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Research on the Current Situation and Optimization Suggestions of the Insurance System for New Energy Vehicle Battery Swapping Vehicles Towards Carbon Neutrality

Yifang Zhu, Jian Shi*, Wei Zhou, Yueyan Zhu

China Automotive Technology and Research Center, Tianjin, China

Corresponding author: Jian Shi, shijian@catarc.ac.cn

Abstract: In recent years, insurance policies for new energy vehicles have been continuously improved to adapt to the rapid development of new energy vehicles. At the national and local levels, a series of policies related to automobile insurance have been introduced to clarify the insurance liability for new energy vehicles. However, the development of battery swapping models has put forward innovative requirements for new energy vehicle insurance products, which differ greatly from traditional automobile and rechargeable new energy vehicle insurance products in terms of insured entities, insurance content, and insurance subjects. This article analyzes the current situation and existing problems of new energy vehicle insurance, and proposes to timely research and launch a "basic + variable" new energy vehicle insurance combination product to support new energy vehicle owners to flexibly purchase insurance according to their actual situation, in order to meet the needs of different vehicle owners for renting power batteries.

Keywords: Carbon neutrality; New energy vehicle; Policy

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1. Current policies and product situation in China

1.1. At the national government level

The Chinese government has created a favorable development environment for the insurance industry through macroeconomic regulation [1]. The State Administration for Financial Regulation and other regulatory departments have issued a series of policies to strengthen supervision over insurance companies and promote high-quality development of the industry [2]. The implementation of these policies not only helps to improve the overall service level of the insurance industry, but also provides consumers with more comprehensive protection, promoting the insurance industry to play a greater role in serving the overall economic and social

development [3].

1.2. At the local government level

In recent years, local governments have actively implemented national guidance on new energy vehicle insurance policies and promoted the implementation of relevant measures. At the same time, local governments are also exploring ways to reduce the maintenance and usage costs of new energy vehicles, promoting the establishment of a high compensation risk sharing mechanism and platform in the insurance industry, and providing effective insurance protection for new energy vehicles with high compensation risks [4]. These policies aim to optimize the new energy vehicle insurance market, improve service quality and efficiency, and cooperate with various national policies to promote the high-quality development of the new energy vehicle industry.

2. The problems with changing the type of electric car insurance

2.1. The insurance product does not take into account the special characteristics of battery swapping mode and does not support the purchase of insurance with "vehicle battery separation"

In the "vehicle battery separation" mode, the sales end can issue separate invoices for the replacement electric vehicle and the power battery, achieving property rights separation [5]. This has led to the demand for car buyers to purchase insurance for the vehicle (excluding the power battery) and for battery asset management companies to purchase insurance for the power battery. However, existing commercial insurance products for new energy vehicles cannot refer to vehicle registration certificates to separately insure vehicles and batteries, nor have they established a reasonable pricing mechanism for separately insuring vehicles (excluding power batteries) and power batteries. For example, most of the existing new energy vehicle insurance clauses are based on vehicles with traditional charging modes, without fully considering the special risks of switching to different types of vehicles. During the battery replacement process, there may be risks of vehicle failure or accidents caused by improper battery loading and unloading, battery quality issues, as well as vehicle damage caused by facility failures at the battery replacement station. These situations are often not clearly defined in existing insurance terms for claims [6].

2.2. The unclear property rights of batteries result in the inability to protect the interests of battery asset management companies

The property rights of the on-board battery of the battery replacement vehicle are not held by the vehicle's driving license holder. In the event of a battery insurance accident, the car insurance company can only pay the compensation to the driving license holder (insured), resulting in insufficient protection of the asset protection interests of the actual holder of the power battery (battery asset management company). For example, after the power battery is burned out along with the entire vehicle, the lessee receives a total loss compensation from the car insurance company, but there are situations where the lessee does not cooperate to pay the lessor after taking possession of the compensation.

2.3. The coverage amount of car insurance has been decreasing year by year, and the coverage amount of battery protection is insufficient

Car insurance is an important type of property insurance in China, and in recent years, its proportion has shown

a downward trend under the comprehensive reform of car insurance. From the perspective of the structure of property and casualty insurance premium income, according to statistics from the State Administration of Financial Supervision and Administration, car insurance premiums exceeded 900 billion yuan, a year-on-year increase of 4.5%. Income accounts for 54% of the total premium income of property insurance. Car insurance still maintains an important position in the premium income structure of property insurance in China.

The coverage amount of normal car insurance has been decreasing year by year due to depreciation, but in the scenario of battery replacement, with the upgrading and iteration of battery technology, there may be a situation where the car body is loaded with new and larger batteries for 2–3 years. Therefore, in the event of a complete vehicle loss accident, even if the car insurance provides full loss compensation according to the policy, it is far from covering the actual value of the battery asset loss [7].

2.4. The difference between the depreciation coefficient of car insurance standards and the depreciation coefficient of battery holders is significant

Taking a commercial truck weighing over 10 tons as an example, the existing new energy vehicle insurance terms stipulate an annual depreciation coefficient of 13%, while many enterprises have an annual depreciation coefficient of 10% for their financial fixed assets. The annual depreciation rate of the entire vehicle under the vehicle insurance is nearly 25% higher than the financial depreciation. This leads to a relatively lower amount of compensation when insurance is required for total or partial loss of the vehicle, calculated based on the higher depreciation factor of the car insurance terms. According to a depreciation factor of 10%, the book value of assets in corporate finance may be higher than the value calculated by car insurance, so insurance claims may not fully cover the asset loss value on the corporate finance book.

2.5. Lack of insurance coverage for accidents involving the replacement of electric vehicles

At present, car insurance only considers the risk of accidents and natural disasters during the “on-board use” of the battery, while there is a gap in protection for the power battery on the battery swapping vehicle during the swapping period and the replenishment period inside the swapping station [8].

3. Suggestions for insurance plan

3.1. Improve the battery registration system

One of the suggestions is to improve the battery registration system and achieve clear independent asset certification for vehicle bodies and batteries. In response to the problem that power batteries are not included in current motor vehicle registration information and it is difficult to verify the ownership of batteries after vehicle battery separation, obtaining a separate property ownership certificate for batteries is the basis of the registration system for vehicle battery separation mode (indicating “unpowered body” on the vehicle property registration certificate). At the same time, for consumers who purchase battery swapping vehicles (excluding power batteries), the vehicle insurance system platform will separate the battery swapping vehicles and calculate the vehicle insurance costs reasonably based on the purchase price [9].

3.2. Launch a combination of “basic + variable” new energy vehicle insurance products

The second recommendation is that insurance companies develop and introduce a combined “basic + variable” insurance product tailored to new energy vehicles, in which insurance costs are shared separately

by consumers and battery asset management companies. Such framework would promote product innovation while accommodating the distinct operational features of battery-swapping models. Insurers could design flexible policy structures and terms that reflect market demand and the technical characteristics of these vehicles, thereby enabling owners to select coverage based on their specific usage patterns and risk profiles. In addition, clear delineation of liability in accident scenarios involving battery swapping is essential. This may be achieved by separating the insured subject and establishing independent insurance categories depending on whether the battery is installed in the vehicle or managed externally, ensuring more precise risk allocation and accountability.

3.3. Coordinate depreciation coefficients

The third recommendation is to coordinate depreciation coefficients between enterprises and insurance providers. Enterprises may engage in negotiations with insurers to adjust vehicle insurance depreciation rates so that they more closely align with the depreciation schedules used in corporate financial accounting. Alternatively, specific contractual clauses may be introduced to determine insured value and compensation based on the enterprise's internal financial depreciation methods. In parallel, there is a need to promote industry standardization. Enterprises can collaborate through industry associations or chambers of commerce to advocate for unified standards or coordination mechanisms governing new energy vehicle insurance for commercial trucks and the depreciation of fixed assets. Strengthening communication and cooperation between the insurance sector and the financial accounting profession would facilitate the development of depreciation frameworks that better reflect operational realities and are more practical for enterprise implementation, thereby reducing inconsistencies and inefficiencies arising from divergent depreciation practices [10].

3.4. Promote industry standardization and innovation

The fourth is to promote industry standardization and innovation. Call for the establishment of industry standards, and relevant industry associations, car companies, battery manufacturers, and insurance companies should work together to promote the establishment of industry standards and norms for battery swapping vehicle insurance. For example, clarify the methods and standards for evaluating the value of vehicles after battery technology upgrades, as well as the principles and processes for insurance compensation, in order to provide a unified basis for insurance companies and car owners, and reduce disputes and uncertainties.

For instance, industry associations should develop low-speed collision test standards and demonstration clauses for new energy vehicle insurance related products, establish a risk classification system for insurance vehicle models, and establish a mechanism for sharing high compensation risks. Car companies should optimize product design and data sharing, where according to the requirements of the insurance vehicle risk classification system, optimize production design and improve maintenance economy level. Battery manufacturers should cooperate with insurance companies to establish a battery evaluation system. Insurance companies should use methods such as green channels for claims, advance payments, and online loss assessment to improve the quality and efficiency of claims services.

4. Conclusion

In recent years, insurance policies for new energy vehicles have undergone continuous refinement to keep pace with the sector's rapid expansion. Both national and local authorities have introduced a range of regulatory

measures to clarify insurance liability frameworks for these vehicles. Nevertheless, the emergence of battery-swapping models has introduced new and distinct requirements for insurance product design. Compared with traditional internal combustion vehicles and plug-in electric vehicles, battery-swapping models differ substantially in terms of insured entities, coverage content, and policyholders. This study identifies several key challenges in the current insurance landscape: existing products often fail to account for the unique characteristics of battery-swapping systems and do not adequately support the "vehicle-battery separation" model; ambiguous battery ownership structures hinder the protection of battery asset management companies; overall vehicle insurance coverage has declined over time, with insufficient protection for battery-related risks; discrepancies between insurance depreciation coefficients and those used by battery asset holders create valuation inconsistencies; and there remains a lack of comprehensive coverage for incidents arising during battery replacement processes. To address these issues, this paper proposes several policy recommendations. First, the battery registration system should be improved to enable clear and independent asset certification for both vehicles and batteries. Second, insurers should develop "basic + variable" insurance products, allowing consumers and battery asset management companies to bear costs separately. Third, depreciation coefficients should be better coordinated between insurers and enterprises to ensure consistency in valuation and compensation. Finally, efforts should be made to promote industry standardization and encourage innovation, thereby fostering a more coherent and effective insurance framework for battery-swapping new energy vehicles.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Xu M, Peng H, 2024, Current Situation, Problems and Suggestions of New Energy Vehicle Insurance in China, Proceedings of 2024 China International Annual Conference on Insurance and Risk Management, 2024.

[2] Lin X, Wei W, Teng X, 2024, Research and Practice on New Energy Vehicle Insurance Scheme Design. Automotive Maintenance & Repair, 2024.

[3] Zhou M, 2025, Research on Development Status and Countermeasures of New Energy Vehicle Insurance in China. Shanghai Securities News, 2025.

[4] Tang J, Li S, 2025, Research on Innovative Development of China's New Energy Vehicle Insurance. Online Journal, 2025.

[5] Wu M, 2025, Research on Evolutionary Game of New Energy Vehicle Insurance Model Under the "Vehicle-Battery Separation" Mode, thesis, Yunnan University of Finance and Economics.

[6] Zhang Y, 2025, Risk Analysis and Optimization Countermeasures of New Energy Vehicles from the Perspective of Insurance. Online Journal, 2025.

[7] Cui S, 2025, Research on Loss Assessment and Evaluation Technology in New Energy Vehicle Insurance Claims. Online Journal, 2025.

[8] Chen M, Fang Z, Guo M, 2025, Analysis and Countermeasure Research on the Problems of High Premium and Difficult Renewal of New Energy Vehicle Insurance. Online Journal, 2025.

[9] Gao X, 2025, Development Trend and Risk Control Mode Optimization of New Energy Vehicle Insurance. Online Journal, 2025.

[10] Wang Y, 2025, Exploration on Development Dilemmas and Solution Strategies of New Energy Vehicle Insurance. Online Journal, 2025.