



The Motivation Analysis of EU Battery Regulation and China's Response Strategies

Naifeng Ma^{1,a}, Hong Shi^{1,*}, Lixin Yao^{1,b}, Baiyu Fan^{1,c}, Lei Ren^{1,d}, Yaru Wang^{2,e}

¹China Automotive Technology and Research Center Co., Ltd., Tianjin, China

²Nankai University, Tianjin, China

^amanaifeng@catarc.ac.cn, ^{*}shihong@catarc.ac.cn,

^byaolixin@catarc.ac.cn, ^cfanbaiyu@catarc.ac.cn,

^drenlei@catarc.ac.cn, ^e2120220805@mail.nankai.edu.cn

Abstract. The current global economic landscape is undergoing a significant transformation, with clean energy and a low-carbon economy emerging as dominant trends. The advent of new energy vehicles has become a focal point of this transformative period, with countries engaged in a competitive pursuit to develop and deploy cutting-edge technologies in this field. This endeavor is aimed at fostering new global industry competitiveness, technological advancement, and market depth adjustments. The increase in the penetration rate of new energy vehicles has given rise to a strong demand for power batteries in various countries. In response, major countries, regions, and enterprises have launched intense competition around power batteries and their industrial chain, introducing a series of policies and initiatives to enhance industrial competitiveness and establish a dominant position in the market. In 2023, the EU Batteries and Waste Batteries Regulation (henceforth referred to as the EU Batteries Law) was enacted, establishing regulations governing the use of batteries and waste batteries. The EU Battery Law, which came into force, sets out strict access requirements for batteries, including their carbon footprint. China's automotive and power battery industries are at the vanguard of global development. New energy vehicles and lithium battery products have emerged as a key growth area for foreign trade exports. The EU Battery Law, as a representative example of international trade barriers, is poised to exert a profound impact on China's power battery exports, potentially undermining the international competitiveness of power batteries and the automotive industry.

Keywords: EU battery law; China power battery exports; response to international trade barriers.

1 Introduction

In light of the accelerated growth of the global economy and the rapid advancements in science and technology, humanity is confronted with unprecedented challenges and opportunities in the domain of energy transformation. Due to the dual pressures of climate change and environmental pollution, clean energy and a low-carbon economy have

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emerged as a global consensus and a key area of action. As a pivotal sector in this transition, new energy vehicles are gradually becoming a significant driving force for the transformation and upgrading of the automobile industry, due to their low carbon emissions and high efficiency. In response to the growing demand for new energy vehicles, governments, enterprises, and research institutions have increased their investments to gain a competitive advantage in the development of new energy vehicle technology, the construction of industry chains, and the expansion of markets. The objective is to secure a favorable position within the global new energy vehicle industry pattern [1].

In this context, as a core component of new energy vehicles, the performance, cost, and sustainability of power batteries are directly related to the competitiveness and popularization speed of new energy vehicles. As the penetration rate of new energy vehicles continues to increase, the global demand for power batteries has increased dramatically. This has not only promoted the rapid progress of power battery technology but also intensified competition among countries in the power battery industry chain. To ensure the sustainable development of the local industry and enhance international competitiveness, major countries and regions have implemented a series of policies and regulations to regulate and manage the production, use, and recycling of power batteries.

The formal entry into force of the EU Battery and Waste Battery Regulation, colloquially known as the EU Battery Law, represents a significant advancement in the global regulatory landscape governing power batteries. The regulation addresses not only the performance and safety of the battery, but also imposes rigorous entry requirements regarding the carbon footprint of the battery, environmental friendliness, and other factors. Its objective is to advance the green and low-carbon development of the battery industry through legislative means. This initiative will undoubtedly have a significant impact on the global power battery market, particularly for export-oriented manufacturers, who will encounter a more intricate and volatile international trade environment.

China has emerged as a global leader in the development of new energy vehicles and power batteries. In recent years, the country has made notable advancements in technology research and development, industrial chain construction, and market expansion, contributing to the emergence of new energy vehicles and lithium battery products as a significant source of foreign trade exports. However, the advent of international trade barriers, exemplified by the EU Battery Directive, has undoubtedly posed significant challenges to China's power battery exports, which may potentially erode the global competitiveness of China's power battery and automobile industry. It is therefore of great significance to undertake a detailed analysis of the motivation behind the EU battery law, to study its impact on the global and Chinese power battery industry, and to put forward corresponding strategies and suggestions to ensure the sustained and healthy development of China's new energy automobile and power battery industry.

This thesis will concentrate on the impetus behind the EU battery law and its examination of the global power battery industry. Concurrently, it will integrate the actual circumstances of China's power battery industry and propose targeted coping strategies and recommendations, to provide a foundation for the internationalization of China's new energy vehicles and power battery industry.

2 A Critical Examination of the Rationale Behind the EU Battery Law

The battery industry plays an integral role in the global realization of sustainable development. To this end, it is imperative to enhance the management of the battery product life cycle. Lithium batteries represent a crucial energy storage solution, playing a pivotal role in numerous sectors. The advancement of the battery industry is instrumental in advancing sustainable development, enhancing energy efficiency, and propelling economic growth. It is anticipated that global demand for battery products will witness a notable surge in the forthcoming years. According to data from the European Commission, the European Union is the second-largest battery market in the world. It imports approximately 800,000 tons of automotive batteries, 190,000 tons of industrial batteries, and 160,000 tons of daily energy storage and other consumer batteries into its market each year, with this figure still increasing [2]. However, previous countries that regulated the battery only until its useful life ended did not address the recovery and recycling aspects, which resulted in a significant portion of resources being wasted and potential safety issues related to hazardous substances. In light of the evolving socio-economic conditions, technological advancements, market trends, and battery utilization patterns, it is imperative to devise regulations and measures of sustainability, safety, carbon footprint, chemical performance, recycling, and battery reuse. Furthermore, a comprehensive life-cycle approach to regulating battery products is essential.

The European power battery market demand is strong, but the local battery industry is still in its infancy. In 2023, European new car sales of 12.84 million units, up 13.7% year-on-year, the new energy vehicle market is growing strongly, of which the purely electric car market share reached 15.7%, plug-in hybrid car market share reached 7.7% [3]. The current trend of upgrading the European automobile market is gradually strengthening, Europe is the world's second-largest electric vehicle market after China, and the demand for the power battery market remains strong. According to the report of the International Energy Agency (IEA), the current demand for electric vehicle batteries in Europe is 185 GWh, higher than the United States of 100 GWh. At present, the main suppliers of automotive batteries in Europe are mainly South Korean and Chinese companies, the sum of the two market share of about 95% [4]. Although in recent years the European local battery industry investment in full swing, with Sweden Northvolt, France ACC, Germany PowerCo, and other representatives of the European power battery companies rising, the European local battery industry ecosystem still exists in the foundation of the weak, the lack of appropriate talent and supply chain system and other issues.

The future of the EU will gradually form a self-sufficient battery industry chain, and constantly improve their industrial competitiveness. The EU's green transformation strategy and related industrial policies to promote the EU's new energy vehicles will usher in rapid growth in the future and will release a greater demand for power batteries. According to the European Automobile Manufacturers Association forecast, by 2030, the penetration rate of new energy vehicles in Europe will reach 60%, far exceeding the global penetration rate of 26%. According to the forecast of European Battery Alliance, by 2025, the demand for batteries in the EU will reach 550 GWh, and by 2030 the

demand for batteries will reach 1,000 GWh, which will show the huge development potential of the EU battery market [5]. The EU is full of ambition for the future development of the battery market, is actively promoting the battery full-cycle management legislation, increasing investment in battery technology research and development, as well as ensuring the sustainable supply of key raw materials for batteries, its goal is to significantly enhance the competitiveness of the local battery manufacturing industry in the next decade, the formation of a self-sufficient battery industry chain. The EU's Net Zero Industry Act, released in 2023, proposes that by 2030, EU battery manufacturers will be able to meet nearly 90% of the annual demand of the battery market, and the EU battery manufacturing capacity will reach at least 550 GWh, ensuring that the EU occupies a dominant position in the battery market [6].

The EU battery law is intended to protect the local battery industry, and the full range of non-EU countries to improve export compliance difficulties. EU battery law puts forward to the EU market battery (including local production and imported to the EU battery) to implement the full life cycle regulation, covering the entire industrial chain from upstream mining to downstream transportation, that is, the need to account for the upstream mineral mining to downstream transportation and sales and even recycling and other links. In terms of upstream emissions, it expands China's disadvantage of higher carbon emissions from electricity. according to the calculation rules of the EU battery law, the current carbon footprint of China's power battery production is 90-100 kgCO₂/kWh, while the carbon footprint of EU's Northvolt is only 33 kgCO₂/kWh due to the use of non-fossil energy sources. in terms of downstream emissions, since products sold to the EU need to be transported over long distances [7]. This has led to an increase in the carbon footprint of power battery products from China, Japan, and South Korea. In addition, the EU battery law also puts forward requirements on the percentage of recycled materials, supply chain due diligence, audit process, and a series of other areas, raising the entry threshold for non-EU countries in all aspects, providing a favorable environment for attracting international industrial investment and the development of its battery industry.

In summary, the EU battery law is not specifically aimed at China, but for all non-EU countries, only China, Japan, and South Korea due to the leading position of the battery industry and bear the brunt. In other words, the EU battery law is mainly a matter of industrial competition, not a purely technical or ideological issue.

3 The World Power Battery Industry Situation Analysis

China, Japan, and South Korea hold a dominant position in the battery manufacturing sector and are the primary competitors in the global power battery market. As indicated by data published by the South Korean market research organization, the global installed capacity of power batteries reached 705.5 GWh in 2023, representing a year-on-year growth of 38.6%. The market shares of China, South Korea, and Japan are approximately 63.5%, 23.1%, and 6.4%, respectively (**Figure. 1**) [8]. In comparison to the preceding year, China exhibited a 3.1 percentage point increase, whereas South Korea and Japan demonstrated a decline of 0.6 and 0.9 percentage points, respectively. The

majority of the market share is concentrated in a limited number of prominent companies, resulting in a notable agglomeration effect. Among the top ten global power battery installed capacity enterprises, six are Chinese. Ningde Times has been the world's first in installed capacity for six consecutive years, with a market share of 37%. BYD and South Korea's LG New Energy are tied for second place. In terms of international market competitiveness, in 2023, South Korea, China, and Japan, in addition to China's market share of approximately 48.7%, 32.3%, and 16.4%, respectively [9]. It is evident that Japan continues to be the primary nation engaged in battery manufacturing, yet its market share has experienced a notable decline. The long-standing tripartite configuration between Korea, China, and Japan has been disrupted, giving rise to a two-legged structure between China and Korea. In general, batteries manufactured in China are primarily utilized within the domestic market, whereas the capacity and revenue of Korean and Japanese companies are predominantly concentrated in overseas markets, including the United States and Europe. Concerning international competitiveness, China, Korea, and Japan still exhibit certain disparities.

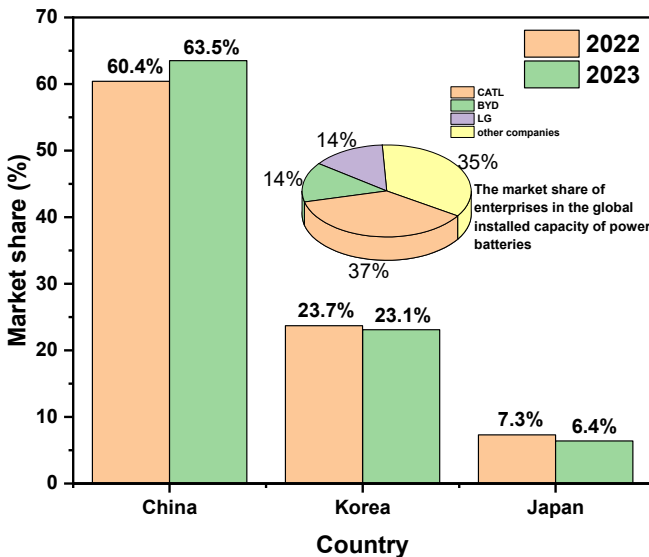


Fig. 1. China, South Korea, and Japan's market shares in the global installed capacity of power batteries.

The European Union (EU) has been relatively slow to develop its power battery industry, but it has recently accelerated its pace of growth. One of the key objectives for the EU is to reduce its dependence on the Asian supply chain. Prior to 2017, the EU battery industry was virtually non-existent. However, in recent years, it has undergone a period of rapid development. In terms of production capacity, the EU currently occupies the second-largest position in the global battery production landscape, with a significant concentration in Poland and Hungary. Of the total capacity, approximately 75% is accounted for by South Korean companies, including prominent players such as

LG and SDI, while Chinese companies represent a notable 12% share, as shown in **Figure 2**.

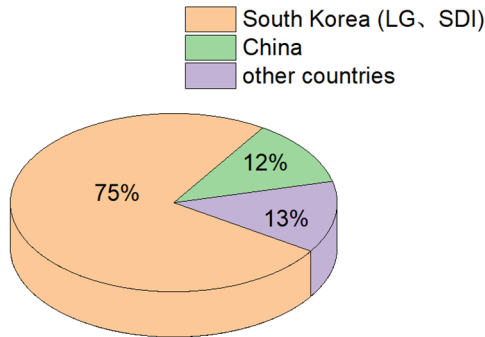


Fig. 2. Distribution of battery production capacity among countries in the European Union

In terms of market dynamics, UBS anticipates that in the absence of policy intervention, European automakers may further increase their imports of inexpensive Chinese batteries. This is expected to result in a notable expansion of their market share in the EU, from 30% to 50%, between 2023 and 2027 (**Figure 3**). In contrast, South Korea’s share is projected to decline from 60% to 40% over the same period. In light of these circumstances, the EU is actively supporting local enterprises, as evidenced by Northvolt’s objective of reaching 150 GWh capacity by 2030 and reclaiming 25% of the European market. Nevertheless, these enterprises have yet to be acknowledged by the EU market. To illustrate, the BMW Group’s 160 GWh battery order in 2023 was awarded to three Chinese companies, including Hive Energy [10].

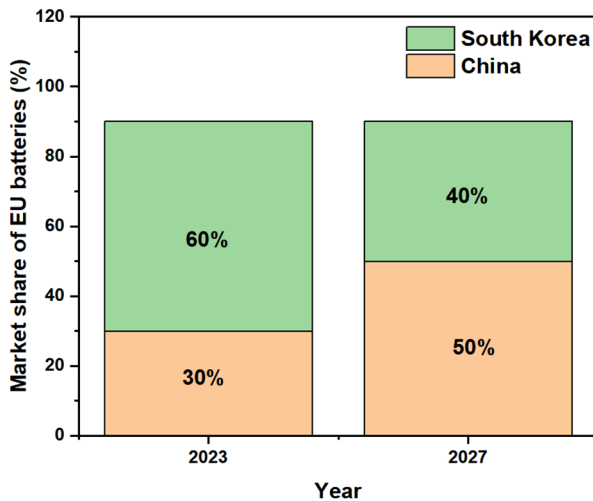


Fig. 3. The forecast of China and South Korea’s battery market share in the European Union.

The Chinese market for new energy vehicles is expanding at a rapid pace, which is directly responsible for the sustained growth of the automotive lithium battery market. As indicated by the data published by the China Automotive Power Battery Industry Innovation Alliance, the aggregate sales of power batteries and other batteries in China during 2023 reached 729.7 GWh. As shown in **Table 1**, the cumulative sales of power batteries amounted to 616.3 GWh, representing a year-on-year increase of 32.4% and accounting for 84.5%. As the production and sales of new energy vehicles increase, so too does the installed capacity of power batteries. In 2023, the installed capacity of China's automotive power batteries reached 387.7 GWh, representing a 31.6% year-on-year increase and accounting for over 50% of the global share. The domestic power battery market remains highly concentrated, with the top two, top five, and top ten enterprises collectively accounting for 70.3%, 87.4%, and 96.8% of the installed volume, respectively [11]. In response to the growing demand for energy vehicles, the leaders of power battery companies have increased production and significantly enhanced their capacity planning goals. According to the China Automotive Power Battery Industry Innovation Alliance, China's lithium power battery production capacity is projected to surpass 3,000 GWh by 2025. However, this rapid expansion raises concerns about the potential for overcapacity in the future. "Overseas" has emerged as a strategy for domestic power battery enterprises to address the issue of excess production capacity. In 2023, China's cumulative exports of power batteries reached 127.4 GWh, representing an 87.1% year-on-year growth. Concurrently, the domestic principal battery manufacturers' overseas revenue constituted an overall increase. For instance, Ningde Times' overseas market revenue accounted for 32.67% of its total revenue in 2023, representing a 9% year-on-year growth [12].

Table 1. Data statistics on the rapid growth of China's new energy vehicle market

	Total exports (GWh)	Year-on-year (%)	Proportion (%)
Sales volume of power batteries	616.3	32.4	84.5
Sales of other batteries	113.4	N.A.	15.5
Vehicle power battery loading volume	387.7	31.6	50% (Global)
Accumulated export volume of power batteries in China	127.4	87.1	N.A.

To gain a greater market share and overcome trade barriers, Chinese power battery companies are actively investing in EU plants. In comparison to Chinese battery companies, South Korean battery companies have been more expedient in entering the European and American markets, and continue to occupy a larger share of the overseas market for power batteries. This is according to a report by the IEA. In 2023, Japanese

and South Korean battery companies accounted for approximately 65% of the local battery production capacity in Europe and the United States. In contrast, Chinese companies accounted for only over 10%. Nevertheless, as Chinese battery companies pursue expansion in overseas markets, South Korean competitors are facing intensifying competition. Presently, to guarantee compliance with the EU carbon footprint and other novel battery regulatory stipulations, according to incomplete data, seven Chinese power battery companies—Ningde Era, Vu Energy Technology, Hive Energy, BYD, AVIC Lithium-Ion, Visionary Power, and Guoxuan Gaoke—have initiated the construction of factories or have commenced operations in Europe. Among these, Hungary has become a strategic entry point for battery companies seeking to expand into the European market. Prominent players such as Ningde Times, Beehive Energy, and BYD have announced plans to establish battery assembly facilities in Hungary. Ningde Times, for instance, has invested 7.34 billion euros in Debrecen, Hungary's second-largest city, to construct Europe's largest power battery plant. The new factory is expected to have a battery capacity of up to 100 GWh and will produce a new generation of safer and more efficient lithium iron phosphate super-charged batteries for electric vehicles upon completion. It is anticipated that by the conclusion of 2031, Hungary's power battery production will have reached 207GWh, thereby establishing itself as the foremost lithium battery producer in Europe. Of this projected production, more than 175GWh will emanate from market leaders, predominantly Chinese companies.

4 China's Response Strategies and Recommendations

The implementation of the EU's new battery law will have a significant and far-reaching impact on the global battery industry chain. China currently accounts for over 60% of global power battery sales. In the near term, China will likely maintain its export-oriented strategy. The EU has a substantial market demand for battery products, and China's battery production costs are lower, giving it a competitive advantage. Additionally, the EU's domestic battery industry lacks the necessary infrastructure and resources, making it reliant on external suppliers. The EU's new battery law aims to address this by ensuring a stable supply of raw materials and other essential resources for the development of the local battery industry. In the long term, as the EU battery industry chain undergoes gradual improvement, Chinese battery products may be subject to a range of restrictions, including carbon footprint limits, access controls, supply chain due diligence, and even countervailing investigations, and other unfair trade barriers. In response, China's battery industry may gradually shift its production overseas. Industrial relocation is an unavoidable consequence of China's and the global economy's current stage of development. It does not indicate a decline in China's industrial or economic influence. However, in light of the recently enacted battery legislation, which represents the inaugural instance of environmentally conscious trade restrictions, China is compelled to prioritize scientific inquiry and analysis and to proactively devise and implement targeted response strategies and recommendations.

The initial stage is that of active adaptation and self-improvement. China's current energy structure is still dominated by high-carbon fossil energy sources, with a lower

proportion of low-carbon energy than is the case in the European Union. To advance the utilization of renewable energy sources, China has initiated the implementation of green power supply initiatives in multiple regions, including Jilin, Shanxi, Shandong, and Inner Mongolia. These endeavors entail the establishment of “new energy lines” between power generation enterprises and power companies, to facilitate the transition to a more sustainable energy supply. However, despite these advancements, the green power supply remains in its nascent stages of development and has not yet been widely adopted on a national scale. Concerning the data foundation, the current situation is characterized by a paucity of accumulated carbon emission data, slow updating, an incomplete database, and insufficient data segmentation. This renders it impossible to accurately and realistically support the calculation of product carbon footprint. To address the aforementioned shortcomings, it is imperative for China’s relevant industry enterprises to proactively seek insights from the advanced experiences of developed countries and regions, such as the European Union, under the guidance of government authorities. This will facilitate the transformation and upgrading of the energy structure and industry, and enhance the robustness of the data support infrastructure.

It is engaged in active negotiations regarding the requisite space. Regarding data and information, the actual input of materials, bill of materials, and other data essential for carbon footprint accounting are confidential business information. Following the stipulations of the recently enacted battery legislation, customers may mandate that the data essential for carbon footprint accounting be transmitted to a third-party platform. This will inevitably result in increased costs, workload, and challenges to data confidentiality. Concerning the mutual recognition of certification, the EU stipulates that power battery companies must undergo evaluation by EU-recognized certification and auditing organizations prior to their release to the public. It is imperative to communicate with the EU on this matter without delay. One proposal is to report data for desensitization, to promote the EU and China’s certification and auditing bodies to establish a mutual recognition mechanism.

We are unwavering in our commitment to advocating for our rights and interests. Concerning data citation, the database prioritized for citation under the new battery law reveals a notable lag in the citation of China’s carbon emission factors. Additionally, the data citation is not open and transparent, which is inconsistent with the actual situation in China. The current average consumption of electricity in China has a higher carbon footprint than that of Japan and South Korea, as well as other major power battery-producing countries. This figure is higher than that of the EU mainland, with the carbon footprint of electricity being derived primarily from the power generation link. In China, the high proportion of coal power generation results in a significant contribution to the carbon footprint of electricity, which is a major factor affecting the competitiveness of China’s new energy vehicles and battery products. The aforementioned issues have a detrimental impact on the competitive standing of China’s new energy vehicles and battery products. It is therefore recommended that the national level and the EU engage in active negotiations and consultations to rectify the overestimation of China’s power, steel, aluminum, and other carbon footprints. Furthermore, efforts should be made to secure EU recognition and acceptance of China’s ongoing efforts to

reduce the carbon footprint of its products, as well as to gain EU recognition of China's green card in the reduction of the carbon footprint of enterprise power applications.

5 Conclusions

In the context of the global economic transition towards clean energy and a low-carbon economy, the rapid development of new energy vehicles and their core component, the power battery, has emerged as a significant driver of change within the automotive industry and the broader global economy. The formal entry into force of the EU Battery and Waste Battery Regulation signifies the advent of a more rigorous and intricate phase of global power battery regulation. Its rigorous stipulations on battery carbon footprint, sustainability, and other elements not only exemplify the EU's resolute commitment to fostering a green economy and attaining carbon neutrality but also have a profound impact on the competitive landscape of the global power battery industry.

As a leading country in the new energy vehicle and power battery industry, China is facing a new challenge and opportunity co-existing situation with the implementation of the EU battery law. From the perspective of international trade, the regulation on China's power battery exports can be viewed as a potential barrier to trade, increasing the cost and complexity of exports and potentially impacting the global competitiveness of China's power battery and automobile industry. Conversely, this has prompted China's power battery industry to accelerate the transformation and upgrading of its production capabilities, enhance the green and low-carbon level of its products, strengthen technological innovation and industry chain synergy, and participate in global competition with higher quality products and services.

In light of this challenge, it's needed that China adopt a constructive and proactive approach, incorporating a range of strategic responses and recommendations. Firstly, it is imperative to enhance communication and collaboration with the international community, facilitate the formation of a more equitable and rational international trade regulatory framework, and diminish superfluous trade impediments. Secondly, it is recommended that R&D investment be increased, that energy efficiency, safety, and sustainability of power batteries be improved, and that the requirements of the EU battery law be met actively. Concurrently, efforts should be made to reinforce the upstream and downstream segments of the industry, to establish a more comprehensive and efficient industrial chain structure, thereby enhancing the overall competitiveness of the sector. Furthermore, attention should be directed towards the advancement of battery recycling and reuse, to establish a robust battery recycling system that will facilitate the recycling of resources and the sustainable development of the environment.

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