RESEARCH PROJECT SUMMARY

Unlocking demand for low carbon & resource efficient innovation

Potential Market Forming Interventions for EV battery circularity

PROJECT OVERVIEW

PURPOSE AND CONTEXT

This report presents the findings of a UKRI and DESNZ commissions research project into Market Forming Interventions (MFIs). The views and recommendations expressed are those of the authors and do not reflect official policy or government position.

The UK has a strong innovation base, with a pipeline of low-carbon, resource-efficient materials, products and business models. However, many innovations struggle to progress to commercial scale. Weak and uncertain demand, high perceived investment risk, and fragmented value chains continue to constrain scale-up. This limits progress towards generating value from UK-owned IP and building resilient and low carbon supply chains that help to meet net zero and circular economy goals.

The project, delivered by ERM in partnership with Eigen Ventures and the Scope 3 Peer Group, focused on identifying and designing Market Forming Interventions and enabling factors that could help accelerate the adoption of innovative materials, products, and business models across the UK automotive sector. The identified interventions are designed to work alongside existing policy frameworks, industry roadmaps, sector associations, stakeholder initiatives and net zero commitments, creating structured and systemic pathways to commercialisation. Grounded in extensive stakeholder engagement, it sets out practical options to unlock private investment, stimulate demand, and strengthen UK industrial competitiveness.

MFI DEFINITION AND NEED

Within the context of this project, an MFI is defined as a potential demand-side measure that seeks to accelerate the adoption of novel technologies or business models to reduce lifecycle carbon emissions.

MFIs tackle the demand-side barriers that prevent innovations or business models from scaling, such as uncertain demand, missing standards, misaligned incentives, and fragmented supply chains, using mechanisms like cost support, demand aggregation, financial de-risking, and predictable pricing.

SCOPE OF RESEARCH

Innovation areas explored: Use less material (increased battery energy density, increased power density of motors, vehicle lightweighting); use low carbon material (low carbon battery manufacture, low carbon materials); circular business models (repair and maintenance, leasing and as-a-service models, second life battery business models, battery recycling, magnet recycling, body parts recycling)

MFI measures considered: Regulation and lower cost (e.g. subsidies); demand aggregation (e.g. buyers' club); direct financial support (e.g. blended finance); price support (e.g. contract for difference).

EV BATTERY CIRCULARITY WAS SELECTED FOR IN-DEPTH EXPLORATION

Electric Vehicle (EV) battery recycling and repurposing was identified as a potential innovation area by this research project following a structured assessment against environmental, market, economic and innovation readiness criteria:

Waste management: As the uptake of EVs in the UK accelerates, there will be a high volume of batteries reaching end-of-life in vehicles that must be managed. The total annual capacity of batteries from BEVs reaching end-of-life is forecast to grow from 1GWh today to 44GWh by 2040.[1]

UK energy system needs: Batteries are a critical part of a decarbonised energy system in the UK. Current battery value chains are highly concentrated, leaving the UK vulnerable to potential supply chain shocks and geopolitical events. Recycling and repurposing offer opportunities for a resilient domestic supply of battery materials and packs for manufacturing and stationary storage. The APC estimates secondary battery materials could meet up to 20% of UK automotive battery demand by 2035 (approx. 13 GWh).[2] ERM modelling indicates end-of-first-life Lithium-Iron-Phosphate (LFP) battery capacity will exceed total UK BESS demand by 2040, with an estimated BESS value of £822m per year based on current purchase costs for imported batteries.

Growth of the UK EV manufacturing industry: Establishing domestic battery manufacturing is key to supporting the automotive sector (directly employing 132k people[3]) as it transitions to BEVs, while also supporting high-skilled advanced manufacturing jobs. Commercial recycling capabilities also present a significant opportunity to strengthen the resilience of the battery supply chain. The government has set a target to meet 20% of critical mineral demand through recycling.[4] Using recycled materials in battery production also supports compliance with EU Battery Regulation recycled content requirements and rules of origin for trade, which is critical given that 80% of UK-made vehicles are exported globally, largely to the EU.**Error! Bookmark not defined.**

Decarbonisation potential: Use of recycled materials in the manufacture of new batteries or the use of repurposed end-of-life batteries in second-life applications provides the opportunity to lower the embodied carbon of the battery. Quantification of carbon savings is highly dependent on the second-life use case or recycling conditions, however, studies report examples of carbon-intensity reductions for second-life batteries in BESS applications of ca. 50% per kWh compared to single-life use.[5,6]

WHAT ARE THE DEMAND BARRIERS FOR EV BATTERY CIRCULARITY?

This research has found that there is significant activity to support the scale-up of battery circularity, including overarching UK strategy, ongoing reviews of UK regulation, and innovation funding schemes.[7] However, the uptake of battery repurposing and recycling faces several key barriers that limit their adoption, including unlocking the flow of EV batteries to recyclers and repurposers once removed from end-of-life vehicles.

Stockpiling and value perception: Stockpiling contributes to a reduction of EV waste batteries re-entering the value chain for recycling or repurposing. Stockpiling can be driven by the higher cost to recycle vs. temporarily storing waste EV batteries with the expectation of higher value in the future. High costs are somewhat inherent to the recycling process and depend on the value of the extracted critical

[1] ERM Modelling (2026), Achieving Circular Flow for EV Batteries in UK, BEV = Battery Electric Vehicle
[2] Advanced Propulsion Centre UK, Automotive battery recycling landscape with the UK and EU perspective, December 2025;
[3] Modern Industrial Strategy, and Advanced Manufacturing Plan, June 2025;
[4] Critical Minerals Strategy, November 2025
[5] Dong et al. (2023), https://doi.org/10.1016/j.isci.2023.107195
[6] Jannesari et al. (2019), https://doi.org/10.1016/j.rser.2019.109413,
Ahmadi et al. (2015), https://doi.org/10.1007/s11367-015-0959-7
[7] A full barrier and existing intervention mapping exercise was carried out by ERM through review of literature and stakeholder engagement, Achieving Circular Flow for EV Batteries in UK

minerals; however, these are exacerbated by the lack of domestic processing capabilities, leading to the export of waste batteries for processing. Stockpiling is also fuelled by the perception that the value of waste EV batteries will soon rise or should be higher, due to expected repurposing as stationary storage or for critical material extraction.

End-of-life EV battery standards: Although standards on battery storage and handling and battery treatment at end-of-life exist in the UK (PAS 7060/1 and BS EN 18061:2025), they are not widely adopted by industry. Lack of standardised and widely used end-of-life battery processes leads to treatment uncertainty and a lack of clear end-of-life options, as well as safety concerns. This further disincentivises battery recycling and processing for second-life. Standards include:

- Standards for the safe handling and dismantling of waste EV batteries
- Standardised processes and data availability for state of health measurement and safety assessment for second-life

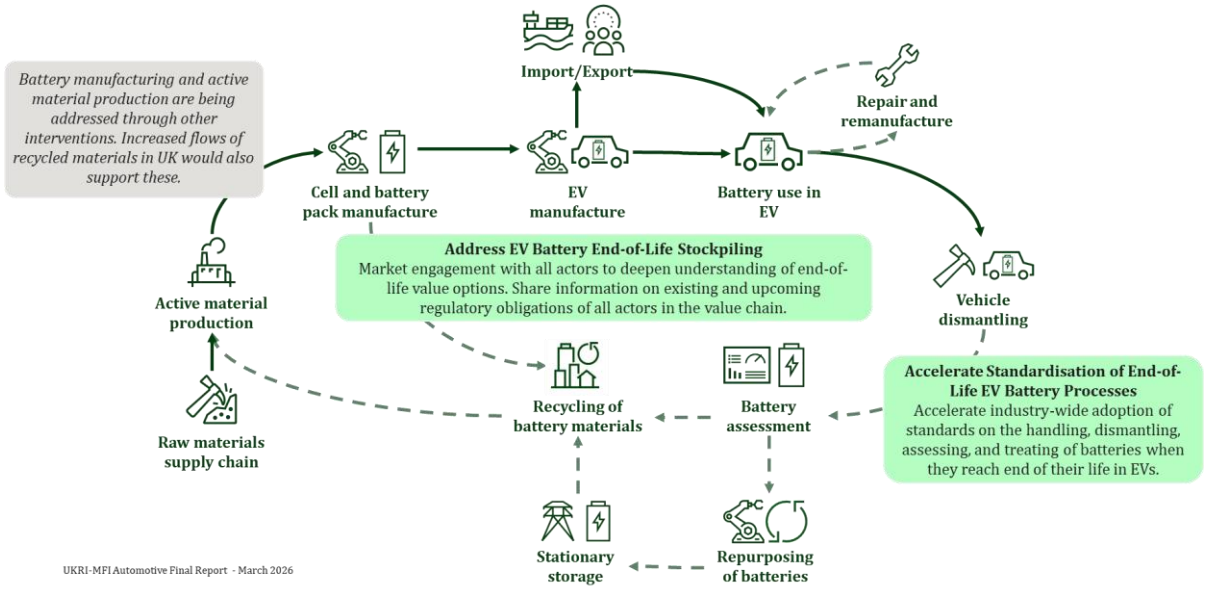
The lack of domestic end-of-life battery processing and recycling capability results in the export of waste batteries. It also creates a security of supply risk for the automotive industry's transition to EVs and the grid's transition to renewable power, as it inhibits the growth of domestic EV battery manufacture and second-life grid storage applications, forcing the import of critical materials and batteries. Domestic battery manufacturing and active material production are being addressed through other interventions, however, increased flow of recycled materials in the UK would also support this.

HOW COULD BATTERY RECYCLING AND REPURPOSING BE UNLOCKED?

Addressing these barriers may require coordinated action to improve both the physical handling of end-of-life batteries and the market behaviours that currently constrain their flow. These would need to achieve:

1. Industry-wide adoption of standards to dismantle, handle, assess, and treat end-of-life EV batteries, by accelerating standardisation of end-of-life EV battery processes. This research proposes a review of existing standards to ensure they are "fit-for-purpose". Any reform of UK battery regulations should aim to simplify compliance and provide clarity on treatment pathways.
2. Increased flow of EV batteries to repurposers and recyclers when removed from vehicles, this could be achieved by addressing end-of-life stockpiling through targeted market engagement and information campaigns to address misaligned value perceptions and limited understanding of both regulatory obligations and viable end-of-life options.

WHAT ACTIVITIES ARE REQUIRED?



The enabler activities recommended by the research to achieve these objectives includes the following:

Enabler 1: Accelerate standardisation of EV battery end-of-life processes	Enabler 2: Address EV battery end-of-life stockpiling
1.1 Review of existing EV battery end-of-life management standards This aims to bring together industry, insurers, policymakers and standards bodies to review why existing UK standards for managing EV batteries at end-of-life are not being widely used. Through collaborative workshops, it could help to identify gaps, barriers and practical improvements to make these standards clearer, more usable and economically viable for businesses across the value chain. Ultimately, the aim is to enable safer, more consistent handling and recycling of EV batteries, supporting a more transparent and dependable supply of second-life batteries and materials.	**2.1. Market engagement campaign to convene vehicle end-of-life actors, battery recyclers and repurposers, to address knowledge gaps around battery end-of-life value** This activity could deliver a targeted market engagement campaign to connect vehicle dismantlers with battery recyclers and repurposers, addressing key knowledge gaps around the value and end-of-life options for EV batteries. By providing clear guidance, sharing best practice, and improving transparency on battery pricing and pathways, it could help correct misperceptions that may lead to stockpiling. Ultimately, the aim would be to increase the flow of batteries into reuse and recycling, unlocking value and supporting a more efficient and circular battery ecosystem.
1.2. Review alignment of standards with UK battery regulations This activity would help to ensure that existing standards for managing EV batteries at end-of-life are aligned with UK battery regulations, with potential for future reforms considered. By working closely with industry and policymakers, it could help to identify where standards and regulation need to better connect, and recommend updates to improve consistency and clarity. The aim would be to create a more joined-up framework that supports and incentivises compliance and strengthens industry confidence.	**2.2. Information campaign on existing and any upcoming regulatory requirements** This activity could deliver a coordinated information campaign to improve understanding of both current and upcoming UK battery regulatory requirements across the EV value chain. It could help to provide clear, targeted guidance to all key actors on their obligations under existing rules and proposed reforms, helping to address widespread gaps in awareness and compliance. The aim would be to strengthen accountability, improve coordination across the system, and ensure regulations are consistently understood and effectively implemented.

WHAT WOULD THE RECOMMENDED ACTIVITIES HELP ACHIEVE?

Industry alignment on pathway to standards adoption. Agree recommended actions to support wider adoption of existing and/or updated EV battery end-of-life standards, identify key gaps and improvements needed in the standards, and set out a clear plan to enable consistent uptake across the value chain, assigning responsible actors and regulatory action.

Harmonisation of standards and battery regulation. Align existing EV battery end-of-life standards with UK battery legislation and any potential future reform, identify regulatory change needed to support standard adoption and development, and identify where standards and regulation may need to be adjusted or updated to work coherently together.

Industry-wide understanding of the value generation options for end-of-life EV batteries. Establish understanding across vehicle dismantlers of where they can access value for EV batteries extracted from vehicles and build a network of vehicle dismantlers and end-of-life EV battery treatment providers to facilitate exchange of end-of-life EV batteries.

Industry-wide understanding of regulatory requirements. Establish shared understanding between stakeholders in the end-of-life EV battery value chain, including vehicle dismantlers, battery recyclers and repurposers, battery and vehicle OEMs, of their obligations and relevant obligations of other actors relating to existing standards and regulation.