POLICY BRIEF

Securing the UK Lithium Supply: If supply is constrained can basic needs be met?

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EXECUTIVE SUMMARY

Lithium is a critical input to electric vehicles, consumer batteries, grid-scale energy storage, pharmaceuticals, lubricants, and other essential applications. Yet, current UK analyses lack a systems-level perspective on how Lithium flows through the economy, accumulates in long-lived products, and becomes available for reuse or recycling. Without such a perspective, it is difficult to evaluate industrial policies such as manufacturing subsidies for cathode production and recycling that may be necessary to achieve a resilient Lithium supply chain. Developing a comprehensive model that tracks Lithium as it moves through and accumulates in the UK economy is therefore essential for capturing these dynamics and informing strategic decision-making.

Coordinated industrial policies that strengthen domestic manufacturing and improved sector collaboration could enable a more resilient UK Lithium supply. High-quality estimates of production and manufacturing capacities, along with trade data, would make dynamic modeling of Lithium flows possible. This can be used to assess supply chain resilience, identify bottlenecks, and guide investment in manufacturing and recycling infrastructure in the UK.

Key Recommendations

FOR POLICYMAKERS

→

Ensure at least one UK-based producer at each critical supply chain stage through targeted incentives or public investment

→

Make Lithium flows visible through industry reporting of product Lithium content and volumes to support supply chain coordination and recycling

FOR RESEARCHERS

→

Develop open, UK-wide stock–flow models of Lithium use to forecast in-use stocks, end-of-life availability, and recycling needs

→

Stress-test the energy transition under Lithium constraints by developing scenarios that assess impacts on EV deployment and energy security

Introduction

Renewable energy technologies are more material-intensive than fossil fuel systems. For instance, electric cars require six times the mass of critical minerals compared to gasoline vehicles, and offshore wind requires six to thirteen times the critical minerals used in equivalent coal or gas generation [1].

However, this comparison understates the full extent of material demand, as it does not account for the additional infrastructure required to manage the intermittency of renewable energy sources. Unlike fossil fuel systems, which provide dispatchable power, renewable generation necessitates large-scale energy storage to ensure reliability and grid stability.

This introduces a further layer of material and supply chain complexity, as storage technologies are themselves highly resource-intensive. In particular, Lithium-ion batteries have emerged as the dominant solution for both grid-scale storage and electric mobility. As a result, Lithium occupies a central position within the material architecture of the energy transition. These uses for Lithium will compete with its non-energy uses in the ceramics, pharmaceutical, and lubricant industries.

The high material-intensity of renewable energy systems and the increased complexity related to storage is one of the most significant challenges of the energy transition and requires increased coordination within the battery manufacturing sector, particularly, with the management and tracking of critical mineral stocks, their inputs and wastes.

This policy brief focuses on the total Lithium demand of the United Kingdom, which is expected to rise sharply in the coming decades as transport infrastructure is electrified. According to the UK Critical Minerals Strategy, an increase in Lithium demand of over 1,000% is expected by 2035 [2], exceeding earlier IEA projections which expected a similar increase until 2050 [3].

Given the vital nature of Lithium to energy security, and that the current demand is being met through imports of finished products such as electric vehicles, securing a base level of domestic production or recycling is crucial to maintain a base of supply security in the event of trade disruptions. As an example, China dominates downstream Lithium battery supply chains, including more than 98 percent of Lithium Iron Phosphate cathodes [4], a significant source of geopolitical leverage. Additionally, the UK Battery Strategy sets the very ambitious target of 90% of batteries to be produced domestically by 2030 [5]. The government response discusses this target in the context of Gigafactories, but if the cathode material is imported this simply shifts the dependency up a stage of the supply chain [6].

The quick ramp-up of electric vehicle demand leads to oscillations in capacity requirements over time resembling a pulse. Although developing an entire domestic battery manufacturing ecosystem across each stage of the supply chain to meet peak demand would be unfeasible and lead to significant overcapacity, securing a minimum level of manufacturing capacity at each stage would strengthen UK resilience [7].

The current UK Critical Minerals strategy lacks a comprehensive system-level view of Lithium flows, stocks, and recycling potential[2], despite Government concern on the subject[8]. Without this system-level understanding, the UK risks over-reliance on imports, inability to ensure adequate feedstocks for recycling, and weak domestic manufacturing capacity– particularly in cathode production. Consequently, end-of-life Lithium from recycled batteries cannot be fully leveraged if domestic processing and manufacturing capacity is insufficient.

This brief sets out actionable measures to strengthen UK Lithium security. Key recommendations include:

→ Establish a selective industrial policy that ensures at least one domestic manufacturer at each step of the Lithium supply chain. This could focus on encouraging the private sector to boost production through tax incentives or subsidies, or alternatively, on investments to establish state-owned enterprises for key products.

→ Mandate reporting of Lithium content and production volumes by Lithium product manufacturers to track imports, support recycling, and enhance sector collaboration.

→ Engage researchers to develop open, physical stock–flow models of UK Lithium use to identify supply vulnerabilities and plan recycling infrastructure.

→ Develop Lithium-constrained demand scenarios to assess the resilience of the energy transition under supply disruptions or resource limitations.

Together, these suggestions will ensure that the industrial sector can coordinate manufacturing capacity and government has the information required to make informed policy and ensure the country's Lithium security.

Policy Recommendations

1. Ensure at least one competitive domestic manufacturer at each step of the Lithium supply chain through selective industrial policy

Domestic net-zero scenarios forecast electric vehicle (EV) and battery storage demand to increase at a remarkable pace in the next quarter century[9]. While fully developing every segment of the required supply chains may be unfeasible, a "plus one" policy [7], in which the UK or a dependable ally maintains at least one manufacturer for each component, would ensure domestic expertise exists. This presence would reduce the learning curve and allow the sector to respond more quickly and effectively in the event of a disruption. This is in line with the current UK Battery Strategy, which acknowledges complete end-to-end battery supply chain is not feasible, but that some level of cathode and anode production will confer strategic advantages[6].

2. Mandate data reporting of product compositions and production to facilitate recycling.

This serves two purposes: (A) to track UK manufacturing requirements for imports, and (B) to enable increased collaboration within the sector to improve circularity and domestic resilience.

The UK Critical Minerals Strategy estimates Lithium demand based on EV projections and is limited to four HS codes (Harmonized System codes, which classify goods for international trade) [2, annex 5] related to inputs for advanced manufacturing, such as Lithium hydroxide. However, a significant amount of Lithium is also imported through other Lithium-containing products, such as cathodes. The 2026 revision to the Combined Nomenclature has added a specific HS code for Lithium Iron Phosphate (LFP) cathode material. This will greatly aid in tracking Lithium flows for battery manufacturing. Other HS codes, such as those for Lithium lubricants, Lithium bromide, and black mass from recycled batteries, remain non-specific. China has introduced a 10-digit code to separate Lithium battery black mass from other waste streams. A similar step could be taken in the future for the UK's Combined Nomenclature. For Lithium-containing products that are still classified under broad HS codes, an alternative approach would be to collect data through targeted surveys of companies that import or export these products. Given the small number of manufacturers for most of these products, this could provide the required data and enable refinement of HS codes in the future.

The Office for National Statistics produces national Input/Output tables [10], but the resolution is insufficient for effective sector coordination. For sectors deemed vital to energy security, we recommend that the government or trade organisations track annually manufactured products, their required inputs, and plant capacities. Improved data availability would facilitate sector coordination and the funding of recycling capacity.

Recommendations for Researchers

3. Engage with industry to develop open source data and stock models.

With increasing Lithium demand for batteries, recycling is crucial to ensure sufficient Lithium resources within the United Kingdom. Recycling facilities are expensive and must be integrated with the rest of the UK´s Lithium supply chain to have a meaningful impact on material security.

Data reported by industry could feed into stock-flow models maintained by government or academic institutions. A key challenge to recycling is that battery feedstocks are highly heterogeneous[8]. Because recycling processes are specific to the feedstock, these models would allow companies and governments to ensure that recycling capacity is built in alignment with specific end-of-life (EOL) feedstock, and that sufficient downstream manufacturing capacity, such as cathode and standardized battery production, is also in place to complete the process. The UK's Lithium supply chain is only as strong as the weakest link (the sector with the least capacity). Given the short timelines involved (less than 25 years)[9], effective government coordination within the sector is essential.

4. Develop 'Lithium constrained' demand projections. If Lithium is constrained or unavailable due to trade blockades or geological constraints, how will domestic demand be met?

Given the complexity of supply chains for renewable energy technologies and the global demand for these metals, alternative plans should be prepared in case certain minerals become cost-prohibitive. This could result from competition, fossil energy constraints, or direct trade disruptions.

Since the vast majority of Lithium is required for transport electrification, scenarios that reduce reliance on personal transport should be explored. With 37 Mt of global Lithium reserves [11], projected United Kingdom demand would exceed the amount that would correspond to the UK's share if distributed by population. If trends continue from resource conversion into reserves, equity issues might be mitigated. However, the opposite outcome is also possible, as current Lithium prices have made much Australian hard-rock extraction unprofitable. Declining fossil fuel production may also affect mining costs and economic viability of resource extraction. This area warrants focused future research.

FIGURE 1

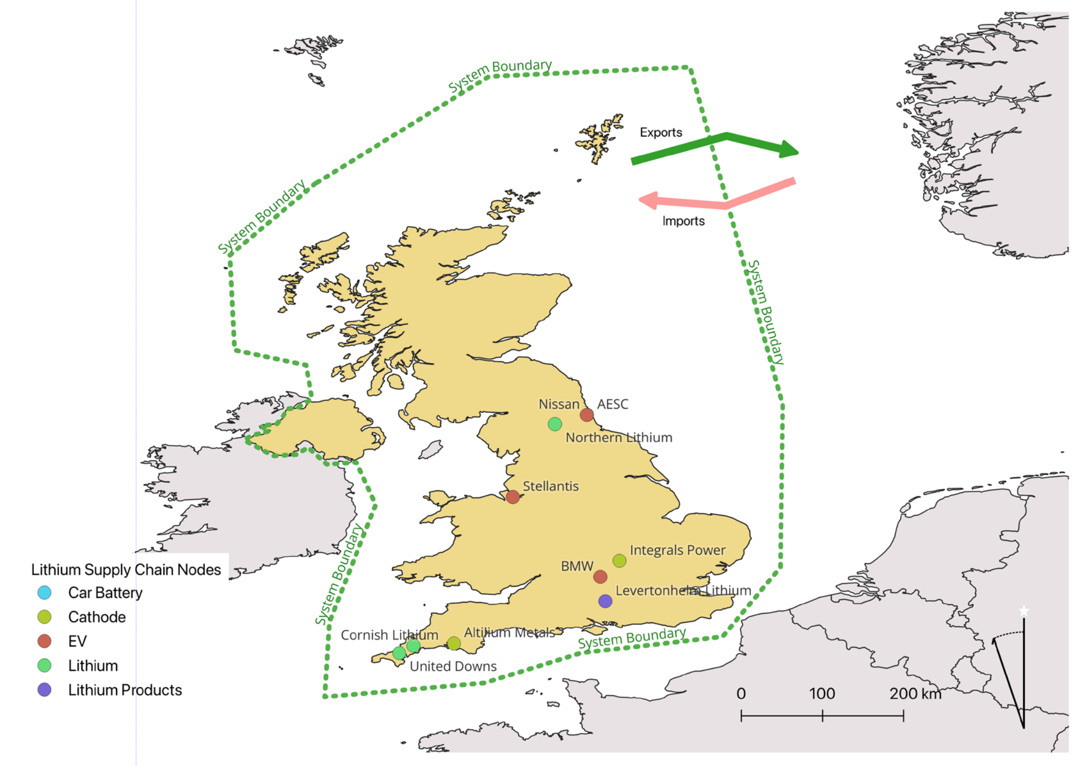

FIGURE 1: HERE WE ILLUSTRATE THE UK LITHIUM SUPPLY CHAIN RELEVANT TO BATTERY PRODUCTION. AS THERE ARE NO COMMERCIALLY OPERATING MINES, THE UK IS RELIANT ON IMPORTS ACROSS THE SYSTEM BOUNDARY. ONCE LITHIUM IS IMPORTED, COORDINATION AMONG SECTORS IS ESSENTIAL TO MAKE A BASE LEVEL OF RECYCLING VIABLE.

Potential of the UK Lithium supply chain

This brief is informed by ongoing research at the Cambridge Critical Materials Lab (CCML) assessing Lithium supply security in the UK. As Lithium becomes increasingly vital to the power grid and transport systems, we evaluate the UK's capabilities across each stage of the battery supply chain and integrate these into a stock model for scenario analysis.

The UK Critical Minerals Strategy has a goal of 50 kt of Lithium (LCE) produced domestically by 2035 [2]. This would come from Mica or geothermal brine wells in Cornwall or in Lithium-mica bearing Saint Austell Granite which could potentially be recovered from tailings[12]. Neither source is currently commercially mined for Lithium [12]. The Cornwall site doesn't have any declared resources as of yet [12].

Past the initial extraction phase, preliminary analysis identifies cathode production as a key bottleneck in the UK battery supply chain (Figure 1). While the UK can produce battery-grade Lithium carbonate (LevertonHelm Lithium) and AESC battery gigafactories have recently expanded to 12 GWh capacity [13], cathode production remains largely in the planning stages, with projects from Altillium Metals Ltd. (Nickel Cobalt Manganese) and Integrals Power Ltd. (Lithium Manganese Iron Phosphate) [14].

If Lithium carbonate were extracted from black mass waste, the current cathode production capacity would be insufficient to utilise the feedstock. Re-lithification processes are also sensitive to specific battery technologies and feedstock design. An integrated, sector-wide stock–flow model could track expected EOL waste inputs and guide the timing and funding of recycling facilities. We are developing such a model, which will enable rapid scenario analysis of policy levers, including export restrictions, product lifetime extensions, recycling mandates, and plant capacity expansions. To reach its full potential, this tool will require collaboration between government and industry.

Finally, regarding the fourth recommendation on Lithium-constrained scenario creation: while the renewable transition is of utmost importance to the environment and to mitigating finite fossil fuel supplies, the complexity of supply chains and potential cascading risks to energy security make it essential to include "Lithium-constrained" backup scenarios in planning. In the case of Lithium, this is relatively straightforward, as the vast majority of Lithium is used for transport electrification, which could be moderated by encouraging public transport in place of personal car ownership.

Conclusion

Securing the future Lithium supply in the UK is critical to the energy transition and national security. Implementing industrial policy through promoting domestic manufacturing and recycling capability, improving data reporting and sector coordination, and developing system-level stock–flow models will strengthen domestic resilience and enable recycling. Incorporating Lithium-constrained scenarios ensures preparedness for potential supply disruptions. Coordinated action between government, industry, and researchers is essential to maintain a secure and sustainable supply of Lithium for the UK's energy future.

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We believe the energy transition must be equitable and inclusive. That means mineral-rich countries and their communities should benefit fully from their resources. By co-creating information platforms, producing rigorous research, and building tools for better decision-making, we work to strengthen equity in how critical materials are used to ensure no one is left behind.

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