

Research on Export Opportunity Identification and Coping Strategies of New Energy Lithium Batteries under Dual-Carbon Constraints: A Case Study of Do-Fluoride New Materials Co., Ltd.

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Abstract. The global implementation of dual-carbon strategies is reshaping the energy and transportation landscape. Meanwhile, carbon control and battery localization trade policies issued by European Union (EU) and the United States (U.S.) have raised the entry barriers for lithium battery exports. Existing studies mostly explore policy impacts and industry-level analysis, while in-depth discussions on the path mechanisms through which enterprises can identify and convert export opportunities under dual-carbon constraints remain insufficient. This paper identifies segmented export opportunities for lithium batteries in overseas markets under dual-carbon constraints, and analyze the operating mechanisms of corporate exports amid multiple trade, market and technological constraints. Based on the case study of Do-Fluoride, this paper conducts analysis combining industry data, corporate operating data and texts of low-carbon trade policies of various countries. The results show that energy storage, new energy passenger vehicles, and light electric vehicles represent the three major growth areas driving incremental demand for lithium battery exports. The integrated industrial chain endows Do-Fluoride with advantages in cost and product adaptation, yet carbon compliance barriers, intensifying industry competition, and fast-evolving technologies continue to put pressure on overseas market profitability. Furthermore, enterprises need to adopt combined strategies including hierarchical regional layout, low-carbon technology R&D and product structure upgrading to achieve sustainable overseas development.

Keywords: Dual-carbon constraints, New energy lithium batteries, Export opportunities, Do-Fluoride, Industrial chain advantages

1. Introduction

Driven by the transformation of energy structures, the growth of renewable energy installed capacity has intensified power fluctuations, boosting demand for energy storage. Furthermore, China ranks among the world's top countries in terms of installed photovoltaic and wind power capacity, which

places higher requirements on power system regulation capacity. Meanwhile, expanding peak-valley electricity price gaps and cross-regional power dispatching mechanisms have raised the proportion of energy storage systems deployed in power grids, fueling rising demand for lithium batteries. At the corporate level, leveraging vertical integration and technological innovation, Do-Fluoride New Materials Co., Ltd. has built leading domestic capabilities in energy storage batteries and entered high-end global energy storage markets, thus demonstrating strong competitiveness and technological advantages in new energy lithium battery exports [1]. Existing research mainly centers on the impacts of carbon constraint policies, evolution of energy storage technologies and changes in battery costs. However, research on how enterprises identify export opportunities and formulate strategic paths under dual-carbon constraints remains relatively scarce. This paper analyzes export opportunities for China's lithium batteries under dual-carbon constraints, and explores paths for enterprises to convert relevant opportunities into export competitiveness via low-carbon production, product upgrading and overseas layout, with a case analysis of Do-Fluoride. Specifically, it focuses on export constraints at the policy, market and technological levels, identifies structural opportunities that can be leveraged, and further analyzes potential coping paths for enterprises. Accordingly, this study adopts a combined methodology of literature analysis, case studies as well as industry and policy data analysis, so as to provide a basis for new energy lithium battery enterprises to formulate export strategies and offer references for judging industrial development trends under dual-carbon constraints.

2. Dual-carbon constraints and rule-based environment for lithium battery exports

2.1. Dual-carbon goals and trade rules

Driven by global dual-carbon policies, the low-carbon transition of energy systems has accelerated the deployment of renewable energy capacity. However, the intermittency and volatility of renewable energy have raised demand for power system regulation, increasing the deployment ratio of energy storage and thereby generating structural growth in lithium battery demand [2]. Meanwhile, Europe, the United States and major Southeast Asian markets have accelerated the phase-out schedule for fuel vehicles and tightened carbon emission constraints, lifting penetration rates of new energy vehicles and sustaining robust demand for power batteries.

In terms of changes to trade rules, the EU Batteries Regulation and the U.S. Inflation Reduction Act have raised market access thresholds for exports through carbon footprint accounting and local content requirements, pushing up compliance costs for lithium battery exports. At the same time, these policies have driven the regionalization and localization of global lithium battery supply chains, reshaping patterns of international labor division.

2.2. Policies governing lithium battery exports

Within China's domestic dual-carbon strategic framework, policy tools including fiscal subsidies, tax incentives and export tax rebates have reduced comprehensive costs for lithium battery enterprises to a certain extent and supported the expansion of export volumes. In the early stage, export tax rebates mainly boosted enterprises' price competitiveness to facilitate their participation in overseas market competition [3]. Meanwhile, with the projected downward adjustment of export tax rebate rates starting in 2026, policy orientation has gradually shifted from cost support to structural optimization, encouraging enterprises to curb expansion of low-value-added production capacity and accelerate technological upgrading and product restructuring.

In this process, dual energy consumption control and green manufacturing policies have imposed stricter energy efficiency and emission constraints on production links. The lithium battery industry has gradually strengthened energy consumption management in raw material processing and battery manufacturing, aligning with rules like EU carbon footprint accounting. This has raised compliance requirements while demanding higher transparency of carbon emission data and green certification for exported products.

3. Business structure and export market profile of Do-Fluoride's lithium battery materials

3.1. Key characteristics of export business composition

Based on a vertically integrated industrial chain encompassing "fluorine resources–lithium battery materials–lithium batteries," Do-Fluoride has developed an integrated industrial collaboration system.

Linkages between upstream and downstream segments have created a cost buffer mechanism whose effects on export competitiveness are transmitted across production stages.

In the upstream segment, the company's enhanced self-sufficiency in basic fluorine chemical raw materials such as fluorite and hydrofluoric acid has reduced its reliance on external raw material suppliers. This has partially mitigated the impact of fluctuations in lithium salt raw material prices and reduced uncertainty in overseas market pricing. In the midstream segment, continuous capacity expansion and large-scale mass production of lithium hexafluorophosphate have strengthened scale effects, effectively lowering unit production costs and enabling stable material supply for downstream electrolyte and related application sectors. In the downstream segment, the layout of large cylindrical battery businesses has increased its internal consumption of lithium salt materials. The synergistic production between the materials and battery segments has, to some extent, optimized the overall manufacturing cost structure [4].

Driven by the above industrial chain synergies, optimized cost structures have been reflected in shifts in export mix: exports have evolved from lithium salt materials alone to coordinated exports of lithium materials and finished batteries, transforming the export model from single-product output to multi-product combined supply.

3.2. Impacts of dual-carbon constraints

Amid global tightening carbon emission constraints and accelerated regional restructuring of supply chains, dual-carbon targets have become key external variables affecting corporate export behaviors, further driving dynamic adjustments to export market layout and product mix. During this period, rising uncertainty in external institutional environments has exposed enterprises to more complex compliance and cost constraints in cross-border operations.

With the refinement of EU carbon footprint accounting rules and growing local capacity ratio requirements in overseas markets, compliance costs for pure product exports have kept rising. Against this backdrop, the company has partially hedged tariff barriers and carbon compliance pressures through joint venture construction and localized production overseas, mitigating institutional cost constraints and uncertainties of cross-border trade.

Notably, disparities in regional low-carbon transition pathways have shaped a highly differentiated global demand landscape. The European market prioritizes large-scale energy storage batteries, while Southeast Asia and the Middle East focus on batteries for economical passenger vehicles and light two- and three-wheeled electric vehicles. On this basis, the enterprise implements

differentiated product adaptation and market launch strategies tailored to regional policy orientations and demand structures, reducing reliance on single markets and single clients while optimizing overall export structure and risk resistance [5].

4. Identification of strategic export opportunities for Do-Fluoride's lithium batteries under dual-carbon constraints

4.1. Energy storage growth and export potential

Driven by global dual-carbon goals, the rapid growth of wind and photovoltaic power installations has increased power output fluctuations, creating a greater need for energy storage to support grid peak shaving and directly boosting demand for energy storage batteries [6]. Meanwhile, energy storage subsidies and mandatory storage allocation policies adopted by multiple countries have raised energy storage deployment ratios, shifting energy storage demand from policy-driven to rigid demand. As a result, overseas orders for energy storage batteries have expanded, driving growth in lithium battery exports. In terms of product requirements, energy storage batteries demand long cycle life, high safety and low unit costs. Do-Fluoride's full-tab large cylindrical batteries feature extended cycle life and low unit costs, while upstream self-supplied lithium salt materials cut partial raw material costs. This equips the company to supply residential, commercial and industrial, as well as grid-scale energy storage projects, unlocking corresponding export growth potential [7].

4.2. Accelerated electrification and rising power battery demand

Under constraints including EU fuel vehicle bans and carbon emission credit policies worldwide, fuel vehicles have lost market share while penetration rates of new energy vehicles rise, driving sustained growth in demand for power batteries [8]. Meanwhile, Southeast Asian and Middle Eastern markets prioritize low-cost short-distance vehicles, which rely heavily on large cylindrical power batteries above 40mm. Leveraging its integrated lithium salt-battery production structure to cut material costs and expanding battery production capacity, Do-Fluoride has secured supporting orders from overseas automakers, making power battery exports a major source of export growth. Furthermore, regional variations in vehicle electrification development have influenced differentiated market demand: the European market focuses on passenger vehicle supporting batteries, while emerging markets demand batteries for economical vehicles.

4.3. Light vehicle electrification and emerging opportunities

Low-income developing economies are accelerating the replacement of high-pollution lead-acid batteries under low-carbon governance, making the electrification of light two- and three-wheeled vehicles a key pathway for regional emission reduction and creating new incremental demand for lithium batteries. Additionally, batteries for light transport vehicles feature low trade barriers, low transportation costs and large, fragmented application markets, forming a segmented export niche distinct from power and energy storage batteries. As a result, Do-Fluoride's standardized batteries for light vehicles meet cost and performance requirements for light transport applications, enabling full replacement of lead-acid batteries and aligning with demand for low-cost mobility tools in emerging markets across Southeast Asia and Africa. Furthermore, drawing on domestic supply chain and client experience accumulated in supporting two- and three-wheeler manufacturers, the

company replicates and expands overseas sales channels, delivering stable export growth characterized by small-batch and high-frequency orders [9].

5. Challenges and strategies for Do-Fluoride's lithium battery exports

5.1. Escalating trade barriers and mounting export pressures

The EU Batteries Regulation requires full life-cycle carbon footprint accounting and minimum battery recycling rates, while the U.S. Inflation Reduction Act introduces local capacity requirements, jointly increasing export barriers. In particular, carbon footprint certification and recycling system construction raise compliance costs and compress profit margins per unit product. At the same time, local content requirements raise market access thresholds for finished battery exports to Europe and the U.S., reducing the adaptability of pure goods export models [10]. Meanwhile, geopolitical risks and industrial protectionist policies in host countries increase uncertainty in overseas investment and factory expansion. In the short term, the enterprise shifts production capacity absorption to Southeast Asian, Middle Eastern and other markets with weaker constraints. In the long run, it pushes forward construction of overseas material and battery assembly production lines to mitigate impacts of tariffs and carbon compliance restrictions on exports and stabilize overseas supply capacity.

5.2. Intensified industry competition and shrinking profit margins

Intense industry competition has driven a continued decline in average lithium battery export prices, with the 2025 average export price reaching RMB 112.31/kg, representing a year-on-year decrease of 21.4%. Furthermore, the concentrated release of new production capacity has further intensified price competition. At the same time, sharp price volatility of upstream lithium hexafluorophosphate, whose average price fell to 97,500 RMB per ton in April 2026, has transmitted raw material cost fluctuations downstream to battery manufacturing and squeezed profit margins [11].

Against this backdrop, corporate profit sources have shifted from capacity expansion to cost control and product restructuring, with the marginal contribution of capacity expansion to profitability declining. The ability to control unit costs has become a core variable. Additionally, downstream clients hold stronger bargaining power, with most orders executed under long-term fixed prices or dynamic price adjustment mechanisms, further narrowing profit margins and increasing reliance on scale-driven cost reduction capabilities.

5.3. Accelerating technological iteration and rising R&D expenditure

Amid rapid technological evolution, emerging breakthroughs in high-nickel ternary materials, novel lithium salt systems, and solid-state batteries are accelerating changes in lithium battery technology pathways. Overseas enterprises are also increasing R&D investment to compete for dominance over technical standards [12]. Besides, downstream clients have raised requirements for battery energy density, fast-charging performance and low-carbon manufacturing indicators, forcing enterprises to continuously adjust material systems and production processes while renovating production lines, which drives up R&D investment intensity.

To address these shifts, Do-Fluoride leverages its strengths in lithium hexafluorophosphate and other core products to accelerate product portfolio upgrading. In addition, it also deploys forward-looking directions including sodium-ion batteries and solid-state batteries to strengthen

technological reserves. Furthermore, the company constructs carbon management systems and carries out low-carbon process transformations to meet international green certification requirements, sustaining product competitiveness amid dual pressures of technological upgrading and compliance constraints.

6. Conclusion

Dual-carbon constraints have driven growth in demand for energy storage batteries, power batteries and light vehicle batteries across energy and transportation sectors, reshaping the global market structure of lithium battery exports. Leveraging its integrated layout across fluorine-based materials and battery manufacturing, Do-Fluoride has formed certain advantages in cost control and product adaptation, enabling it to capture differentiated orders driven by low-carbon transitions across regions. Nevertheless, it faces sustained constraints from three fronts: intensified global carbon trade barriers, price competition driven by industrial capacity expansion, and rapid technological iteration, which respectively squeeze profit margins through higher compliance costs, erode profitability and impose stricter technical capability requirements on export businesses.

In this context, the enterprise has partially alleviated external shocks and improved industrial chain collaboration efficiency via a combined strategy of differentiated regional product launch, gradual overseas layout and low-carbon technology upgrading. However, this research has limitations. Based on a case study of Do-Fluoride, its conclusions mainly apply to vertically integrated lithium battery enterprises, with limited applicability to pure battery manufacturers or single material producers. Moreover, the study only covers data from 2025 to 2026 and does not account for long-term policy changes or geopolitical shifts. As global dual-carbon governance advances, competition in lithium battery exports will increasingly hinge on low-carbon manufacturing capacity, full industrial chain collaboration efficiency and technological reserve strength. Follow-up research may further explore differentiated overseas expansion paths of various enterprise types, and evaluate long-term impacts of evolving carbon policies on export structure and corporate performance using longer time-series datasets.

References

- [1] Jiang, M. H., Hao, X. Q., Li, B. Y., et al. (2025). Global value added and embodied carbon emission transfers driven by lithium battery trade. *iScience*, 28(5), 112320. <https://doi.org/10.1016/j.isci.2025.112320>
- [2] Li, C. S., Ji, X. Y., Tan, K. Y., et al. (2024). An evolutionary game analysis of China's power battery export strategies under carbon barriers. *Systems*, 12(11), 482. <https://doi.org/10.3390/systems12110482>
- [3] Wang, Y. T., Ji, X. Y., & Lin, B. (2025). The choice of recycling and remanufacturing strategy for power battery supply chain under carbon border adjustment mechanism and cap-and-trade. *Transportation Research Part E: Logistics and Transportation Review*, 203, 104687.
- [4] Zhai, M., Wu, Y. F., Tian, S., et al. (2025). A circular economy approach for the global lithium-ion battery supply chain. *Nature*, 642(7081), 567–573. <https://doi.org/10.1038/s41586-025-09617-4>
- [5] De Waal, I. M. (2025). The legal transition towards a more circular battery value chain: A critical analysis of the EU Batteries Regulation. *Transnational Environmental Law*, 14(3), 456–482.
- [6] Kallitsis, E., Lindsay, J. J., & Wu, B. (2024). Think global act local: The dependency of global lithium-ion battery emissions on production location and material sources. *Applied Energy*, 362, 123498.
- [7] Clemente, M., Maharjan, P., & Salazar, M. (2025). Meta-analysis of life cycle assessments for Li-ion batteries production emissions. *The International Journal of Life Cycle Assessment*, 30(10), 2625–2641.
- [8] Farhani, A. (2025). Digital product passports and blockchain for sustainable lithium battery and EV supply chains: A unified framework. *Journal of Cleaner Production*, 412, 137451.
- [9] Gao, H., Yan, K., & Zhao, L. (2025). Study on localized product carbon footprint accounting in China: Evidence from the lithium battery industry. *Engineering Sciences*, 27(4), 112–121.

- [10] Tang, X., Cai, J., & Huang, K. (2024). Full life-cycle carbon footprint of electric vehicle batteries. *Journal of South China Normal University (Natural Science Edition)*, 46(4), 78–86.
- [11] Chen, H., Li, H., & Xu, Y. (2024). Research progress on energy storage technologies in China in 2023. *Energy Storage Science and Technology*, 13(5), 1359–1397.
- [12] Cui, D. (2024). China's lithium battery export trade pattern and response strategies to green barriers under dual-carbon constraints. *Journal of International Trade Issues*, (2), 78–96.