The Impact of Public Policy on the Lithium Battery Industry- Taking the United States as an Example

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Abstract. Lithium battery plays a notable role in global manufacturing. As the demand for clean energy increases worldwide, the lithium battery industry is expanding rapidly. The United States, which stands at a leading status, aims to strengthen its competitive position. Policies support the development of technological innovation and enhanced domestic production capabilities. The objective of this research is to analyze the impact of public policies in the United States on local lithium battery production. The tariff policy, tax policy, research and development, and subsidy policies will be discussed separately in the following sections. This study includes a review of academic literature, industry reports, and policy papers. By analyzing the impact, this paper draws the following conclusions. Firstly, the local policies strengthen domestic manufacturing and supply chain resilience to enhance the international position. Secondly, the market in the US encourages the consumption of electric vehicles, which fosters the demand for lithium batteries. To further enhance the global competitiveness of the United States in the lithium battery industry, the US government should continue to contribute to the current status.

Keywords: Lithium battery industry, public policy, United States.

1. Introduction

Net zero is a crucial national development goal introduced in 2015 in The Paris Agreement on Climate Change aiming to reduce human greenhouse impact to zero, which gets agreement from the United States. Therefore, electrification is an unavoidable process of shifting fossil fuel industries to electrical industries, where the energy density of lithium batteries as energy storage is necessary. Following the policy requirement to reduce carbon emissions, the electric vehicle market is growing rapidly, and the demand for lithium batteries is rapidly increasing. Lithium battery is also a crucial part of the storage of renewable energy, such as solar energy and wind energy. Furthermore, the lithium battery is widely used in electricity products, including smartphones and electrical vehicles. The global lithium battery industry is in a rapid development stage.

The United States had an early development in the lithium battery industry under the Obama administration in 2009. The current US market is a little bit behind in the lithium battery production schedule. According to the report of the Federal Consortium for Advanced Batteries, the US market takes only 8% [1]. However, under a large amount of investment based on the updated policies, lithium battery production in the US has grown from 68.9GWh in 2022 to 120GWh in 2023, which implies a huge increase in production in the future years [1]. The global lithium battery industry is in a rapid development stage. According to the global status, the United States is at a leading position in the worldwide lithium battery industry, supported by domestic policies and technological innovation. The United States is focusing on enhancing domestic competitiveness and securing the supply chain.

The lithium battery industry within the US market is competitive, mainly composed of several industry giants, multinational corporations, and emerging startups. For instance, Tesla is the leading company in the United States lithium battery market, as well as one of the largest electrical vehicle companies. The investment in lithium batteries in electrical vehicles has greatly enhanced the battery production capacity of the United States. Besides the industry giants, multinational corporations in the United States also hold significant market shares in the US market. Companies, such as Panasonic,

collaborate the domestic companies and invest the production facilities to enlarge their market share in the US.

The objectives of this research are to analyze the influence of public policies, including specific and comprehensive impacts, on the lithium battery industry in the United States. The elements influencing the lithium battery business in the United States are ensured by the analysis's assistance, which also includes a review of academic literature, industry reports, and policy papers.

2. The Specific Impact of Us Public Policies on the Lithium Battery Manufacturing Industry

2.1. Tariff Policy

The United States has a high dependence on the import of the lithium battery. To change the import and export structure of the lithium battery industry in the US, the US implemented Section 301 tariffs in 2015. This act adds a 25% tariff on many imported goods, including lithium batteries and raw minerals. In response to the tariffs, the companies reduce costs and increase their competitiveness internationally. This results in an increase in imports reduces dependence on Chinese products and enhances the development of the domestic supply chain.

Furthermore, on August 16, 2022, President Biden released the Inflation Reduction Act (IRA) [2]. Lithium is one of the most important minerals in producing the battery but mainly comes from foreign countries. The act limits the companies to import lithium from only North America or U.S. trading partners. IRA requires companies to manufacture or assemble lithium batteries in America from 50% in 2024 to 100% in 2030 [2]. Minerals from "noteworthy foreign entities", such as China and Russia, are gradually disqualified from being used in the US from 2024. This act aims to reduce the reliance on foreign countries and increase the sustainability of domestic security.

2.2. Tax Policy

IRA (Inflation Reduction Act) also has an important role in changing tax rates. IRA directly increases the need for lithium batteries by providing many tax incentives, which encourage the public to consume electrical vehicles. The act decreases taxation on buying electrical vehicles, thus, new buyers can receive up to $7500 in tax credits, and used buyers can receive up to $4000 tax credits when buying an electrical vehicle [2]. The act encourages U.S. production by reducing costs for consumers and linking consumption and manufacturing together. The increasing consumption in buying electrical vehicles is directly linked to the increase in the need for lithium batteries.

Several states in the United States provide tax incentives for emerging lithium battery factories. Investment Tax Credit offers further tax incentives, to make enterprises expand their production scale. For instance, Texas established battery production bases, which reduce corporate income tax and land use tax. Take Tesla, as an example, is being attracted by the policies.

2.3. Research and Development (R&D) and Subsidy Policies

To encourage enterprises and individuals in the US to pay greater attention to the lithium battery industry, a significant amount of funding is applied. In 2007, as the early development of the industry, the Energy Independence and Security Act was released, providing abundant research and development funding and aiming to be energy-efficient with direct improvement of renewable energy [3]. In 2009, the American Recovery and Reinvestment Act allocated $2 billion in grants for the development of cutting-edge battery systems and the production of electric car components [4]. Based on this act, the US Department of Energy established investment funds to support the innovation in lithium battery technology, including sustainable battery recycling technologies and fast-changing technologies.

In 2021, the Bipartisan Infrastructure Law (BIL) was released and motivated companies to develop lithium battery industry production, with $7.5 billion U.S. dollars [2]. On August 16, 2022, President

Biden released the Inflation Reduction Act (IRA), which plans to invest 369 billion US dollars to develop clean energy by advancing the capacity of lithium battery volume [2]. Furthermore, this act provides subsidies for new electric vehicles and promotes a higher-quality battery. Companies, such as Nissan and Tesla, are positively supported by the Advanced Technology Vehicles Manufacturing Loan Program. This program calls the demand for high-quality lithium-ion batteries since the manufacturers of electrical vehicles get money to develop.

3. The Comprehensive Impact of Us Public Policies on the Lithium Battery Manufacturing Industry

3.1. Market Expansion and International Competition

The U.S. government has encouraged consumers to buy electric vehicles through tax incentives and purchase subsidies, which increases the popularity of electric vehicles and has driven the demand for lithium-ion batteries. The policy significantly reduced the cost of purchasing a car for consumers. This growing market demand provides significant opportunities for the lithium battery industry to expand production and invest in new technologies. As a result, the supply chain has grown, especially in fostering innovation and boosting the U.S. presence in the global EV and battery markets.

In the context of globalization, the US lithium battery manufacturing industry is facing keen competition from other countries and regions around the world. The US government has enhanced the competitiveness of its domestic enterprises in the international market through the support of public policies. Providing financial support and collaborating on technological research and development can help companies overcome technological bottlenecks and market barriers. The US has benefited from the advanced technical level in this field. With the support, the innovative technology of the US helps the US to take over a large market share globally, while it is seen as a trendsetter.

3.2. Supply Chain

The US is facing supply chain vulnerabilities within the country, which is highly dependent on mineral resources, such as lithium, from other countries, especially from China. To change the status, the US implements public policies to address the issue through diversification and localization. IRA encourages the domestic mining of lithium, which is an important mineral, and increases the stability of the supply chain by collaborating with North American or U.S. trading partners. Also, the IRA calls for a recycling economy, which supports the recycling of lithium batteries by providing grants and incentives. Through recycling, the minerals, such as lithium and nickel, can reenter the supply chain. Therefore, the sustainability of the supply chain can be enhanced.

Domestic companies are encouraged to set up more industries to raise the productivity of lithium batteries. Take Tesla as an example, it spends $3.6 billion to build industries in Giga and Nevada [5]. The battery production capacity has increased rapidly and promotes the surrounding supply chain. The growth in the production of electrical vehicles symbolizes the increase in the production of lithium batteries. The industries contribute to scaling up semi and 4680 battery cells.

The application of lithium batteries is widespread and closely relates to the public’s daily lives. Based on the policies in IRA and BIL, the electrical vehicle market has experienced rapid development. The car purchase subsidy and tax incentives are both essential for promoting the development of the upstream and downstream of the supply chain, where both purchasing and production have increased. Other than that, lithium batteries act as a crucial part of constructing the renewable energy storage system. IRA provided more than $700 billion since 2022 [6]. The investment has promoted the construction of large-scale battery energy storage projects and supports the integration of renewable energy sources.

The US is putting a lot of effort into enhancing the sustainability of the supply chain in a long-time plan. It attempts to increase the independence of production and global competitiveness to get more market share.

3.3. Technological Innovation and Industrial Upgrading

In increasing global competitiveness, the US attempts to enhance local production capacity by encouraging to strengthen the domestic production facilities. Innovation in lithium industry production is heavily valued because it increases production efficiency.

Furthermore, the recycling of used lithium batteries requires a relatively complicated technology to increase the efficiency of recycling. To stimulate innovation, the US Department of Energy (DOE) organized the Battery Recycling Prize, which contains a bonus of up to 5 million US dollars [7]. This competition collaborates with national laboratories and private enterprises to provide technological support and resources to innovators, which accelerates the verification of the feasibility of innovated technology. For instance, the technology of 3D printing positively helps to overcome difficulties in production, such as improving the scalability and efficiency of batteries [8]. These technologies are expected to improve the economic benefits of battery recycling.

4860 battery cells are one of the core innovative technologies from Tesla. This battery design strengthens the performance of the battery at its sizes, energy density, and efficiency. The production of this kind of battery applies dry electrode manufacturing, which can decrease the energy consumption in battery manufacturing and the impacts on the environment. Solid-state lithium battery uses solid electrolyte materials and is expected to replace the material of traditional liquid lithium batteries [9]. The higher energy density increases the efficacy and safety of storing energy. However, it still requires further discovers to be devoted to market use. Innovation of technology is important in the development of lithium battery production. The policy emphasizes the importance of recycling used lithium batteries and inventing new batteries that with better performance.

4. Conclusion

This article mainly analyzes the impact of US public policies on the development of the lithium battery industry; thus, the following three main conclusions are drawn. Firstly, lithium batteries, as a form of energy storage, play an important role in the transition from coal-based energy to electric energy. This transformation is essential for reducing reliance on fossil fuels and promoting cleaner energy alternatives. Secondly, the policies of the US are meaningful for the development. The policies, especially IRA and BIL, aim to increase domestic productivity and build domestic supply chains to increase global market competitiveness. The tax incentives and purchase subsidies enhance the demand and innovation for lithium batteries.

Although the policies have promoted technological innovation in the field by providing subsidies, the government and private companies still need to discover more about the most updated technology to keep the leading position globally. For instance, the development of solid-state lithium batteries, which have better performance than traditional lithium batteries, might be a direction for industries to upgrade and popularize. The innovation in recycling is also a crucial part, which increases the sustainability of the domestic supply chain and decreases the negative impact of environmental damage caused by the production of batteries. To increase the demand for the lithium battery industry, the government can further expand the demand for end markets, such as electric vehicles and energy storage devices.

In the future, as the demand for new electrical vehicles continuously increases, the lithium battery industry production will also continuously be significant in development. Nowadays, the US emphasizes the importance of constructing a domestic supply chain. Following the refinement of the supply chain and innovation in technology, the US has an optimistic future in increasing its status in the globe wide. The activated innovation will bring more efficient and more capable batteries, which will help the US to play a more important role in future development.

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