality will give a subsidy of CNY 1,000 to the automobile manufacturer. The Regulations of Hefei City on the Administration of Financial Subsidies for Promoting and Applying New Energy Vehicles (2018 Revision) give a reward of CNY10 per kilowatt hour based on battery capacity to finished vehicles and batteries manufacturing enterprises that have established a waste traction battery recycling system and are recycling waste batteries. The Financial Support Policy for Promotion and Application of New Energy Vehicles of Shenzhen Municipality in 2018 clearly stipulates that enterprises shall set up special funds for traction battery recovery and treatment at the standard of CNY 20/KWH, and the Municipal Development and Reform Commission shall give subsidies to enterprises at 50% of the amount determined by audit.

Governments at state and local levels promote development of the industry of traction battery recycling for new energy vehicles through special-purpose fund, tax incentives, green finance and other incentive measures in such fields as new energy vehicles promotion, ecological civilization construction,
comprehensive utilization of resources, etc., however, such incentive measures only benefit a minority of traction battery recycling enterprises, the industry still faces the issue of inadequate economic efficiency, it lacks special incentive policies to promote enthusiasm of related enterprises to carry out the work of battery recycling.

4. Suggestions on Incentive Policies for Traction Battery Recycling

In order to successfully carry out the work of traction battery recycling for new energy vehicles, solve the economic problems in the process of recycling, and improve the enthusiasm and ability of traction battery recycling of relevant enterprises, the following suggestions on incentive policies for traction battery recycling are given from both national and local levels.

4.1. National Level

First, study preferential tax policies. In collaboration with the Ministry of Industry and Information Technology, the Ministry of Finance and the Ministry of Taxation, with reference to the incentive policies in the promotion policies of new energy vehicles and in combination with the financial subsidy measures of the national ecological civilization construction project, we shall study and formulate exclusive tax preferential policies in the field of traction battery recycling of new energy vehicles, and promote the issuance and implementation of relevant policies. The preferential tax policies can include some binding measures, for example, if a user fails to transfer waste batteries in a standard form in the process of battery maintenance, replacement and scrapping, he/she will not be entitled to tax credit when re-purchasing new energy vehicle products.

Second, set up special government subsidies. In view of related enterprises' weak links in the recycling of new-energy vehicle traction batteries, relevant policies of additional fiscal subsidies will be introduced to reduce the economic burden of enterprises and improve their enthusiasm. For example, in the recycling process, special funds should be allocated for the construction of recycling service outlets, and relevant enterprises should be subsidized to improve the recovery system of traction batteries. In the regenerating process, some research and development subsidies will be given to relevant enterprises, and enterprises with outstanding achievements will be rewarded and be promoted in the field of traction battery recycling as a role model.

Third, strengthen support for national science and technology programs. We will make use of existing special fund channels such as green manufacturing system integration to increase support for traction battery recycling projects of new energy vehicles. In combination with the national key research and development plan, we shall support the research and development of key industrialization technologies and advanced equipment such as the ecological design of traction batteries and the evaluation of residual value, and guide the cooperation between industry, university, research and application, so as to jointly overcome key industrialization technologies of recycling.

Fourth, increase publicity and promotion. The Ministry of Industry and Information Technology will take the lead to verify traction battery recycling performance of relevant enterprises, commend those enterprises with good implementation results, and promote excellent operation modes. The traction battery recycling industry shall be surveyed annually, an excellent enterprises star rating system be set up, and publicity and promotion of excellent enterprises be promoted.

4.2. Local Level

First, carry out pilot work and introduce relevant policies. We will actively organize relevant local enterprises to carry out pilot projects, explore diversified recycling models of waste traction batteries that are technically and economically viable and resource-friendly, and promote the sustained and healthy development of the new-energy vehicle industry. Based on the pilot work and in combination with local policies on the promotion of new energy vehicles and comprehensive utilization of resources, we will study and introduce incentive policies for recycling of traction batteries, define specific subsidy measures for all links, and promote orderly progress in the recycling of traction batteries.
Two, explore the cash pledge mechanism and increase the intensity of recycling. The cash pledge mechanism shall be implemented in the production or sales of new energy vehicles, and the cash pledge will be returned and certain subsidies be granted after the effective recycling of traction batteries. Enterprises need to use this part of the funds for the construction of recycling production line, research and development of recycling industrialization technologies, etc., to reduce capital investment of enterprises, improve their enthusiasm in traction battery recycling.

Third, strengthen project support and encourage scientific and technological innovation. Local governments vigorously promote the construction of projects related to traction battery recycling, actively introduce professional and technical personnel in the field of recycling, increase the force of scientific and technological innovation, and strengthen the research and development strength of enterprises. In addition, in the evaluation of outstanding innovative enterprises in science and technology and demonstration enterprises in energy conservation and environmental protection, be inclined to traction battery recycling enterprises, and improve their enthusiasm.

Fourth, broaden financing channels and increase support for green finance. Encourage financial institutions to set up green credit, green bonds, green insurance and other financial products and insurance types, expand financing channels for enterprises dealing in the recycling of traction batteries of new energy vehicles, ensure smooth financing for enterprises, and grant preferential low-interest and interest-free loans to enterprises dealing in traction batteries recycling, and guarantee smooth implementation of recycling projects.

5. Conclusion
This paper succinctly summarizes the status quo of traction battery recycling industry of new energy vehicles in China, and comprehensively analyzes the problems existing in the current traction battery recycling industry from the perspective of economic benefits. In addition, the implementation of incentive measures for traction battery recycling in new energy vehicle promotion, ecological civilization construction, comprehensive utilization of resources and other fields is discussed. It is found that there is still a lack of special incentive policies at present, and the enthusiasm of relevant enterprises to carry out battery recycling needs to be further improved. In view of the current problems and in full combination with the status quo of traction battery recycling industry, the paper proposes incentive measures from both the national and local levels to help the high-quality development of China's traction battery recycling industry and promote the healthy and sustainable development of the new energy vehicle industry.

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