Brunel University of London

POLICY BRIEF

October 2025

End-of-life Management of Electric Vehicle Batteries

Dr Muhammad Shafique

Policy Context: Net-Zero aims have led to an increase in the market share of UK electric vehicles (EVs) to 20.4% in 2025 – up from 16.9% in 2024. It is estimated that by 2035, 150,000 tonnes of battery packs will reach end of life (EOL) annually that will need to be processed. Unless this waste flow is managed, many of the environmental gains of the transition to EVs will be lost.

Policy Advice: Government and the automotive industry should take a holistic approach to EOL EV battery management: focusing on regulations, producer responsibilities, financial incentives, infrastructure development, domestic processing capacity, research and development (R&D), and supply chain security. A comprehensive strategy is necessary to build a circular economy for batteries and avoid environmental damage from waste overflow and international shipping for processing.

Key Research findings

- 339,000 tonnes of EV batteries in UK will reach EOL annually by 2040. At this stage, the UK will require 140GWh worth of cell production capability, representing 567,000 tonnes of cell production per year, of which 22% could be met by recycling alone.
- Failure to scale up recycling or regulatory/infrastructure support will result in growing stockpiles of EOL batteries, leading to environmental & safety hazards, lost economic opportunity and supply chain vulnerabilities. .
- The UK has very limited large-scale facilities for recycling lithium-ion batteries (LiBs), particularly for dismantling, “black mass” extraction and refining critical minerals like lithium, nickel and cobalt. Many current recycling methods recover only a portion of valuable materials. Many UK manufacturers currently export used LIBs to Asian & European facilities for recycling, leading to lost economic opportunity (estimated global recycling market of USD 70.49 billion by 2035) and a higher carbon footprint from international shipping. Domestic recycling will result in total carbon savings of nearly 383,480 tonnes of carbon per year.
- Several factors contribute to the lack of EV battery recycling facilities in the UK: (1) no specific regulatory frameworks exist for EV battery dismantling, reuse, or minimum recycled content; (2) the volatility of market prices for raw materials (lithium, nickel, cobalt) reduces the profitability of recycling. When prices are low, virgin materials may be cheaper than recycled equivalents; (3) there are no subsidies or tax breaks for recyclers or second-life battery businesses; (4) battery producers are not legally obligated to account for the recyclability of their products, leading to a lack of standardised requirements for collection, sorting, and recycling processes.

Policy Recommendations

- **Domestic battery recycling infrastructure:** Public and private investment into domestic recycling and refining facilities should include capital grants for building or upgrading recycling/refining plants and establishment of industrial recycling hubs with shared infrastructure (e.g. logistics, energy, waste treatment). This will create a market environment where recycling batteries locally is more economically viable than exporting the batteries or their black mass (shredded battery material) to overseas facilities. This will minimise battery material shipping costs and associated emissions, ensure battery processing in the UK labour market and keep battery critical materials within the UK enhancing supply chain resilience through creating a local circular economy.
- **R&D and innovation:** Funding research and development for improving recycling efficiencies will support scaling up and demonstrate the commercial viability of novel recycling processes and technologies. Focus areas should include new methods for direct recycling, more efficient hydrometallurgical processes, development of cheaper battery chemistries, innovation around automation of the discharge process for safer and efficient means of discharging and faster battery dismantling, and expanding research on second-life applications. Strategic government-funded research initially can play a catalytic role in attracting future private sector investment, de-risking innovation and establishing foundational infrastructure and knowledge.
- **Regulatory actions:** Update Extended Producer Responsibility (EPR) regulations to clarify the responsibilities of manufacturers throughout a battery's lifecycle, including EOL management. EPR regulations, which require battery manufactures to take back their products for recycling, should be developed to support the move to a circular economy model, ensuring safe and effective re-use of EV batteries, with increasingly robust recycling targets for manufacturers.
- **Recycling standards:** Establish mandatory targets for minimum recycled content in new batteries and for the recovery of specific critical minerals including lithium, cobalt, and nickel, in order to maintain market compatibility and reduce reliance on virgin and overseas critical minerals. Recycled content requirements will place pressure on battery manufacturers and the recycling industry to scale up their capacity and technology to meet rising demand.

Work with me

Dr Muhammad Shafique is Lecturer in Civil Engineering at Brunel University of London. He is an expert in lifecycle sustainability assessment and circular economy of emerging products and technologies, and in engineering solutions that accelerate the UK's transition to net-zero transport. The wider impact of the research lies in enabling practical pathways to improving low carbon practices, reducing GHGs, and supporting net zero targets in the transport industry.

Contact Dr Shafique at muhammad.shafique@brunel.ac.uk if you would like to learn more about end of life management of EV batteries, his broader research, invite him to speak at your event, or ask for advice or guidance in assessing sustainability and circularity and application of systems-based approaches for net-zero transport

Cite: Shafique, Muhammad (2025). End-of-life Management of Electric Vehicle Batteries. Brunel University of London. Policy Brief. https://doi.org/10.17633/rd.brunel.30354847