MOTT MACDONALD



Derby City LAEP

EMCCA LAEP 1H - Final

July 2026

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Derby City LAEP

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July 2026

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Executive summary

The Derby City Local Area Energy Plan (LAEP) provides a comprehensive, data-driven roadmap for achieving a just, resilient, and affordable transition to net zero. Commissioned by the East Midlands Combined County Authority (EMCCA) and prepared by Mott MacDonald in partnership with IES, the plan integrates technical modelling, spatial analysis, economic appraisal, and stakeholder engagement to identify how Derby City can most effectively decarbonise the local energy system while delivering wider social and economic benefits. The LAEP contributes to a joined-up regional approach that aligns local action with national policy objectives and the EMCCA's 2050 net zero ambition.

Purpose and Context

The UK has set a legally binding target to reach net zero greenhouse gas emissions by 2050. The Climate Change Committee's Seventh Carbon Budget (2025) further reinforces the urgency of local delivery by estimating that approximately 82% of the UK's emissions are within the sphere of local authority influence. Derby City Council declared a climate emergency in 2019 and set an ambitious target to achieve net zero by 2035, fifteen years ahead of the national target. This LAEP supports that ambition by identifying the most cost-effective, spatially optimised, and socially inclusive pathways for decarbonisation.

The plan responds directly to the local challenges of high fuel poverty in some areas, dependence on fossil-fuelled gas, biomass and other fuels for heating, grid capacity constraints, and the need for tailored approach to retrofitting heritage/listed buildings or those in conservation areas.

Approach and Methodology

The LAEP was developed using the Energy Systems Catapult (ESC) methodology for place-based energy planning. It draws on a combination of:

- Digital Twin Modelling: IES's dynamic 3D model simulating energy demand, generation, and carbon emissions across Derby City's building stock at the Middle Super Output Area (MSOA) level.
- Scenario Modelling: Quantitative comparison of three distinct decarbonisation pathways — Counterfactual (Do Nothing), Net Zero by 2050, and Accelerated Net Zero by 2040 — using logistic (S-curve) uptake functions for key technologies.
- Techno-Economic Analysis: Appraisal of capital investment, operating costs, system benefits, and bill savings under each pathway.
- Spatial Prioritisation: GIS-based identification of Focus Zones for targeted interventions where energy, social, and grid considerations converge.
- Stakeholder Collaboration: Engagement with local organisations and stakeholders including Derby City Councils, utilities, large industries, housing providers, and community groups.

This approach ensures that the LAEP is evidence-based, spatially specific, and co-created with those who will be instrumental in its delivery.

The UK government is currently undertaking a reorganisation of England's local government with the intention to establish new single-tier unitary councils in areas where two-tier systems exist, such as across Derbyshire. If implemented, this would see "unitary authorities" assume full legal powers in April 2028. It is acknowledged that this local government reorganisation (LGR) has the potential to impact how and/or who delivers the recommendations outlined in this

report. However, the analysis which underpins this LAEP report was intentionally undertaken on an MSOA level such that following a potential local government reorganisation, the data can be re-shaped at the MSOA level to continue to provide an evidence-based decarbonisation pathway for Local Authorities. Whilst the UK LGR may require reallocation of roles and responsibilities to deliver the projects specified in this LAEP report, the restructure is intended to deliver long-term simplification, stronger strategic leadership, and more effective cross-area collaboration, ultimately with the intention to quicker, more efficient delivery of projects.

Scope

The LAEP focuses on the parts of the energy system where a local authority can exert meaningful influence. This includes homes and non-domestic buildings, personal road transport and charging infrastructure, locally influenced generation such as rooftop solar, and the decarbonisation choices facing local industry that connect into local networks. Nationally controlled systems that are better addressed through central government or national operators, for example strategic rail, aviation and utility-scale electricity generation, sit outside the scope for emissions accounting and intervention planning. Maintaining this focus helps Derby City concentrate resources on deliverable local actions.

The LAEP models three scenarios, with the preferred scenario for Derby City being Net Zero by 2040, in alignment with each council's corporate ambitions.

DO NOTHING

Only decarbonisation activities between now and 2050 that are already legislated to happen

2050 NET ZERO

In line with national targets and guidelines including 6th Carbon Budget to 2035 and Distributed Future Energy Scenarios

2040 NET ZERO

Bespoke for D2N2 programme, set by EMCCA. Based on stakeholder preference and suitability of solutions.

Current Energy and Emissions Baseline

In 2023, Derby City's total territorial emissions were approximately 1,077 $ktCO_2e$. The area's emissions profile is dominated by three key sectors: transport (40%), domestic (26%), and industry (16%).

Total energy consumption in buildings stood at 2,389 GWh, dominated by space heating (55%), followed by lighting (16%), domestic hot water (14%) and equipment (13%). Natural gas remains the dominant fuel, accounting for the majority of emissions from heating, with a smaller portion of heating supplied by electricity.

Energy efficiency and Buildings Retrofit

Across Derby City, approximately 75,000 domestic buildings require some level of retrofit (either light retrofit only, deep retrofit only or both) to achieve the net zero scenarios. Modelling shows around 42,798 homes (44% of the housing stock) require light retrofit, while around 42,098 homes (43%) need deep retrofit.

Light retrofit typically offers shorter payback periods and is well-suited for rapid scaling, particularly in owner-occupied homes. In contrast, deep retrofit is essential for older, solid-wall properties to enhance the efficiency of heat pump operation and address fuel poverty hotspots. The recommended approach is to concentrate deep retrofit in a first wave of priority MSOAs where solid wall prevalence, fuel poverty and low energy performance certificate (EPC) ratings coincide.

Low-carbon heat

Heat decarbonisation in existing homes relies primarily on air source heat pumps (ASHPs) installed alongside targeted fabric upgrades and appropriate hot water storage. Of the identified

73,753 suitable properties, early installations should be focused in areas where electricity network capacity coincides with existing funding eligibility. In parallel, heat network zoning around the 1Energy Derby scheme is proposed so that large public and private anchors can decarbonise heat without each site needing its own plant, which reduces connection cost and allows integration of low-carbon heat sources and storage at system level. Hydrogen is not assumed for domestic heat, while the plan leaves open the option that hydrogen could play a targeted role for specific high-temperature industrial demands if supply, logistics and economics can be established.

Transport Electrification

Across the Derby City the modelling shows the number of electric vehicle (EV) cars rising to about 133,931 vehicles by 2040 in the preferred scenario, with a planning assumption of one public charger for roughly 10 EVs and the remainder of charging met by private and workplace provision. Siting of public chargers should begin with public car parks including through solar-carport infrastructure at council-owned buildings, and areas that lack off-street parking, then expand to workplace and destination hubs that can host rapid and ultra-rapid chargers. Heavy Goods Electric Vehicles (HGEV) as well as commercial light duty vehicle (LDV) fleet electrification needs must be considered, taking a holistic approach to supporting the decarbonisation of road transport in the region.

Local generation and flexibility

Expanding local renewable energy generation is key to enhancing energy resilience and managing grid load. The analysis identifies significant potential for rooftop solar photovoltaic (PV), with the capacity to generate over 231 GWh annually across domestic and non-domestic buildings. When paired with battery storage and Demand Side Response (DSR) measures, this local generation can reduce peak demand, provide flexibility to the grid, and lower consumer bills.

Industrial decarbonisation

The plan prioritises the electrification of low-temperature industrial processes first, while high-temperature processes prepare for a potential transition to low-carbon hydrogen, contingent on the development of a credible supply chain and supporting infrastructure.

Analysis suggests that industrial gas use for process heating can be substantially reduced by 2050, with associated emissions falling by around 70% under the assumed fuel-switch scenarios. To make these achievable, large industrial sites should be encouraged to develop time-phased decarbonisation plans detailing what changes will occur, when they will occur, and what new energy vectors and network capacities will be needed. Collaboration with community energy organisations as well as local authorities is recommended to ensure that potential opportunities for residential-commercial partnerships are explored, for example, the connection of a domestic district heat network to excess heat from an industrial site.

Networks, storage and headroom

The plan highlights that several primary substations and MSOAs have limited spare capacity, making timely reinforcement, connection planning, and flexibility critical to keeping electrification on track. There is a strong case for proactive investment in distribution network upgrades, as any net zero compliant scenario is projected to add more than 800 MW of After Diversity Maximum Demand (ADMD) across Derby City combined, which would exceed the capacity of the current infrastructure.

Close collaboration with the local distribution network operator (National Grid Electricity Distribution will be necessary to appropriately phase the scale roll-out of PV, ASHP and EVs.

Economics and value for money

The additional undiscounted capital expenditure for the 2040 and 2050 scenarios is estimated at £3.7 billion in today's prices. Although the required investment is substantial and the pace of transition will depend on sustained policy and grant support, it is expected to generate benefits through lower energy bills, carbon reduction, improved air quality, and employment stimulation in the local economy.

Prioritisation and focus zones

Spatial mapping identified Focus Zones where targeted interventions deliver maximum benefit. These include areas with high fuel poverty risk, poor EPC ratings, and high grid utilisation, where the deployment of retrofit measures would be expected to reduce the strain on the electricity network whilst supporting a just transition by ensuring vulnerable groups benefit from decarbonisation efforts.

In addition, the following "Quick Win Projects" are identified:

- Retrofit of fuel-poor private housing – deploying deep and light intervention measures simultaneously with ASHPs to reduce disruption.
- Deployment of rooftop solar on public sector buildings including energy intensive leisure centres, community centres and depots.
- Rollout of public EV charging – developing local charging hubs on council-owned premises for both council fleet and public use, supplemented by on-street charging infrastructure in high-demand residential zones, particularly those with high fuel poverty levels.
- Collective purchasing agreements – facilitating the bulk procurement of solar PV for clustered community deployments or negotiating large-scale renewable power purchasing agreements could help reduce the cost of sourcing renewable energy through economies of scale.
- Education / awareness campaigns – providing a 'one-stop-shop' for trusted advice, guidance, applicable grant funding as well as a council-approved list of installers/specialists to support retrofits, ASHPs, solar PV and battery installations for the 'able-to-pay' market.

These projects draw on the availability of funding, expertise within the local and regional communities and aim to address the most pressing challenges.

Next Steps

To ensure the timely and effective delivery of the LAEP, three key actions are recommended:

1. Establish a LAEP delivery partnership to progress the actions and focus zones outlined in the LAEP.
2. Collaborate on and support the development of an EMCCA-wide LAEP hub, providing a centralised web platform for residents, businesses and other local community representatives to visit to seek advice, funding guidance or connect with local expertise / suppliers.
3. Develop a comprehensive delivery roadmap and investment plan that prioritises short-, medium-, and long-term interventions as outlined in the report.

1 Introduction

Mott MacDonald, in partnership with IES, has been appointed by the East Midlands Combined County Authority (EMCCA) and its local authority partners to lead the development of the Local Area Energy Plan (LAEP) for Derby City, supporting the area's journey toward achieving net zero carbon emissions. In response to escalating impacts of climate change and the global push towards sustainable energy solutions, the development of a LAEP has been identified as a crucial step in supporting climate ambitions across Derbyshire and Nottinghamshire.

This LAEP forms part of a wider regional local area energy plan commissioned by EMCCA. The East Midlands regional plan comprises of eight local area plans, of which Derby City is one. This LAEP has therefore been prepared to be comparable to the other local plans, and to contribute to the wider regional plan. This report presents the outcomes of the Derby City LAEP, following a comprehensive process of data acquisition, scenario modelling, stakeholder collaboration, and spatial analysis.

1.1 Purpose of the LAEP

A LAEP is a long-term, evidence-based plan that sets out the most effective and efficient pathway for an area to transition to a low-carbon, smart, and flexible energy system. It provides a strategic framework to coordinate investment in energy infrastructure, shape local policies, and guide decision-making across stakeholders. By aligning spatial, technical, and socio-economic considerations, LAEPs ensure that local authorities, businesses, network operator, and communities can collectively plan for a cost-effective and just transition to net zero.

Local authorities have a pivotal role to play in enabling the UK's net zero transition. An estimated 82% of the UK's carbon emissions fall within local authorities' scope of influence[1]. There is a growing need for place-based energy strategies that align national goals with local opportunities, priorities, and constraints.

A LAEP is a bottom-up, data-driven, whole-system approach that integrates technical evidence, stakeholder engagement, and non-technical factors to create an energy system decarbonisation plan tailored to Derby City's unique characteristics.

The LAEP considers energy supply and demand, private transport, buildings, local industry, and the environment. It looks at current energy use and future decarbonisation opportunities for electricity, heat, and gas networks, the built environment (industrial, domestic, and commercial), and the potential for hydrogen and other low-carbon fuels. The plan has been developed in collaboration with various stakeholders to support a realistic, data-driven action plan.

The primary goal of Derby City's LAEP is to identify the most cost-effective ways to decarbonise the area's energy system, aligning local plans and priorities with broader national policies and strategies. It provides a roadmap for each local authority to achieve net zero emissions at the local level. Additionally, the LAEP is being coordinated alongside other areas within the wider EMCCA region to ensure a consistent and joined-up approach between Derby City, Derbyshire, Nottingham, and Nottinghamshire (D2N2).

[1] HM Government. Net Zero Strategy: Build Back Greener. Department for Business, Energy & Industrial Strategy, October 2021. Available at GOV.UK

Our standardised approach delivers alignment in outputs, which will significantly increase the ability for projects across areas to scale up through similar enabling mechanisms such as training programmes, funding allocations and aligned priorities.

1.2 Geographical Boundary of the LAEP

Derby is a city located in the East Midlands region of England with a population of 263,490 and covers an area of 78km^2. The city is known for its historical significance in the industrial revolution, particularly in the textiles and engineering sectors. Derby now has a mixed economy, with strong sectors in aerospace, rail, and engineering.

Figure 1.1: LAEP Geographical Boundary



1.3 LAEP Scope

The LAEP considers energy supply and demand, transport, buildings, local industry, and the environment. It examines current energy use and future decarbonisation opportunities for electricity, heat, and gas networks, the built environment (industrial, domestic, and commercial), and the potential for hydrogen and other low-carbon fuels. The plan involves collaboration with various stakeholders to develop a realistic, data-driven action plan.

Table 1.1: LAEP Scope

Energy Source	Description
Buildings	Identifying priority areas for retrofitting of domestic homes and public buildings to improve energy efficiency Identifying priority areas for heat pump installation or other low-carbon heating. Identifying opportunities for the installation of rooftop solar panels and low-carbon, flexible energy technologies, such as batteries, to reduce demand at peak times
Transport	Identifying priority locations for the installation of electric vehicle (EV) charge points based on projected EV use, particularly around dwellings without off-street parking.
Energy Generation	Reflecting local identification of sites for large-scale, low-carbon energy developments such as utility-scale solar, and district heat networks. Providing information for electricity distribution network operator (DNOs) to ensure the electricity network can handle expected extra capacity and grid connections.
Local industry	Understanding energy requirements and decarbonisation options for local industry.

1.4 Emission Boundary

The LAEP is focused on areas where local authorities can exert meaningful influence, including buildings, private transport, local energy generation and industrial emissions within the distribution network footprint.

While the Derby City LAEP provides a strategic framework for guiding the area's transition to net zero, it is essential to define the boundaries of its scope. In line with the Energy Systems Catapult LAEP methodology and the practical remit of local authorities, the areas set out in Table 1.2 are considered out of scope for emissions accounting and intervention planning.

Table 1.2: Emissions scope exclusions

Emission Source	Justification
National and Strategic Transport Infrastructure	Emissions from vehicles transiting through Derby City on national motorways are excluded as these journeys are not locally generated and fall outside the remit of local transport planning.
Rail electrification	Emissions from diesel-powered rail services and the potential electrification of rail infrastructure are excluded, as these are governed by national transport policy and infrastructure investment decisions.
Aviation	Emissions from domestic and international aviation are excluded, as flight operations and airport infrastructure are governed by national and international regulatory frameworks beyond local authority control.
Large-scale energy generation	Emissions from large-scale distributed generation, where output is exported to the national grid rather than consumed locally, have been excluded from this analysis, as these assets contribute to national energy supply and their associated emissions are already captured within the carbon intensity factors used for electricity consumption. The LAEP focuses on distribution-connected and locally influenced generation, such as rooftop solar and community-scale renewables.
Land use change and peatland emissions	Although significant in the regional carbon balance, emissions from land use change and peatland degradation are excluded. These are typically addressed through broader land management and agricultural strategies.
Agricultural emissions	Emissions from agricultural activities, including methane and nitrous oxide from livestock and fertiliser use, are excluded due to limited local authority control and the need for sector-specific national strategies.

Embodied emissions from construction	Embodied emissions (sometimes referred to as capital carbon) includes the emissions emitted in fabricating goods (construction or consumer goods), transporting them to their point of use, and in the case of construction the emissions emitted during construction. These emissions, and any interventions to reduce them, are excluded from the LAEP.

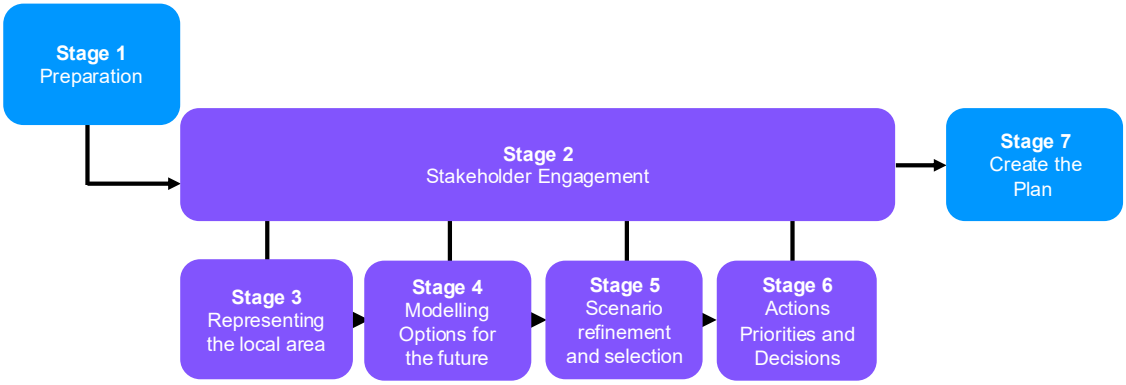
Note: other exclusions may exist, which will be presented in the technology intervention areas, and associated appendices.

These exclusions reflect the standard practice in LAEP development, which typically omits non-energy sources of greenhouse gas emissions and aspects of the energy system expected to be overseen by central government. This approach supports targeted, actionable planning while maintaining alignment with national decarbonisation strategies.

1.5 LAEP Structure

This plan is structured into themed chapters that enable stakeholders to quickly locate and engage with the information most relevant to their interests and responsibilities. It is designed to be both comprehensive and accessible, supporting a wide range of users in understanding and applying the evidence-based roadmap for Derby City's targets to reach net zero. This LAEP models Net Zero by 2040 and 2050 scenarios in order to align with the broader D2N2 regional LAEP, but the preferred scenario drawn out in this report is to achieve Net Zero by 2040 across Derby City.

Figure 1.2: Summary approach of the LAEP, structured by Energy Systems Catapult guidance



2 Policy Context

This section presents an overview of key national, regional and local policies influencing Derby City's emissions levels and resulting net zero progress. This has enabled a context-driven approach, as far as possible, for quantification of positive and negative influences on future pathways to net zero specific to Derby City.

2.1 National Policies

2.1.1 Overview of National Climate Targets and Strategic Direction

The UK's climate policy is anchored in the UK Climate Change Act 2008[2], as amended in 2019 to set a legally binding target of net zero greenhouse gas emissions by 2050. Interim targets include a 68% reduction by 2030 and 78% by 2035, compared to 1990 levels. These targets are territorial, excluding emissions embedded in imports. The Net Zero Strategy: Build Back Greener outlines sector-wide decarbonisation, with a key emphasis on clean electricity by 2035 and recognition that 82% of emissions fall within local authority influence, making LAEPs a critical delivery mechanism.

In 2024, the Climate Change Committee (CCC) updated its recommendations to accelerate progress toward the 2030 target[3]. These include tripling offshore wind, doubling onshore wind, and increasing solar capacity fivefold. The CCC also called for 10% of UK homes to be heated by heat pumps and for nearly all new cars sold to be electric by 2030. These recommendations are reinforced by the Seventh Carbon Budget (2025), which proposes a cap of 535 $MtCO_2e$ for 2038–2042 and an 87% emissions reduction by 2040. Sector-specific targets include an 86% reduction in surface transport emissions and major contributions from electrification and land use change.

2.1.2 Energy Infrastructure, Market Reform and Planning Policies

The UK Government has introduced several legislative and strategic reforms to modernise energy infrastructure and accelerate clean power deployment. The Great British Energy Act (2025)[4], establishes Great British Energy (GBE), a publicly owned company tasked with investing in and operating low-carbon energy infrastructure. Backed by £8.3 billion in public capital, GBE will co-invest with the private sector, support community energy schemes, and help deliver the government's target of a fully clean electricity system by 2030.

The proposed Energy Independence Act aims to phase out new oil and gas exploration licences, improve home energy efficiency, and expand support for insulation and low-carbon heating. Ofgem has approved a £24 billion investment programme to upgrade electricity and gas networks, expand grid capacity to connect 126 GW of clean power by 2030, and deploy flexible technologies such as storage and smart grids. The Clean Power Action Plan (2024) sets regional caps for solar and battery storage to 2030, including 2.1 GW of transmission-connected solar photovoltaics (PV) and 500 MW of battery storage in Central England, guiding local connection priorities.

[2] The Climate Change Act 2008 (2050 Target Amendment) Order 2019

[3] Progress in reducing emissions 2024 Report to Parliament - Climate Change Committee

[4] Great British Energy Bill 2024-25

To support delivery, the Planning and Infrastructure Act (2025)[5] proposes reforms to streamline consenting for critical infrastructure, introduce strategic nature recovery mechanisms, and enable cross-boundary spatial planning. Ofgem's Connections Reform replaces the "first come, first served" grid queue with a strategic prioritisation process, favouring projects with planning progress and alignment to national decarbonisation pathways. This may affect the sequencing and viability of local solar and storage projects.

Furthermore, Great British Energy's Local Power Plan[6], announced in February 2026, sets out a vision for transforming the UK's local and community energy sector so that, by 2030, every community has the opportunity to benefit from and own a local energy project. Through up to £1bn investment in a combination of grants, loans, advice, expert help and more, this plan will support more than 1,000 projects, increase shared ownership, and catalyse the development of scalable, self-sustaining business models for community energy organisations. GBE already have a formalised agreement with the East Midlands Combined County Authority to support the region to access the benefits of local and community energy.

2.1.3 Buildings, Heat and Local Delivery Mechanisms Policies

Buildings account for around 25% of UK emissions, making them a key focus of decarbonisation efforts. The Heat and Buildings Strategy (2021)[7], sets out plans to phase out new gas boilers by 2035, scale heat pump installations to 600,000 per year by 2028, and ensure all new buildings are net zero-ready. The Future Homes and Buildings Standard (FHBS, 2025)[8] will require all new homes and non-domestic buildings to be built to high energy efficiency standards, with low-carbon heating systems and improved ventilation, from 2027 onwards. Homes built under the new standard are expected to produce 75–80% fewer emissions than those built under current regulations.

The Warm Homes Plan (2025)[9] complements these efforts by targeting fuel poverty, aiming to lift over one million households out of fuel poverty by 2030 while accelerating the shift to clean, homegrown energy. Together, these policies provide a robust framework for local authorities to deliver decarbonisation through LAEPs, with clear national targets, funding mechanisms, infrastructure upgrades, and building standards to support local action.

2.1.4 Transport and Industrial Strategy Policies

The upcoming Integrated National Transport Strategy (INTS, 2024)[10], is developing a unified vision for England's transport system, aiming to improve integration across modes, support decarbonisation, and enhance accessibility. It promotes the use of data and technology to improve journey planning and system efficiency and will guide transport policy and investment decisions over the next decade.

Until the INTS is released, the pre-existing UK Transport Decarbonisation Plan (2021)[11] outlines measures to achieve net zero transport emissions by 2050. Key actions include ending the sale of new petrol and diesel cars by 2030, requiring all new cars and vans to be zero-emission by 2035, and investing in public transport, walking, cycling, and sustainable aviation and maritime fuels. Supporting infrastructure includes EV charging points and hydrogen

[5] Guide to the Planning and Infrastructure Bill - GOV.UK
[6] Local Power Plan | Great British Energy
[7] Heat and buildings strategy
[8] Future Homes and Buildings Standard
[9] Warm Homes Plan
[10] Integrated National Transport Strategy for England
[11] Transport decarbonisation plan

refuelling stations. Recent updates include the Zero Emission Vehicle mandate and Sustainable Aviation Fuel mandate from 2025.

The UK's Modern Industrial Strategy (2025)[12] provides long-term policy certainty for high-growth sectors, including clean energy industries. It supports investment in regional clusters, supply chain development, and skills for the energy transition. The Clean Energy Industries Sector Plan, part of the strategy, is particularly relevant to LAEPs, focusing on enabling local delivery of low-carbon infrastructure and workforce development.

2.2 Regional Policies

2.2.1 East Midlands Combined County Authority Ambition for Greener Environment

The East Midlands Combined County Authority (EMCCA) has set ambitious goals to create a greener, more sustainable environment. In alignment with national targets, EMCCA aims to be carbon neutral by 2050. To realise this ambition, some opportunities have been identified which include building new low-carbon homes, retrofitting existing homes in line with the 2025 EMCCA Retrofit Strategy, promoting renewable energy, protecting and enhancing green spaces, exploring the establishment of heat network zoning to decarbonise heating and hot water, and potentially increasing the region's electricity network capacity.

2.2.2 D2N2 LEP Energy Strategy 2019-2030

The D2N2 Local Enterprise Partnership (covering Derby, Derbyshire, Nottingham, and Nottinghamshire) set out a regional energy strategy[13] for 2019-2030 to support economic growth while reducing carbon emissions. It targets a 60% reduction in emissions from 1990 levels by 2030, with ambitions for 100% low-carbon energy supply, of which 60% should come from renewables. The strategy also promotes smart transport, aiming for 70% of vehicle miles to be ultra-low emissions by 2030, and supports community energy generation with a goal of 15 MW installed capacity. It encourages upgrading buildings to EPC C or above, expanding electricity storage by 180 MW, and investing in energy efficiency to reduce regional energy bills by over £1 billion annually.

2.2.3 Derbyshire Spatial Energy Study

This spatial energy study[14] covers all of Derbyshire to provide an understanding of the current situation and future of Derbyshire's energy system. Derbyshire consumes 4,547 GWh of electricity and 10,046 GWh of heat energy annually. The electricity demand is primarily met by the national electricity grid, while heat demand is mostly supplied by the national gas grid, with 6% of properties being off-gas-grid. Most of the energy consumed in Derbyshire is sourced from outside the region, with local generation in 2021 totalling approximately 404 GWh, mainly from renewable sources such as solar PV (~50%), onshore wind (~15%), and energy from waste (~15%). Future energy scenarios predict an increase in energy demand due to a 9% rise in population and an 11% increase in housing between 2022 and 2040, along with associated commercial and industrial development. The study identifies key areas of focus for the short term, including demand reduction through energy efficiency improvements and the decarbonisation of heat demand.

[12] The UK's Modern Industrial Strategy 2025 - GOV.UK

[13] Energy Strategy 2019-2030

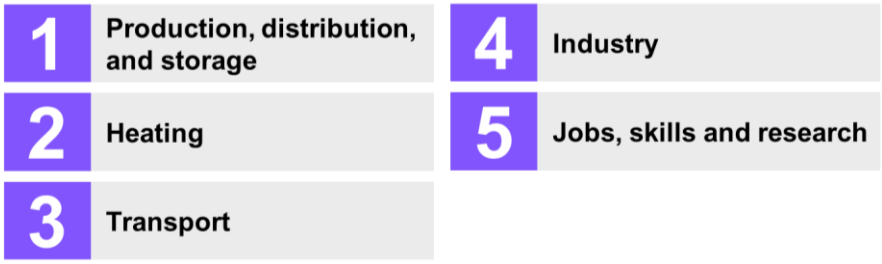
[14] Derbyshire Spatial Energy Study https://www.derbyshire.gov.uk/site-elements/documents/pdf/environment/planning/derbyshire-spatial-energy-study.pdf

2.2.4 Low Emission Vehicle Infrastructure (LEVI) Strategy

The Derbyshire LEVI Strategy sets out a clear vision for transitioning to low emission vehicles by developing comprehensive, accessible, and future-ready charging infrastructure across the county. It supports Derbyshire's broader climate goals by aiming to reduce transport-related emissions and improve air quality. The strategy focuses on equitable access, ensuring that both urban and rural communities, especially those without off-street parking—can benefit from the shift to electric vehicles. It also emphasises collaboration with local authorities and private partners to deliver infrastructure that meets current and future demand.

2.2.5 Hydrogen Road Map

In 2021, Derby City Council released the Regional Hydrogen Roadmap[15] outlining the city's ambition to become the UK's leading hub for future fuel technologies. The roadmap highlighted five key areas for hydrogen investment in the D2N2 region:



The roadmap projects that by 2050 the wider D2N2 region could consume 8.5 TWh of hydrogen, primarily in industry and transportation. By 2030, local demand is expected to surpass local production capacity. Additionally, the report sets out that the region has at least 16 sites with significant potential for hydrogen production and/or end-use.

2.2.6 East Midlands Local Retrofit Strategy

The East Midlands Local Retrofit Strategy (2025–2028)[16] sets out a coordinated regional plan to accelerate domestic energy-efficiency upgrades and low-carbon home improvements. Improving the energy efficiency of homes, reducing fuel poverty, and cutting carbon emissions by accelerating high quality retrofit delivery across the region. Developed with contributions from more than fifty organisations, it promotes a whole system model that brings together communities, skills, supply chains, finance, and governance to create warmer and healthier homes while supporting local jobs and economic growth. The strategy positions retrofit as both a climate priority and a significant social and economic opportunity for the East Midlands.

2.3 Local Policies

2.3.1 Derby City Council climate action plan

Derby City Council (DCC) declared a climate emergency in 2019 and in 2021 set an ambitious target of reaching net zero by 2035. The council published its Climate Action Plan (2022 –

[15] Establishing a Regional Hydrogen Roadmap in Derby and the Wider Region (2021)

[16] East-Midlands-Local-Retrofit-Strategy-summary.pdf

2024)[17] outlining the actions the Council will take to reduce its carbon emissions in response to the climate emergency.

2.3.2 Derby City Council building energy strategy

The Derby City Council Building Energy Strategy (2023-2035) outlines how DCC will work towards achieving the net zero 2035 target. Focusing on the energy consumption of the Council's corporate property portfolio and its resulting carbon emissions, this strategy highlights four strategic focuses:

- Reduce Energy Consumption: reduce energy demand, recover energy where possible and ensure it is used in a non-wasteful manner.
- Improve Energy Efficiency: consider energy efficiency at all asset levels, invest in energy saving technologies.
- Install Renewables: buy renewable energy going forward and invest in renewable installations.
- Carbon offsetting: the remaining carbon will be targeted by carbon offsetting.

2.3.3 Derby local plan strategy

The Derby Local Plan (Core Strategy),[18] covering the period from 2011 to 2028, sets out the long-term spatial vision and framework for the city's development. It addresses housing, employment, transport, infrastructure, and environmental sustainability.

The plan encourages the use of renewable and decentralised forms of energy, provided that the public benefits of implementing renewable energy outweigh any adverse impacts on the natural, built, or historic environment, and do not inhibit the achievement of other strategic objectives of the Plan. The plan welcomes micro-generation and community-led renewable energy and heat generation schemes.

A new local plan, which will replace the current Core Strategy and cover the period up to around 2040, is under development and expected to be adopted by May 2026.

[17] Derby City Council's Climate Change Action Plan https://www.derby.gov.uk/media/derbycitycouncil/contentassets/documents/environmentandplanning/planning/localplan/evidencebase/Core-Strategy_ADOPTED_DEC-2016_V3_WEB.pdf

[18] Derby City Local Plan - Part 1(2017) https://www.derby.gov.uk/media/derbycitycouncil/contentassets/documents/environmentandplanning/planning/localplan/evidencebase/Core-Strategy_ADOPTED_DEC-2016_V3_WEB.pdf

3 Current Emissions and Energy Use

This section presents an overview of the current greenhouse gas emissions and energy system in Derby City. This is intended to establish the starting point for the change required to achieve net zero.

3.1 The energy baseline definition

The Local Area Energy Plan (LAEP) energy baseline for both local authorities is a simulation of energy supply and demand across all buildings within each council's boundaries for the year 2022. It includes both domestic and non-domestic buildings, although confidence in the input data for non-domestic buildings is lower, and emissions from industrial activities beyond gas consumption are not available at this stage.

The baseline covers 105,000 buildings for Derby City, each with a rich set of attributes. Simulated energy consumption and associated carbon emissions are available at annual and monthly granularity, and can be broken down by heating, domestic hot water (DHW), and electrical loads (including lighting, auxiliary loads and equipment). These results can be aggregated at Middle Super Output Area (MSOA) and Local Authority levels and are accessible via the IES 3D digital map (also referred to as the IES Digital Twin), which visualises all buildings and energy assets across the city.

3.2 Creation of the energy baseline

Each local authority's baseline was developed using IES' Digital Twin software, which integrates geographic information system (GIS) and building data to simulate energy use and carbon emissions across the building stock. The key datasets utilised are set out below.

- **The Ordnance Survey National Geographic Database** (OS NGD) Buildings dataset was used to generate 2D building geometries.
- **Energy Saving Trust's Home Analytics** datasets for domestic and non-domestic buildings provided information on building characteristics such as fabric, heating systems, and fuel types.

These datasets include energy performance certificate (EPC) data and predictive modelling for homes without EPCs. For non-domestic buildings, data availability is more limited, restricting the scope of analysis for interventions such as fabric improvements. Where data gaps exist, assumptions are made to enable all buildings to be included in the analysis. A list of attributes available from Energy Savings Trust data for domestic and non-domestic buildings is included in Annex A.

A baseline energy profile is created using IES' technology, resulting in a dynamic 3D digital map of the area. The modelling is organised by MSOAs, with each MSOA containing around 3,000 to 6,000 buildings. These zones represent the smallest geographical units with sufficient government energy data (electricity and gas) for comparison, and each has its own masterplan-scale energy model.

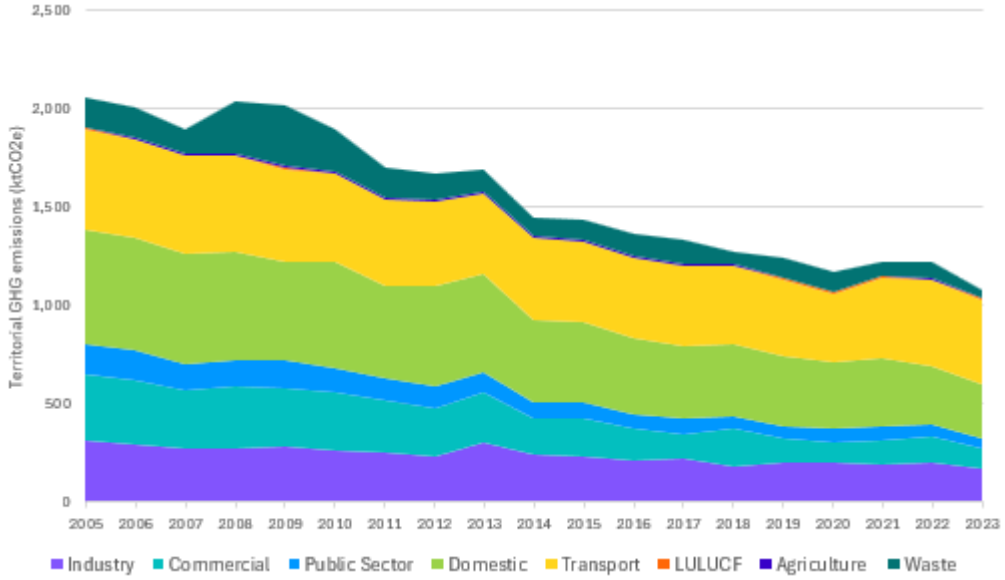
3.3 Current Emissions and Energy Use

The total amount of emissions attributed to Derby City is 1077 ktCO2e, based on UK Government data for 2023[19]. Figure 3.1 illustrates the historical emissions of Derby City from 2005 to 2023 split by sector. Over this period, the area has experienced a gradual reduction in carbon emissions across industry, transport, domestic and commercial properties, and waste. This reduction in emissions is largely driven by the decarbonisation of the national electricity grid.

Transport remains the largest emissions contributor, accounting for 40% of total emissions, followed by the domestic sector at 26%, Industry at 16% and commercial sector at 9%. The LAEP scope includes emissions from industry, commerce, public, domestic and transport sectors, targeting 96% of Derby City's total carbon emissions.

This targeted scope ensures that the LAEP addresses the most significant sources of local emissions and supports the development of effective, place-based decarbonisation strategies.

Figure 3.1: Derby City Historic Emissions (ktCO2e)



Source: https://www.gov.uk/government/statistics/uk-local-authority-and-regional-greenhouse-gas-emissions-statistics-2005-to-2023

[19] https://www.gov.uk/government/statistics/uk-local-authority-and-regional-greenhouse-gas-emissions-statistics-2005-to-2023

Figure 3.2: Derby City 2023 Carbon Emissions Breakdown by Sector

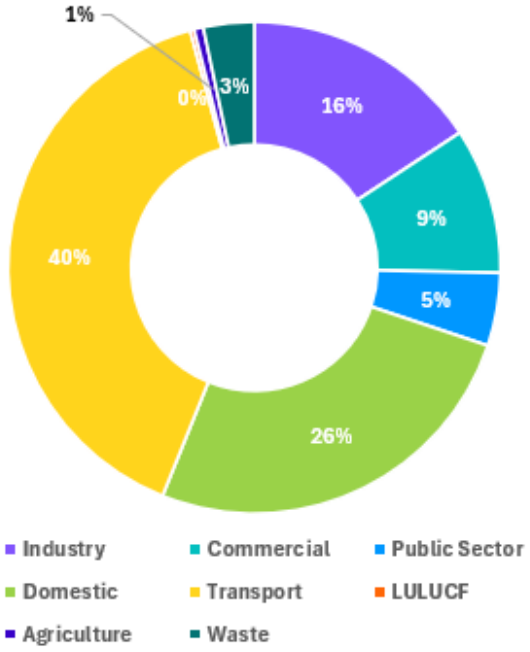
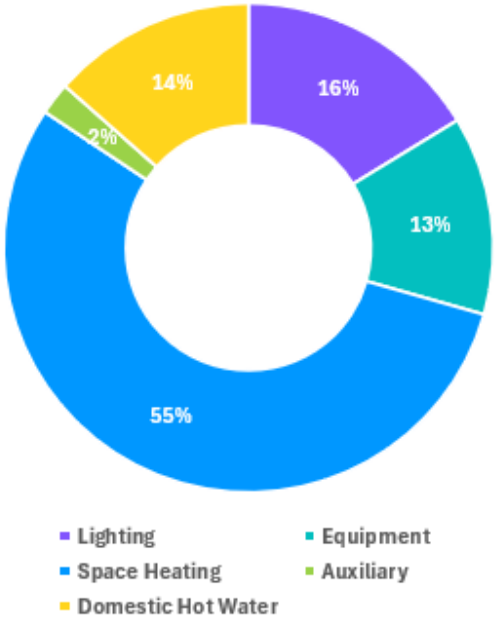


Figure 3.3: Derby City 2023 Building Energy Use Breakdown (GWh)



Source: https://www.gov.uk/government/statistics/uk-local-authority-and-regional-greenhouse-gas-emissions-statistics-2005-to-2023

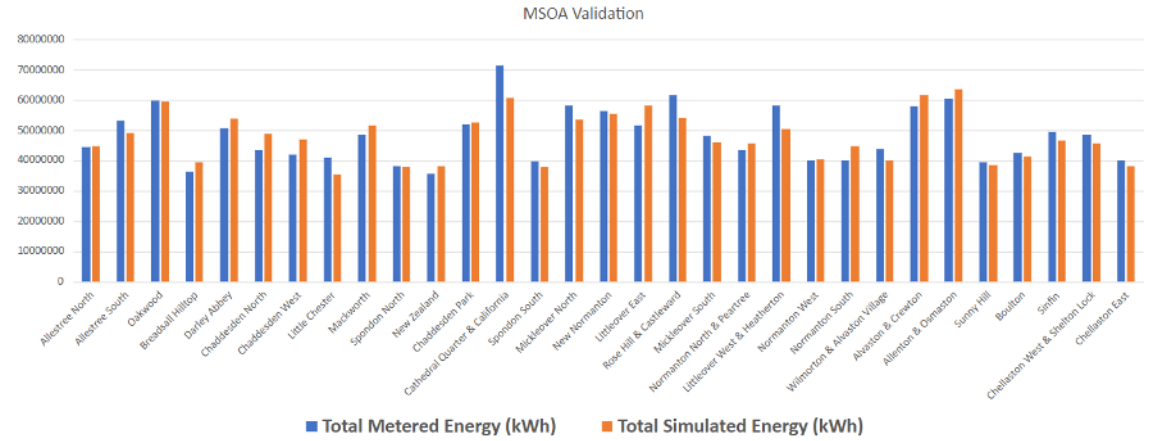
Total building energy demand in Derby City totalled 2,389 GWh in 2023. Space heating was the dominant energy use at 55%, followed by lighting (16%), domestic hot water (14%), equipment (13%), and then auxiliary systems (2%). These figures highlight the significant role of heating and equipment in overall energy consumption, pointing to key opportunities for targeted efficiency and decarbonisation interventions.

3.4 Energy Baseline Validation

Utilising data from the Energy Savings Trust to model energy use in the Digital Twin, results from the Digital Twin are validated against UK Government data, which includes only electricity and gas metered consumption. In terms of data accuracy, therefore, this means fuels such as oil, LPG, and biomass are excluded, leading to less representative results in rural areas where these fuels are more commonly used. With respect to the Derby City, this is immaterial as less than 0.5% of buildings utilise oil, LPG or biomass for hot water and heating.

Below are the energy simulation results for electricity and gas consumption compared to government data at MSOA level for Derby City's domestic buildings.

Figure 3.4: MSOA Validation for Derby City



For both domestic and non-domestic buildings, a floor area correction was applied. This adjustment accounts for the simulation software's assumption that the entire building footprint is thermally conditioned, including spaces such as cupboards, internal voids, and wall thickness. Where high-confidence conditioned floor area values were available from the Energy Saving Trust, these were compared to modelled areas to derive scaling factors used across the building stock.

To enable a like-for-like comparison, oil, LPG, and biomass consumption were removed from the simulation results, aligning with the scope of the government dataset. Given the limitations of the available data, the results are considered acceptable. A tolerance range of ±20% was set, with majority of MSOAs within 5% of the government metered data. Detailed results of the validation for each MSOA are available in Annex C.

4 Stakeholder Engagement Approach

Stakeholder engagement has been the foundation for the overall progress of the project, with frequent interaction with stakeholders undertaken at every stage. A diverse set of stakeholders have been engaged, from commercial and community backgrounds, which enabled efficient review and feedback at different points of the project.

4.1 Engagement Objectives

Stakeholder engagement provided the project team with feedback which informed the preferred pathway chosen for this LAEP. Stakeholders assisted in developing a sequenced plan of proposed actions for achieving Derby City's net zero goals.

The original stakeholder engagement aims tied into the wider LAEP programme are:

- Identify the critical stakeholders needed to deliver the priority projects.
- Develop stakeholder trust and buy-in to the proposals of the LAEP.
- Encourage a wide range of views and insights to refine the LAEP, identifying opportunities and constraints that will improve the deliverability.
- Increase stakeholders' understanding and the LAEP process and how it feeds into the net zero goals of Derby City Council.
- Establish a sound foundation for effective and sustained local action to reduce carbon emissions in line with the councils' net zero goals.
- Promote a sense of ownership and responsibility towards adopting the plan through increased public support and participation.

4.2 Stakeholder Mapping

A desk-based stakeholder mapping exercise was undertaken, to produce a register of names and contact details for each area. These included Group 1, Primary and Secondary stakeholders. This created the stakeholder register, with contact details and a tracker for all touchpoint contacts held in a secure SharePoint site. Further stakeholders were added to the register as relevant throughout the course of the project.

4.3 Stakeholder Management

The interest and position of stakeholders relevant to the project was considered throughout and informed the appropriate methods of communication with each stakeholder group, whether through group stakeholder engagement sessions or organising 1:1 calls or discussions where appropriate.

Table 4.1: Stakeholder Prioritisation

Category	Influence	Interest	Ranking
Steering Group	High	High	High
Group 1 Stakeholders	High	Medium	High
Primary Stakeholders	High	Medium	High
Secondary Stakeholder	Medium	Medium	Medium

Stakeholders have been categorised into four categories. This is to ensure each stakeholder group receives tailored engagement and information regarding the scheme and its proposals.

The ‘tiered’ approach to stakeholder engagement has been employed to demonstrate the differing expectations on stakeholders relating to the frequency of engagement, the level of input and oversight within the local area.

Steering Group (SG)

A small group of individuals who represented Derby City Council, working closely with the project team to advise on engagement, decision making and assist with further stakeholder mapping, along with EMCCA, Mott MacDonald and IES.

Group 1 Stakeholders (G1)

These stakeholders were categorised due to their influence over all LAEP’s included in the D2N2 programme, primarily network operations and the universities. These stakeholders were engaged separately at programme level. Meetings consisted of one-to-one sessions which were held with the Gas Distribution Network and National Grid Electricity Distribution on what data could feed into the digital twin, and energy modelling analysis.

Group 2: Primary Stakeholders (PS)

Primary stakeholders were directly involved in the LAEP process and had significant influence over its outcomes. They provided local insights, priorities, and data inputs, shaping the content and direction of the LAEP, including modelled scenarios, optimised pathways and recommendations proposed. This group primarily consists of employees from other teams and departments within the Council, relevant community groups.

Group 2: Secondary Stakeholders (SS)

Secondary stakeholders have an interest in the LAEP, were not directly involved in its core activities, rather provided local insights, priorities, data inputs and feedback at key stages of the process. These stakeholders included representatives from local housing associations, and industrial and/or commercial organisations (that are deemed to be high energy users).

Primary and secondary stakeholders were invited to workshops at key stages of the development process. Insights gathered at stakeholder meetings were fed to the project team and IES to influence the modelling.

Table 4.2 summarises the stakeholders engaged throughout the development process both at the programme level and for the Derby City LAEP specifically.

Table 4.2: Summary Stakeholder Register

Stakeholder Category	Organisations Engaged
Steering Group	Derby City Council, University of Derby, Midlands Net Zero Hub, Mott MacDonald, and IES
Group 1 Stakeholders	National Grid, Gas Distribution Network, Derbyshire County Councils
Primary and Secondary Stakeholders[20]	• Utility Providers (National Grid) • National Electricity System Operator • Employees from other teams within Derby City councils including from their planning, housing and biodiversity teams • Local residents and resident groups • Large industry commercial organisations (Rolls Royce, Toyota, Alstom, SmartParc, NHS, Derby College) • Housing Association: Derby Homes • Local Government Organisations: Derby City Council Property & Consultancy Services, Derby City Council Planning Policy, Derby City Council Development Control.

4.4 Stakeholder Engagements

The engagement process was designed to be iterative and two-way to ensure that all local and relevant stakeholders are given the opportunity to provide input to this LAEP, whilst avoiding stakeholder fatigue. Insights gathered during stakeholder meetings were fed back into the project team, and any resulting changes or refinements to the LAEP were communicated transparently to contributors. This feedback loop fostered trust, built consensus, and encouraged stakeholders to become advocates for the plan.

The Steering Group met fortnightly throughout the project, to steer the day-to-day work of the delivery team and shape other stakeholder engagements.

Group 1 stakeholder engagement consisted of one-to-one sessions which were held with Gas Distribution Network, and National Grid on what data is available that could feed into the digital twin, and energy modelling analysis.

Group 2 stakeholders were invited to workshops and stakeholder engagement sessions, taking place aligned with the relevant LAEP Stage. Group 2 stakeholders were further categorised into primary and secondary stakeholders as identified by the steering group, in order to target their engagement in all future sessions and workshops, to streamline the outputs received and appropriately manage our time spent with the most relevant Group 2 stakeholders.

Insights gathered at stakeholder meetings were shared and discussed amongst the wider EMCCA LAEP delivery team and agreed inputs were reflected into the energy modelling or intervention modelling, with changes then made as a result.

[20] Whilst all organisations listed were invited to the relevant stakeholder sessions, engagement with these stakeholders varied substantially.

This approach committed Mott MacDonald and IES to meaningful, genuine stakeholder engagement, ensuring our stakeholders are heard and will likely continue to be engaged beyond the publication of this LAEP. Additional engagement was sought from stakeholders via email and MS forms to expand on discussions taking place during the stakeholder engagement sessions and allowed participants to re-summarise their points in writing, or the opportunity to offer more detailed and written answers to specific topics discussed such as intervention proposals and scenarios.

Table 4.3: Key Stakeholder Engagements

Communication channel	Aim	Description
Workshops	Work with primary and secondary stakeholders to gather insights on the LAEP and help refine future plans.	Virtual meetings comprised of a presentation of data or information, followed by specific questions to stakeholders to inform the next phase of work. Stakeholders were given the opportunity to ask questions with regards to the information presented.
Email	Briefing information ahead of workshops. Allowing for two-way engagement if any questions arise	Use of emails prepares stakeholders for the workshops by providing objectives and overview of the session, as well as key themes to encourage streamlined sessions. Email communication allowed people to contact Mott MacDonald and the Steering Group with any ad-hoc requirements or feedback.

4.5 Key Stakeholder Insights

Table 4.4: Key Stakeholder Insights for Derby City

Stakeholder	Insight
Heat Network developer	Understanding Derby's district heating capabilities and potential funding streams which we would otherwise not be aware of such as the Warm Homes Plan which can support enabling measures and connection costs. It was noted there was potential in the region for smaller communal heat systems and that the Green Heat Network Fund could be used for funding these.
Utility provider	Specific data and industry inputs were provided directly which fed back to IES for their data validation.
Hydrogen network representative	Support offered to engage industry partners. This engagement was used to support the LAEP and wider consideration of hydrogen uptake.
College	Sharing their approach to tackling their listed buildings offered useful insights for localised and bespoke approaches for retrofit.

Car manufacturer	Understanding their carbon neutral by 2030 target progress and their view for hydrogen forming part of the regional solution was a useful insight to local feasibility. Additional understanding of existing low carbon technologies such as anaerobic digestion and biomethane with 10-year payback periods supported our understanding of which high-energy non-domestic consumers could be heat network or heat pump ready.
NHS	Useful insights to how they are finding use of a range of low carbon technologies - issues faced include GSHP borehole leakage, high ASHP running costs, and aging CHP systems. Their fabric-first approach is standard, but capital and operational constraints limit deep retrofit potential.
Local authorities	Critical understanding of their support of heat network connections, where the successes have lied with social housing retrofit if health benefits and fuel poverty reductions can be achieved.

5 Assessing Options for the Future

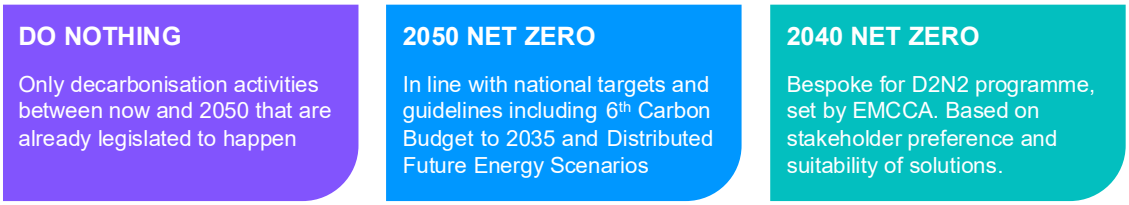
This section sets out the scenario constraints which frame the LAEP, and the approach to deciding which interventions underpin the fundamentals of the transition to net zero for Derby City.

5.1 Overview of Scenarios

Scenarios are a powerful tool in energy planning, letting us explore different futures, understand the impacts of our choices, and prepare for uncertainties. Three scenarios were used as part of this LAEP to explore potential decarbonisation pathways for Derby City.

These scenarios reflect varying levels of ambition and policy contexts, from minimal intervention to accelerated decarbonisation aligned with regional targets. To ensure comparability, key economic parameters such as intervention costs, energy prices, and discount rates were held constant across all scenarios. This supports sensitivity analysis and isolates the effects of policy ambition and technology uptake.

Figure 5.1: Scenarios for the LAEP modelling



5.1.1 Do Nothing

This ‘Do Nothing’ scenario represents what will happen without additional policy (beyond what is already legislated) or without additional infrastructure investment identified in this LAEP. In this way, the ‘Do Nothing’ scenario represents the most probable outcome, if nothing additional was done beyond what is already committed to. The ‘Do Nothing’ acts as the baseline, from which carbon reductions and the cost of the LAEP can be calculated.

This could be characterised as a small amount of consumer engagement in decarbonisation in addition to slow system changes. In the ‘Do Nothing’ scenario, the energy system emissions are reduced, but the scenario does not result is reaching net zero. It aligns with the “Falling Short” pathway from the National Grid/Regen Distributed Future Energy Scenarios (DFES).

Each intervention area in the subsequent sections, provides specific detailed counterfactual assumptions and exclusions relevant to the technological solution. The high-level Do-Nothing assumptions are listed in the following table.

Table 5.1: Do Nothing Modelling Assumptions

Technology Area	Policy landscape and Market Trends
Heating Decarbonisation	As there is currently no legislated mandate for heat pumps, we have assumed no further uptake of low-carbon technologies and a like-for-like replacement of heating systems at the end of their operational life

Building Thermal Energy Efficiency (Fabric Improvements)	We have assumed that all privately rented and social housing currently rated EPC C or below will undergo some form of fabric retrofit in order to meet the MEES target.
Energy Generation	As with air source heat pumps, we have assumed no further uptake of solar PV due to the absence of mandated legislation

5.1.2 2050 Net Zero

Aligned with the UK Government's legally binding target, this scenario reflects a pathway to net zero greenhouse gas emissions by 2050. It is similar to the "Leading the Way" DFES pathway however includes assumptions from the Climate Change Committee (CCC) on retrofit rates and policy impacts. Hydrogen use is considered for industrial clusters, consistent with National Grid's Future Energy Scenarios (FES 2024). This scenario provides a nationally consistent benchmark for evaluating local contributions to UK climate commitments.

5.1.3 2040 Net Zero

This regionally defined scenario targets net zero by 2040, positioned between the national 2050 target and the 7th carbon budget. It allows for bespoke modelling of retrofit rates, hydrogen deployment, and other interventions tailored to local opportunities and constraints. The scenario assesses the feasibility, impacts, and benefits of accelerating the energy transition to meet a 2040 target.

5.2 Scenario Modelling Approach

Scenario modelling for a LAEP can follow two main approaches:

- **Standardised Scenarios aligned with regional planning (Top-Down):** LAEPs can adopt industry-standard scenarios, such as the Distribution Network Operator's Distributed Future Energy Scenarios (DFES), which are derived from the National Energy System Operator's (NESO) Future Energy Scenarios Pathways (FESP). This approach ensures consistency with regional and national planning frameworks.
- **Bespoke Local Scenarios informed by stakeholder input (Bottom-Up**): Alternatively, scenarios can be developed through engagement with local stakeholders, reflecting local priorities and ambitions. This includes input from local authorities, large energy users, community organisations, and businesses. Such collaboration helps identify unique local drivers and constraints that may not be captured in standardised scenarios.

Following discussions at the programme level, a bottom-up modelling approach was adopted to estimate the uptake of interventions, informed by local stakeholder input and priorities. Input is also taken from the UK Climate Change Committee's (CCC) Seventh Carbon Budget, which targets a 75% reduction in UK territorial emissions by 2040, achieving net zero emissions by 2050. While DFES projections for the East Midlands follow similar trends, the data can rely on LAEPs for their modelling. Therefore, national projections are used as a scalable proxy for local totals.

To model uptake of interventions, a logistic growth (S-curve) function was applied. This reflects slow initial growth due to barriers such as upfront costs, followed by acceleration in the mid-phase driven by policy support, and eventual saturation near 100%. Uptake is normalised to 100% of the total required installations by the target year, assuming a low starting point in 2026.

During modelling, curve midpoints and growth rates were anchored to concrete national and regional policy signals, and adjusted around these in discussion with stakeholders. Peak annual

delivery was capped at realistic levels to reflect workforce and supply chain ramp-up constraints. Annual percentages represent the incremental increase in installations for each year, while cumulative uptake reaches 100% by the target year.

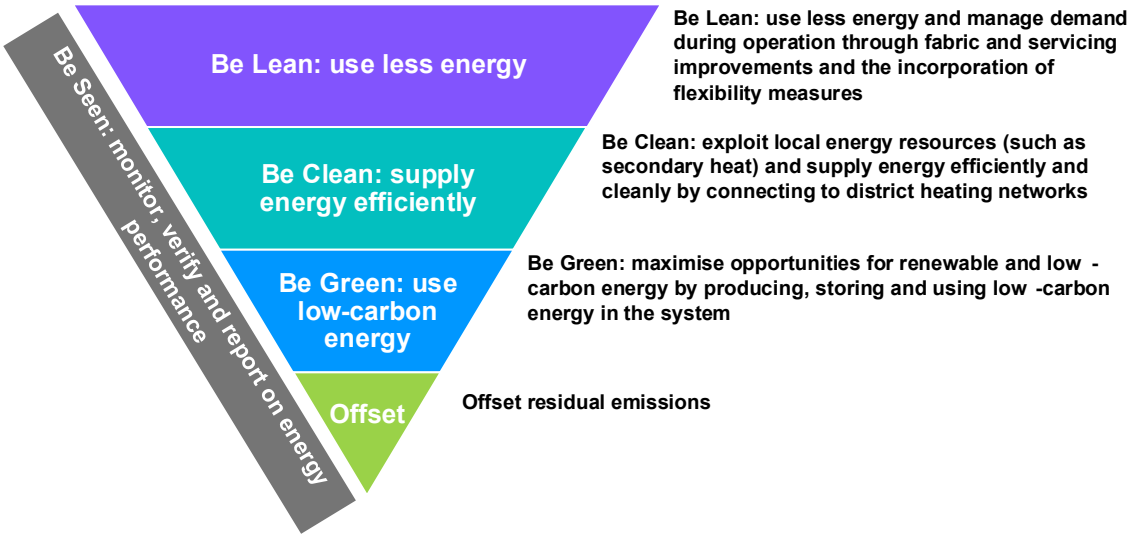
- For the **Net Zero by 2050 scenario**, the uptake curves typically follow the CCC's Balanced Pathway, with local adjustments.
- For the more ambitious **Net Zero by 2040 scenario**, the timeline is compressed by a factor of approximately 1.67 (25 years to 2050 vs. 15 years to 2040). This shifts data points earlier while preserving the S-curve shape.

5.3 Intervention Prioritisation Approach

The idealised approach to achieving net zero emissions is to follow the energy hierarchy as represented in Figure 5.2. It offers a common-sense, cost-effective, sustainable energy policy that aims to reduce energy use before seeking to meet remaining demand by investing in 'be clean' technologies in advance of 'be green' and offset incentives.

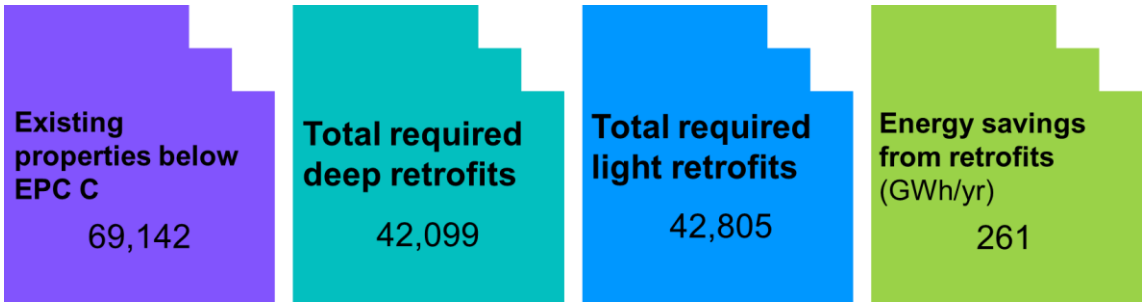
The Energy Hierarchy offers an effective framework to guide sustainable energy policy and decision-making. The interventions identified for Derby City therefore follow this hierarchy, starting with energy efficiency measures – deploying light and deep retrofits, closely followed by low-carbon heating alternatives, then supplementing this with installation of local renewables and battery storage.

Figure 5.2: The Energy Hierarchy



6 Energy Efficiency in Buildings

Buildings account for nearly 40% of energy consumption in the UK across all sectors, and this equates to almost a quarter of total emissions UK wide[21]. This section deals with energy efficiency in buildings associated with the upgrade and retrofit of fabric improvement measures. This spans both domestic and non-domestic properties.



The primary focus of retrofit of building fabric improvements is to bring down the “U-Value”, the thermal transmittance measure, of different components of a building to increase its ability to retain heat and ultimately support environmental sustainability. Increased fabric performance and energy efficiency of buildings can be linked to many direct benefits such as reduced energy bills, reduced fuel poverty, warmer homes and reduced carbon emissions. There are also many indirect co-benefits that can be realised through energy efficiency or fabric retrofit, the better example being resilience on the energy (gas and electricity) grids through the reduced energy demand from homes and businesses. Building fabric retrofit also contributes to the growth of local economies through the creation of jobs and is ultimately linked to the increased health and well-being of the population through the reduction of cold and damp related ailments.

Additionally, implementing retrofits will reduce the overall thermal heat demand of properties. This reduction will be pivotal when transitioning to electric heating systems. This is because it will lower the required heating capacity of properties, which in turn will significantly cut the total capital costs associated, as well as reducing operating energy costs. Further details are provided in Section 7.

6.1 Existing Building Stock

6.1.1 Domestic Housing Stock

Across Derby City, domestic housing accounts for 95% of buildings across social housing, private rented and owner-occupied tenure types. With the right information and insights influencing policy decisions a significant impact on the energy transition and carbon impacts can be made through addressing this sector.

Derby’s housing stock is a mixture of Victorian terraces, interwar council estates, post-war prefabrications, high-rise blocks, and modern regeneration schemes. Its history reflects broader national housing policies while being shaped by the city’s industrial roots and ongoing efforts to improve energy efficiency and sustainability.[22]

Going forward the majority of these houses will continue to be occupied, highlighting the importance of future-proofing these properties. A key aspect of future-proofing is minimising

[21] The CCC Sixth Carbon Budget

[22] Web100YearsofCouncilHousing.pdf

where possible both the thermal and electrical demand, noting that the electrification of heat will increase electrical demand above the current baseline, even with deep retrofit measures deployed. This can be achieved by improving fabric performance and implementing other energy efficiency measures, which in turn lowers energy consumption and reduces associated carbon emissions.

Energy efficiency and energy retrofit in buildings is fundamental to achieving net zero. Through following the first step of the Energy Hierarchy, “Be Lean”, it is possible to bring wider benefits such as creating warmer homes, improving internal air quality and thermal comfort, and reducing energy use, all giving occupants more certainty over their energy bills, and a reduction in the risk of fuel poverty.

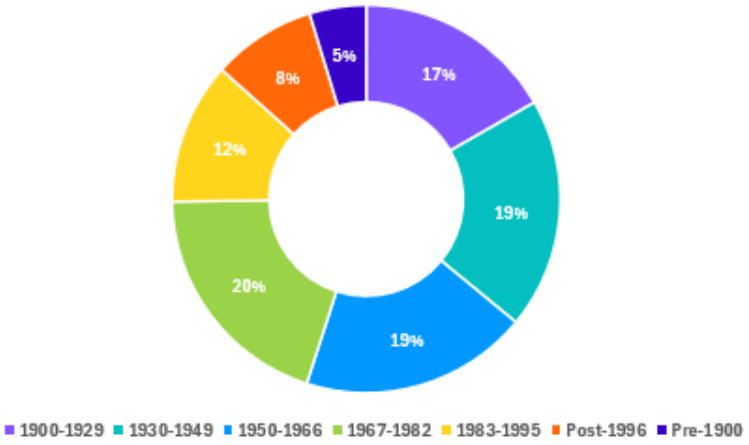
In the context of this Local Area Energy Plan, energy efficiency will play a critical role in demand reduction and heat decarbonisation. The Derbyshire Spatial Energy Study[23] projects that committing to bringing all properties up to an Energy Performance Certificate (EPC) rating of 69 or above (C) would lead to an annual heat energy demand reduction of around 743 GWh and aggregate energy bill reduction of over £58m per annum across 292,574 properties.

The UK’s EPC data provides insight into the thermal efficiency of dwellings across the country. EPC ratings are the most widely used indicator of a building’s energy efficiency level and are based on data points collected across building fabric (insulation, windows, construction type, age), heating and hot water system and electrical demand (lighting, electric heating and appliances).

To address the energy transition needs of the local area it is pertinent first to understand the emissions context of the area and the “tools” that the city authority might have at their disposal by way of energy interventions. Emissions associated with domestic sector has decreased in line with Derby City’s historic emissions (Figure 3.1) and this is mainly due to grid decarbonisation.

The characteristics of each local authority’s housing stock remains a critical factor in determining future energy demand and retrofit potential. Figure 6.1 shows the varying construction dates of Derby City’s domestic properties, which helps indicate the level of pre-existing energy efficiency measures the home may already be equipped with, and lead to an understanding of the scale of retrofit needed.

Figure 6.1: Split of domestic buildings by age band across Derby City



[23] Derbyshire spatial energy study

The housing stock within Derby City presents a significant challenge for energy efficiency, with 80% of homes built before 1983. These properties were constructed under standards far below today's requirements, resulting in high heat loss and poor baseline performance. Figure 6.1 shows that shows that 41% of homes were built before 1950, and only 8% were constructed after 1996 under modern regulations.

The oldest homes, pre-1900 and 1900–1929, typically feature solid brick or stone walls with lime mortar and no cavity, giving estimated U-values above 2.1 W/m²K, roughly eight times worse than current standards[24]. However, their usual wet plaster finish does offer some airtightness. Although these buildings can be durable and architecturally significant, they normally require more complex retrofit solutions, which is likely dependent on factors such as statutory planning protection (e.g., listings, conservation areas). The technological challenge of applying external or internal wall insulation is a significant technical barrier, while cost and affordability present financial barriers. The disruption of the work is also likely to be a major consideration, particularly for internal wall insulation.[25]

The 1930–1949 band marks the architectural transition to cavity wall construction. While these walls offer slightly better conductive performance (typically around 1.5 W/m²K) because of the air gap, they introduced new vulnerabilities. These early cavities were built for moisture prevention rather than thermal retention and were left uninsulated. Additionally, the move to suspended timber floors in this era often makes this cohort significantly prone to higher air infiltration rates compared to their solid-walled predecessors. As a result, these homes tend to have poorer baseline efficiency and higher heat loss without targeted retrofit measures. It should be noted that the EPC data will reflect where changes have occurred to the properties since the year built, i.e. the installation of double glazing or addition of loft insulation. This has therefore been captured in our assessment.

The 1983–1995 and post-1996 segments, coincides with the introduction and progressive tightening of Approved Document L within the Building Regulations. First introduced in 1985 and updated significantly in 1995, 2002, and 2006, these regulations mandated strict limits on air permeability, thermal bridging, and U-values. The 8% of stock built post-1996 likely benefits from mandatory double glazing, floor insulation, and high-performance loft insulation, achieving an EPC rating of C or higher by design. While these newer properties require minimal fabric intervention, they represent a small share of the domestic housing stock. This implies that to achieve area-wide decarbonisation, the primary focus must remain on the 80% of buildings in Derby City constructed before 1983, where the gap between original performance and modern standards is widest.

Homes constructed post-2000 may only require minimal upgrades to reach EPC rating C and above, if they aren't already achieving these levels based on as built and installed fabrics and systems. It may, however, be difficult to achieve EPC rating C for the local area's older properties given the increased complexity in delivering full fabric and energy retrofit improvements, as well as the high costs associated with deep retrofit.

Furthermore, the challenge to improve the energy efficiency of older properties is further reinforced through conservation area designations, listed building controls and Article 4 Directions. Given the complexity of these planning restrictions and the variance in their application, designated buildings require assessment on a case-by-case basis to determine which retrofit measures are feasible, often associated with higher costs and added complexity to navigate planning requirements. Whilst a standardised approach to deploying light and deep

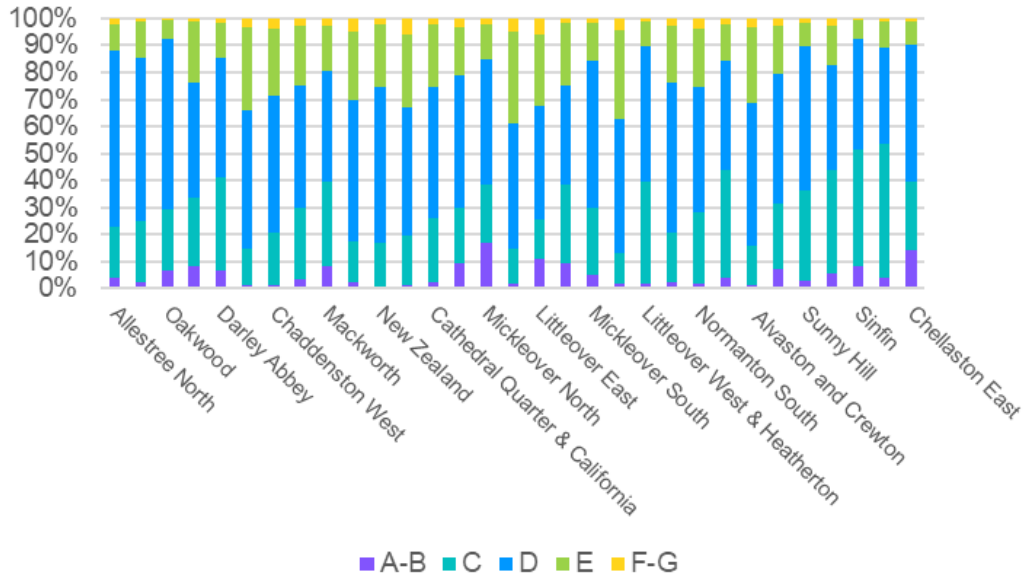
[24] Conservation of fuel and power: Approved Document L - GOV.UK

[25] Retrofit Internal Wall Insulation: guide to best practice

retrofits may be suitable for urban areas with newer housing stock, a targeted and tailored approach will be required within Derby City as further discussed in Section 13.

Figure 6.2 present the EPC rating distribution across Derby City's domestic building stock.

Figure 6.2 Derby City EPC Rating per MSOA



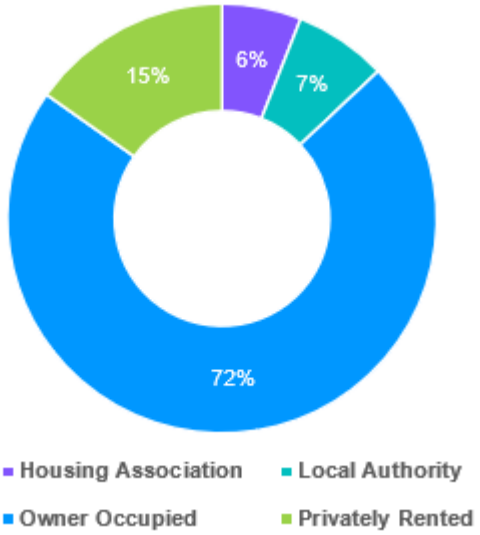
Given the area's large proportion of pre 1996 buildings, it is unsurprising to see a substantial proportion of homes falling below the UK Government's current recommended EPC rating of C. In Derby City, 70% of homes are rated D or lower indicating high energy demand and poor insulation. This further raises the importance of fabric retrofit and energy efficiency as a priority in the area.

It is likely that this challenge will continue to influence the level of fuel poverty experienced in Derby City, with these areas reporting a generally higher proportion (12.5%) of fuel-poor households compared to the East Midlands regional average (11.7%, 2024)[26]. Section 13 outlines targeted measures to address below-average building efficiency, which requires an understanding not only of the housing fabric but also of who owns and manages these homes, since tenure strongly influences the feasibility of retrofit interventions. Figure 6.3 shows the tenure breakdown of the homes within Derby City, most are owner occupied, indicating a strong level of control of occupiers over the implementation of building fabric changes.

Social housing in Derby city is largely managed by housing associations such as Derby Homes. Furthermore, recently social housing has seen increased funding support from government through the Social Housing Decarbonisation Fund and the Warm Homes Social Housing funding.

[26] UK Government, Domestic Energy Map. Available at: http://www.domesticenergymap.uk/

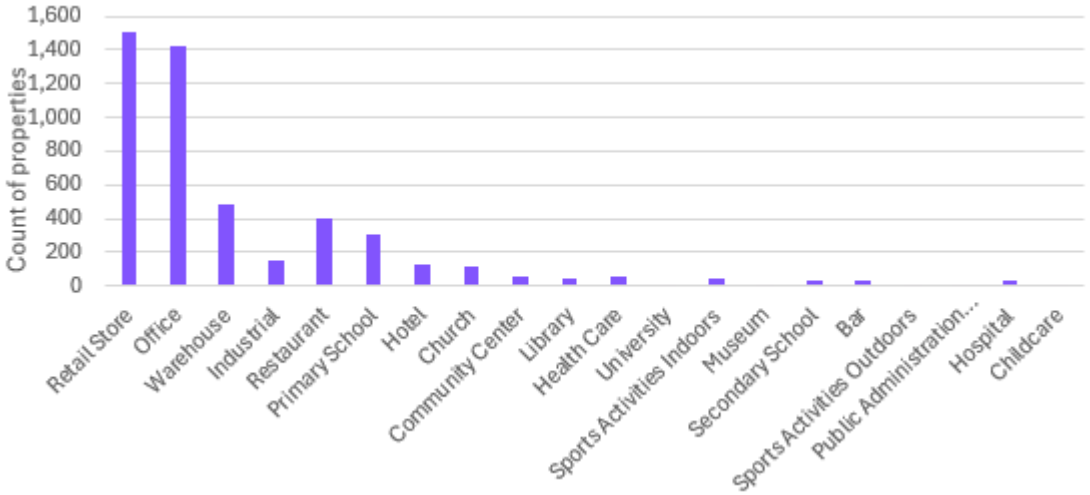
Figure 6.3: Proportion of Tenure Types across Derby City MSOAs



6.1.2 Non-Domestic and Commercial Building Stock

The non-domestic sector accounts for 5% of the buildings across Derby City. These buildings span the public and commercial sectors and are utilised for a variety of primary uses, as listed in Figure 6.4. Detailed in this figure is the total number of non-domestic building split by primary use case varying from restaurants to libraries and sporting facilities. Currently, the non-domestic building stock is predominantly made up of commercial buildings, with office and retail buildings accounting for the majority.

Figure 6.4: Total non-domestic buildings, split by primary use



While the EPC values of non-domestic properties are evaluated to identify priority areas across the region, a significant proportion of the non-domestic building stock in Derby City lacks surveyed EPC data, meaning that the ratings of many properties are not captured. As a result, a large proportion (over 94%) of non-domestic buildings in Derby City are assigned an assumed EPC rating of C. This data gap reflects broader issues with the methodology for undertaking and

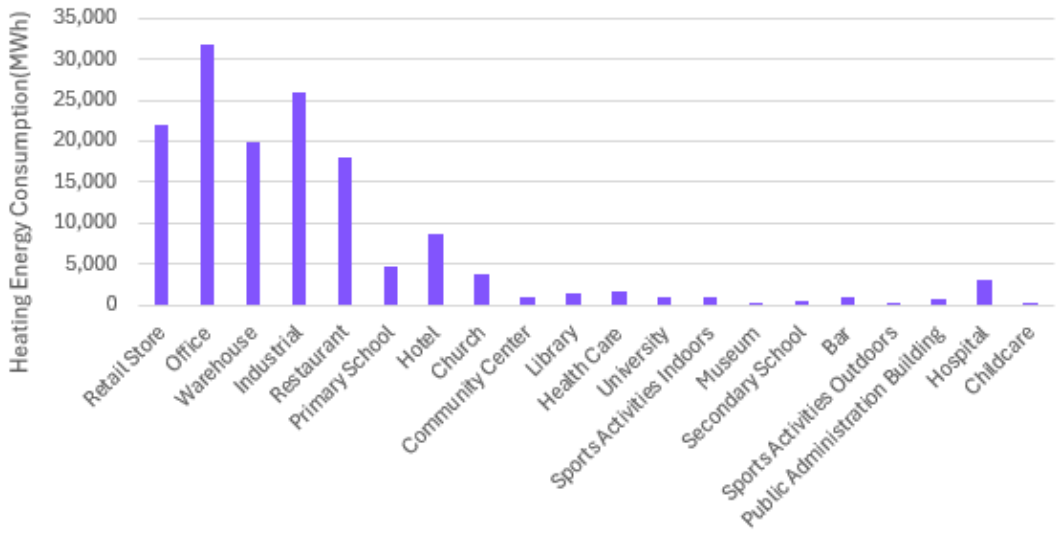
reporting non-domestic EPCs, where the current policy landscape has less strict drivers regarding the uptake of ongoing energy assessments. Currently, one of the only policies in place in this sector is all rented commercial properties in the UK must have a minimum EPC rating of E. To progress energy efficiency in non-domestic building stock, further energy studies on non-domestic buildings are required to provide greater availability of data aiding in the identifying and implementation energy efficiency measures across the properties.

The total simulated thermal demand of non-domestic buildings was also assessed, as shown in Figure 6.5. Retail Stores, Offices, Warehouse and Industrial exhibit significantly higher thermal demand than the other building types.

Office buildings tend to share similar characteristics, such as building envelopes, room layouts, and energy systems, presenting an opportunity for standardised retrofit approaches. Implementing retrofits at scale across these properties is likely to be more straightforward compared to other non-domestic building types, which tend to be more varied in design and function. For these building types, more bespoke retrofit approaches may need to be undertaken, which could incur additional complexity and costs.[27]

One challenge within the commercial buildings sector however is the commercial ownership and rental model, where large office or retail buildings are owned by large commercial asset owners and rented to those utilising the spaces. This means that the ability of the local business or organisation within the space to affect energy efficiency change within their environment is relatively minimal compared to the domestic sector, where most properties are owner occupied in Derby City, due to limited allowances to change the properties and lower incentives due to payback periods being longer than typical tenures. However, by the same principle, increased energy efficiency and fabric standards applied to commercial buildings could impact those large asset owners encouraging their engagement in retrofitting their assets prior to rental or sale.

Figure 6.5: Total thermal demand of non-domestic properties by use



Within the scope of this LAEP, the opportunity to accurately represent the decarbonisation of the non-domestic sector, depends on the available data. The fabric and energy efficiency measures most appropriate for each non-domestic building will depend heavily on the primary use of the building. Different uses like offices and industrial buildings will have significantly

[27] Challenges and Opportunities in Commercial Retrofit | UKGBC

different building fabrics, equipment type and profiles, and occupancy patterns which will affect which measures are most suitable for each building.

Different primary uses also have varying funding mechanisms for how to implement improvements; public sector buildings are more likely to receive more UK Government grant funding than private office buildings. In the absence of available funding for commercial buildings, it is important other incentives or regulations for private building be developed by the UK Government to support the implementation of energy efficiency and fabric upgrade measures.

6.2 Intervention Methodology

6.2.1 Energy Interventions

To meet the legally binding decarbonisation targets for the UK, significant levels of energy efficiency improvements need to be undertaken across the country. For Derby City's diverse domestic and non-domestic sectors to reach the levels of uptake needed for net zero compliance the two chosen scenarios - a 2040 and 2050 net zero scenario, as well as a counterfactual "do nothing" scenario – have been modelled following two energy efficiency approaches.

The specific fabric upgrades that are modelled in this LAEP are split into the following retrofit categories shown in Table 6.1.

Table 6.1: Light and Deep Retrofit Definitions

Light Retrofit Criteria	Deep Retrofit Criteria
Cavity Wall Insulation: Applied to properties identified as having cavity walls that are currently uninsulated.	Window Upgrades: All single-glazed windows being proposed to be upgraded to double glazing.
Full Loft Insulation: Targeted to properties where the predicted loft insulation depth is between 0–50mm.	Solid Wall Insulation: Applied to properties with solid brick or stone walls that are currently uninsulated.
Loft Top-Up Insulation: Applied to homes with an existing insulation depth of 50–150mm, where we topped up with an additional 200mm of insulation.	Floor Insulation: Based on Home Analytics data, we targeted buildings with either suspended floors or those with an unheated space below, provided these floors were not already insulated.

Due to limitations in the available data on fabric conditions and construction types of non-domestic properties, the modelled retrofit upgrades are limited to domestic buildings and do not include non-domestic stock.

6.2.2 Building Fabric – Do Nothing

This scenario takes into account the current pathway, based on currently mandated legislation at the time of completion of this LAEP. It assumes that all existing national legislation is implemented in relation to energy efficiency, which includes the following policies:

The UK Government's Minimum Energy Efficiency Standards (MEES) regulations[28], which applies to private-rented properties not owner-occupied, currently states that a property cannot

[28] Improving the energy performance of privately rented homes: 2025 update

be rented unless it has an EPC rating of E or higher. This is anticipated to increase to EPC C or higher by 2030.

The Future Homes and Buildings Standard (2025) is assumed to be implemented and will mandate that all new builds are constructed as 'net zero ready', future proofed for low-carbon heating and with 'world leading' levels of energy efficiency. This bill aims to have all new builds at an EPC rating of C or higher, however 85% of new build properties in England are already achieving a minimum EPC rating of B. We therefore assume that all houses constructed after 2025 will be to an EPC B or higher and will not require fabric retrofit intervention.

The UK Government is encouraging the improvement of housing stock via these policies and incentives, the impact of which have been incorporated into our modelling of the "do nothing" scenario.

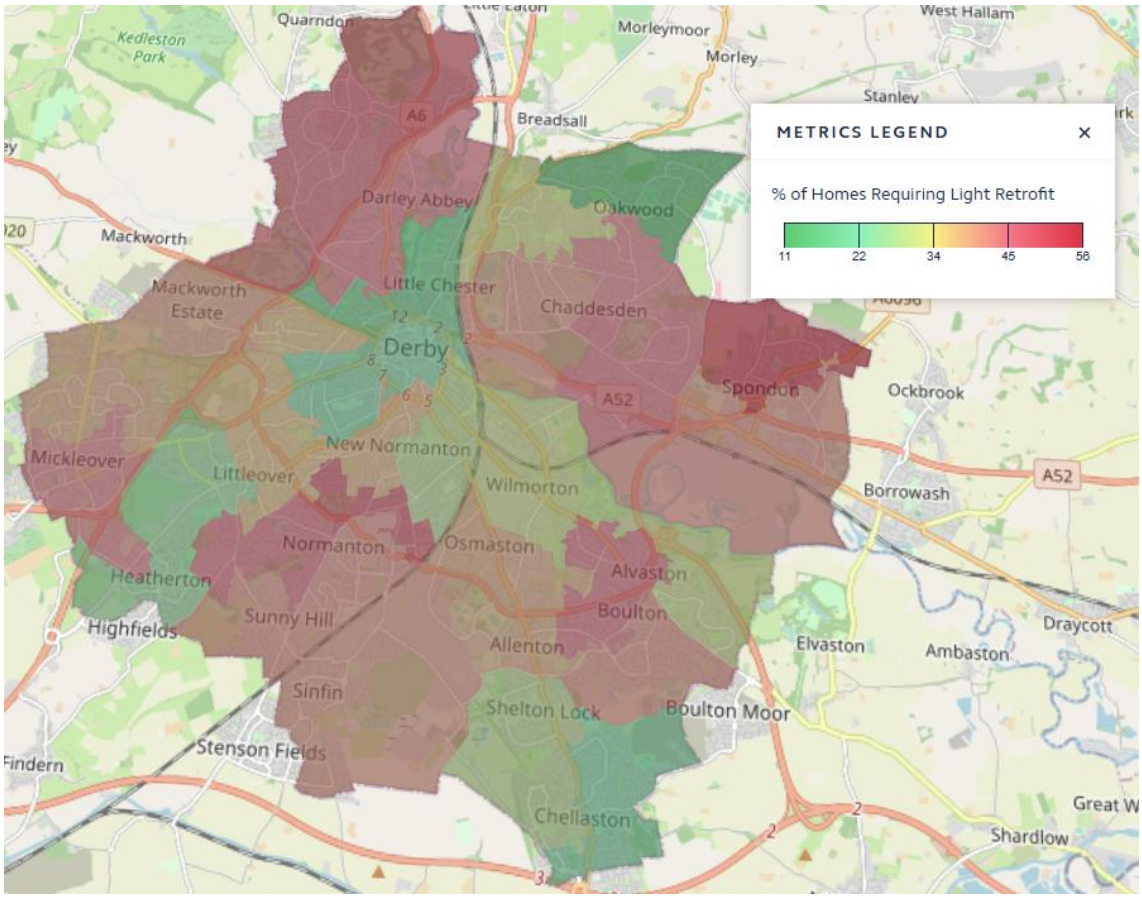
6.3 Light Retrofit

The light retrofit option represents the cheaper retrofit option, focusing on less intrusive insulation improvements. This option is targeted for homes requiring less significant thermal efficiency improvements.

Light retrofit measures such as cavity wall insulation and loft insulation are lower cost than internal and external solid wall insulation and have been identified to have a significantly reduced payback compared with deep retrofit approaches. To find which homes require light retrofits, the existing fabric levels are analysed to find where improvements are needed. The extent of the improvements required is compared against the criteria for light and deep retrofit, described in Table 6.1, to identify which level of retrofit is required. With this analysis across the region, it is then possible to quantify the extent of light retrofit needed across Derby City.

Figure 6.6 identifies the intensity of light retrofit installations required across Derby City, highlighting a large number of required implementations identified in Cathedral Quarter and California.

Figure 6.6: Number of homes requiring light retrofit, by MSOA



The 2040 and 2050 scenario uptake growth rates are informed by mandated national and regional policies, including the UK Government's Warm Homes Plan, which seeks to front-load retrofit measures with a particular emphasis on social housing[29]. Uptake rates are also aligned with the CCC's Seventh Carbon Budget net zero pathway, which prioritises the rapid deployment of energy efficiency measures ahead of low-carbon heating installations[30]. The uptake rates for the preferred 2040 Net Zero scenario are set out in Figure 6.7.

Additionally, the uptake profile assumes a slower rate of delivery between 2025 and 2030, reflecting current workforce and supply chain capacity. From 2030 onwards, however, retrofit demand is expected to drive significant growth in both workforce skills and supply chain capability, enabling a sharper acceleration in uptake.

[29] Warm Homes: Local Grant policy guidance

[30] The Seventh Carbon Budget - Climate Change Committee

Year	Annual percentage uptake	Annual uptake
2025	0%	0
2026	1.2%	514
2027	1.7%	728
2028	3.5%	1,498
2029	6.2%	2,653
2030	10.2%	4,365
2031	14.7%	6,291
2032	17.8%	7,618
2033	16.9%	7,233
2034	12.9%	5,521
2035	8.1%	3,467
2036	4.2%	1,797
2037	2.0%	856
2038	0.4%	171
2039	0.2%	86
2040	0.0%	0

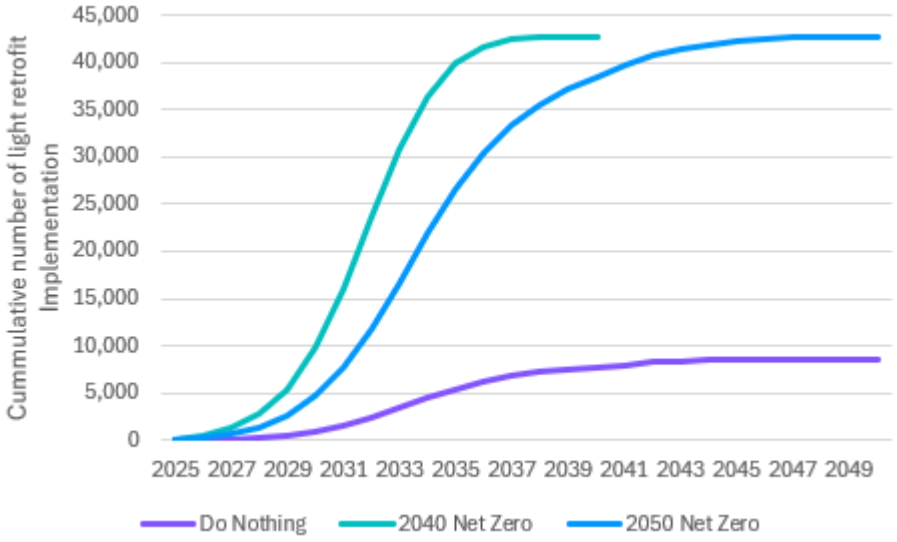
Figure 6.7: Annual light retrofit installations for preferred scenario

Figure 6.8 outlines the required year on year uptake light retrofit uptake rate for the 2050, 2040 and do-nothing scenarios. The do nothing represents the counterfactual scenario, considering the expected retrofit of private rented properties as part of MEES regulations and follows similar update trajectory.

In both the 2040 and 2050 scenarios, a total of around 42,798 homes require light retrofit upgrades, representing 48% of the total housing.

However, to meet the pathway targets of the local area in each scenario, light retrofit upgrades are not sufficient on their own. For some properties further thermal efficiency is required in order to meet the heat grade provided by a heat pump or district heating, so deep retrofit has also been modelled within the LAEP.

Figure 6.8: Cumulative uptake of light retrofit required per scenario



6.4 Deep Retrofit

The deep retrofit option represents the more expensive approach, requiring more intrusive insulation improvements. It is intended for homes that need significant enhancements in thermal efficiency. As described in Table 6.1, the deep retrofit encompasses fabric upgrades for solid wall insulation, glazing upgrades and floor insulation. These retrofit measures are tailored to older housing stock, which often feature building envelopes that benefit most from these fabric upgrades, such as solid stone walls, single glazing and suspended floors.

Figure 6.9: Homes Requiring Deep Retrofit by MSOA

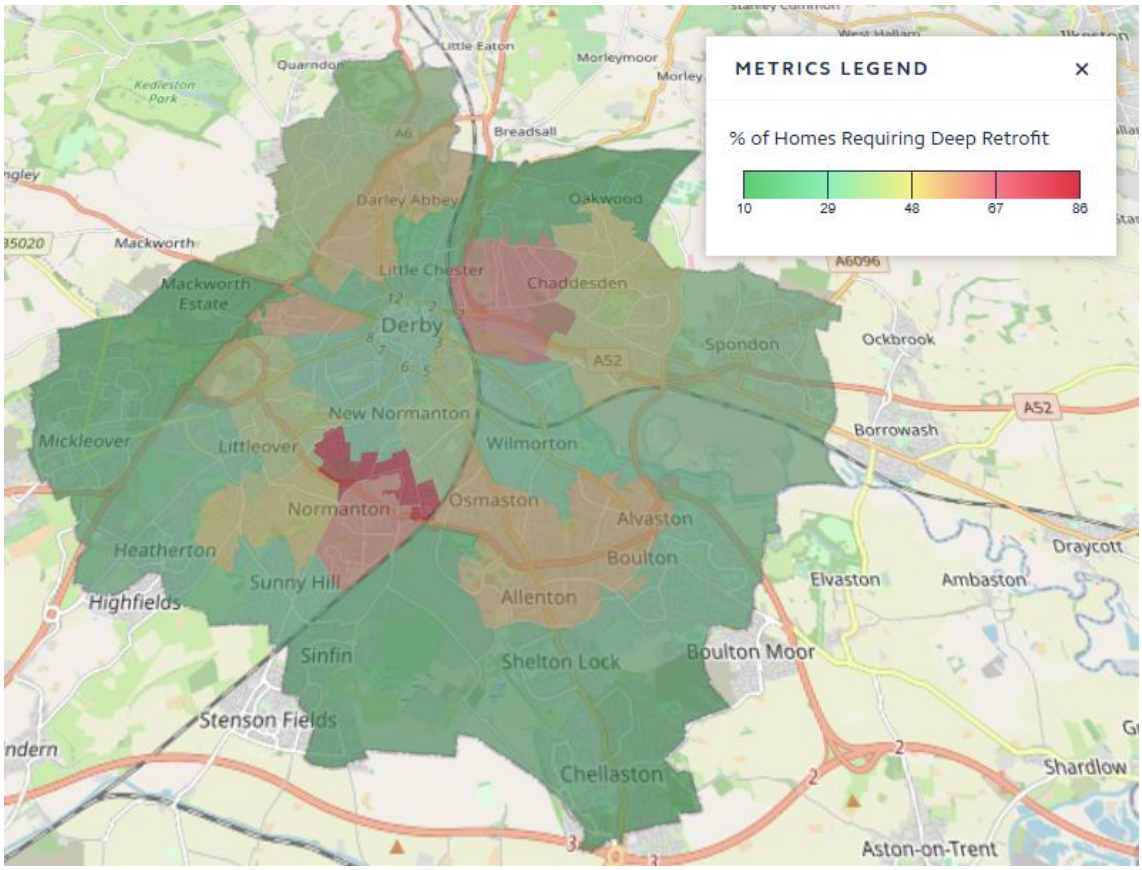
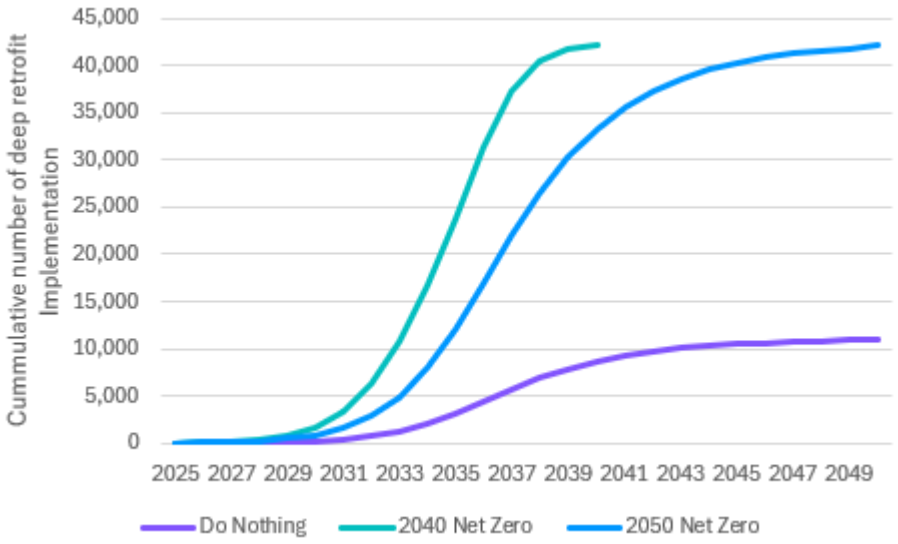


Figure 6.10: Cumulative uptake of deep retrofit required per scenario



Similarly to the light retrofit, the home analytics dataset within the digital twin of Derby City was used to identify where deep retrofit measures would be suitable for each property, based on building fabric and construction type. The aim of this approach was to ensure that every property achieved adequate insulation levels, with a dual purpose of reducing the risk of fuel

poverty and enabling the efficient installation and operation of a low-carbon heat source. This is discussed further in Section 7.

Figure 6.9 emphasises where in Derby is most in need of deep retrofit. These areas are concentrated around the inner city. The central urban zones of Derby, including Osmaston and Allenton show the highest concentration of deep retrofit demand.

It will be vital to target these older building types as they will be most at risk of poor thermal comfort levels, leading to poor health outcomes from risks such as mould. Deep retrofit measures in these properties will provide additional benefits of removing risks of condensation, dampness, and mould caused by excess heat loss.

Year	Annual percentage uptake	Annual uptake
2025	0%	0
2026	0%	42
2027	0%	84
2028	1%	210
2029	1%	463
2030	2%	884
2031	4%	1,684
2032	7%	2,905
2033	10%	4,378
2034	14%	5,978
2035	17%	7,157
2036	18%	7,536
2037	14%	5,936
2038	8%	3,157
2039	3%	1,305
2040	1%	379

Figure 6.11: Annual deep retrofit installations for preferred scenario

Figure 6.10 underlines the required annual retrofit uptake rate for the 2050, 2040 and do-nothing scenarios. The do nothing represents the expected retrofit of private rented properties as part of MEES regulations. Similar to light retrofits, the 2040 and 2050 scenario uptake growth rates were informed by mandated national and regional policies alongside considering the growth of the supply chain to limit the uptake to realistic levels. However, the rates have been slightly reduced to account for the increased scope and costs associated with deep retrofit upgrades, in comparison to light retrofits.

In both the 2040 and 2050 scenarios, a total of around 42,098 homes are required to have deep retrofit upgrades, representing 43% of the total domestic property stock.

6.5 Impacts

Displayed in Figure 6.12, is the total number of retrofit installations required across Derby City, specifying the number of properties requiring either light, deep or no retrofit. Additionally, there is a separate category for the housing stock requiring both light and deep retrofits.

Retrofit installations are expected to be widespread across the region, necessitating installations across primarily privately rented and owner-occupied tenure types, as the building stock within social housing portfolios is primarily comprised of EPC C or above homes. This will require coordinated engagement from the private sector with support from the public sector to develop the incentives, potential funding mechanisms and uplift awareness to support the transition. As the capital expenditure will be the main hurdle for the implementation of retrofits, these funding mechanisms would aid in ensuring the retrofit upgrades are accessible to all properties. The ability for the local authorities to influence retrofit upgrades given they will primarily be required in privately owned buildings is also a barrier.

Households with lower income levels will be the least likely to undertake and pay for the high cost of deep retrofit measures, and to some extent light retrofit measures as well, so appropriate support must be given in such circumstances to ensure a just transition towards net zero by 2040 or 2050. Retrofit programmes must be designed with support mechanisms for landlords and incentives for low-income households.

Additional targeting may be required in areas of high fuel poverty that have a large proportion of privately rented homes. Owner-occupied homes may have greater autonomy to invest in upgrades, while rented properties particularly in the private sector, face challenges due to split incentives and regulatory constraints.

Furthermore, homes considered as heritage, listed, within a conservation area poses an additional level of complexity. Deploying retrofits in these homes is not only more challenging from a technical perspective, but the costs are often higher with ‘run-of-the-mill’ options unsuitable.

Specifically for listed buildings, deep retrofit would be difficult as many modern retrofit methods are not compatible with listed buildings and listed building consent would be required – with no blanket rules applicable, with no two listed buildings being the same. Broadly speaking, retrofits at ‘hard-to-treat’ homes require consideration on a ‘case-by-case’ basis.

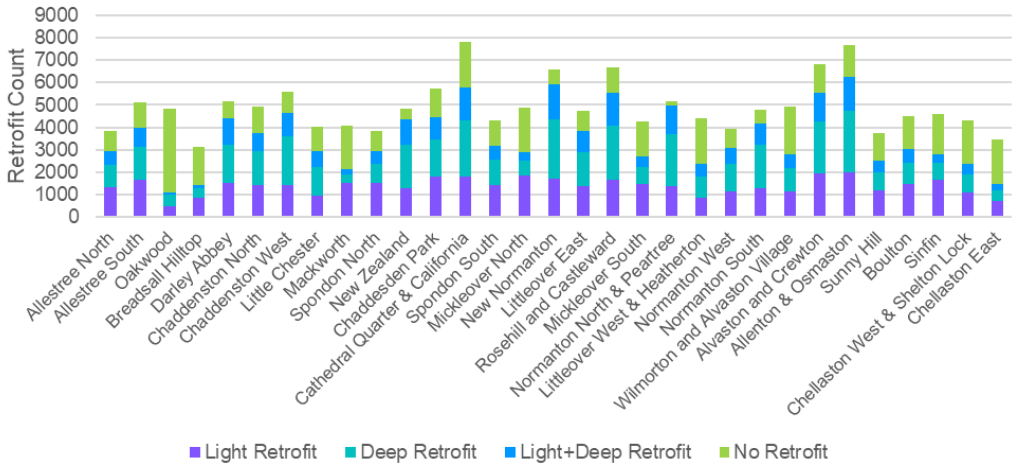
Where funding programmes are available, local authorities focus on distributing funds across the maximum number of homes possible, to ensure that as far as possible funds deliver the largest benefits to the region and are deployed in a fair and equitable manner.

With local authorities continually faced with funding pressures, this often means that retrofit measures are prioritised for ‘easier’ or ‘quick-wins’ homes, with local authorities left to prioritise homes without clear guidelines. In many cases, these homes are left with a higher funding gap to cover or no funding option at all.

As such, a comprehensive, clear strategy to deploying retrofits at ‘hard-to-treat’ homes is necessary – drawing on a combination of local authority support, specialist expertise, targeted funding, collaborative roll-out programmes, all building off accessible advice at zero-cost (at least initially). An educational programme would also support those in the ‘able-to-pay’ bracket to streamline understanding and empower owners to proceed with retrofit deployments, as further discussed in Section 13.

Refer to Section 12 - Economic Appraisal for further analysis and in depth technoeconomic discussion on costs of each intervention across each net zero scenario.

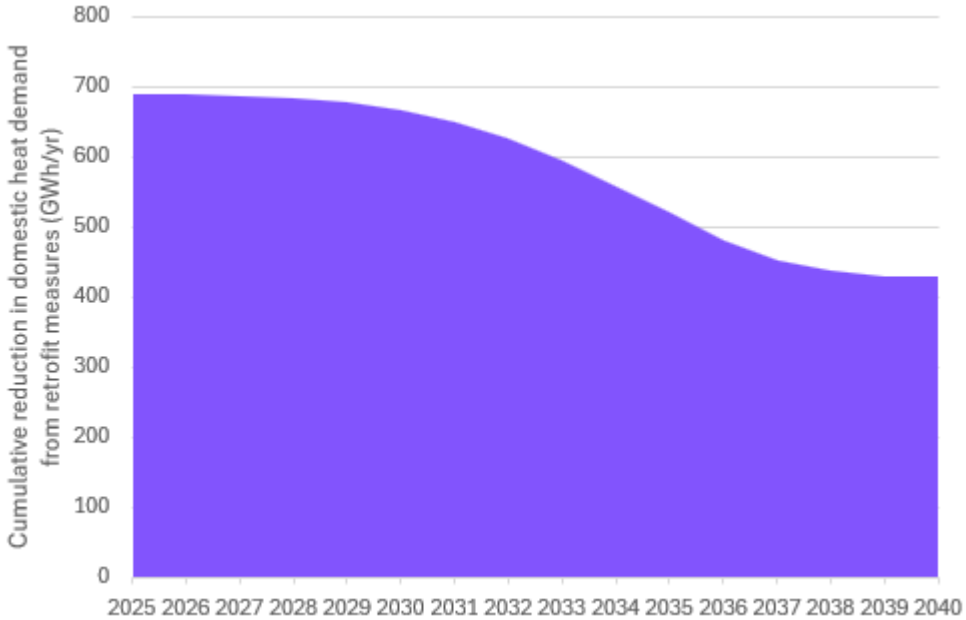
Figure 6.12: Number of Buildings requiring fabric retrofit, per MSOA



The successful implementation of these retrofits will introduce significant energy savings across the region while satisfying thermal comfort levels within each property. Figure 6.13 illustrates the cumulative reduction in domestic space heating energy demand resulting from the uptake of retrofit measures across the study area. This identifies the significant increase in energy efficiency of homes, resulting from light and deep retrofits.

The energy savings will provide vast benefits both to residents and Councils, providing cost and carbon savings leading to a host of other benefits. These include alleviating fuel poverty, as households that were previously thermally inefficient would be able to heat their homes affordably.

Figure 6.13: Cumulative reduction in domestic heat demand from retrofit measures



In aggregate, the modelled interventions reduce total space heating energy demand by approximately 38% relative to the baseline. The results are presented at a local authority level and therefore reflect the combined impact across the entire domestic building stock. This

includes both dwellings that have undergone retrofit and those that have not, either because retrofit is not required or because the buildings are not considered suitable for retrofit. As a result, the percentage reduction represents a system-wide outcome rather than savings across retrofit-eligible buildings alone.

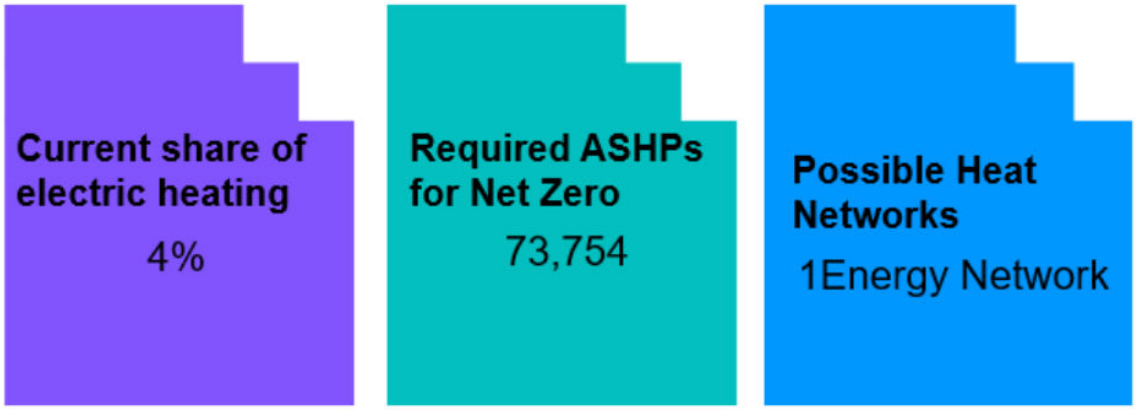
These benefits will be further extended as low-carbon heating technologies are deployed. Retrofit measures act as a foundational step by reducing underlying heat demand, enabling low-carbon systems to operate more efficiently and deliver additional energy savings. This approach not only leads to immediate reductions in energy consumption and lower utility bills for residents, but also contributes to a reduction in carbon emissions associated with gas use. In addition, the resulting decrease in thermal demand will help mitigate future strain on the local electricity network as the region transitions towards a higher proportion of electrified heating.

For more information on the impacts of the installation of low carbon heating systems, please refer to Section 7.

7 Low-carbon Heating

This section analyses how low-carbon space heating technologies can be implemented to help Derby City achieve net zero carbon emissions. Currently, the majority of domestic and non-domestic buildings rely on fossil fuels to meet their space heating and hot water demands, presenting a significant challenge. To decarbonise heat consumption, most buildings will need to transition to low-carbon technologies, primarily those powered by electricity.

7.1 Domestic Sector



7.1.1 Existing System

Natural gas is the predominant fuel type used in both Derby City as shown in Figure 7.1 based on government data[31,32]. Over 96% of home energy usage is consumed in gas-powered boilers for space heating and hot water. Around 4% of homes use electricity for heating which includes both electric heat pumps and resistive electric heating. These homes can already be considered to have low-carbon heating systems, as their emissions will continue to decrease as the national grid decarbonises.

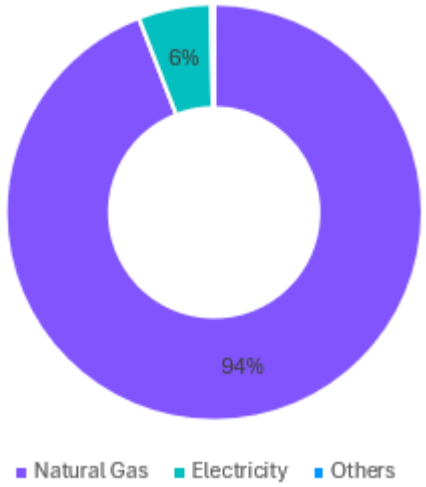
Derby City has a small number of homes using oil, liquefied petroleum gas (LPG), or biomass for heating, grouped under the 'other' category, with only 0.24% of homes currently relying on these sources. Most of these homes in this category will need to transition to a decarbonised heat source and may prove more costly due to their more unusual heating systems.

From an emissions perspective, domestic buildings using natural gas contribute up to 298 ktCO2e of emissions, followed by 240 ktCO2e from electricity. There have been significant emissions reductions across all fuel types since 2005, predominantly from electricity use. This is in large part due to the decarbonisation of the grid as well as efficiency measures.

[31] Sub-national total final energy consumption data - GOV.UK

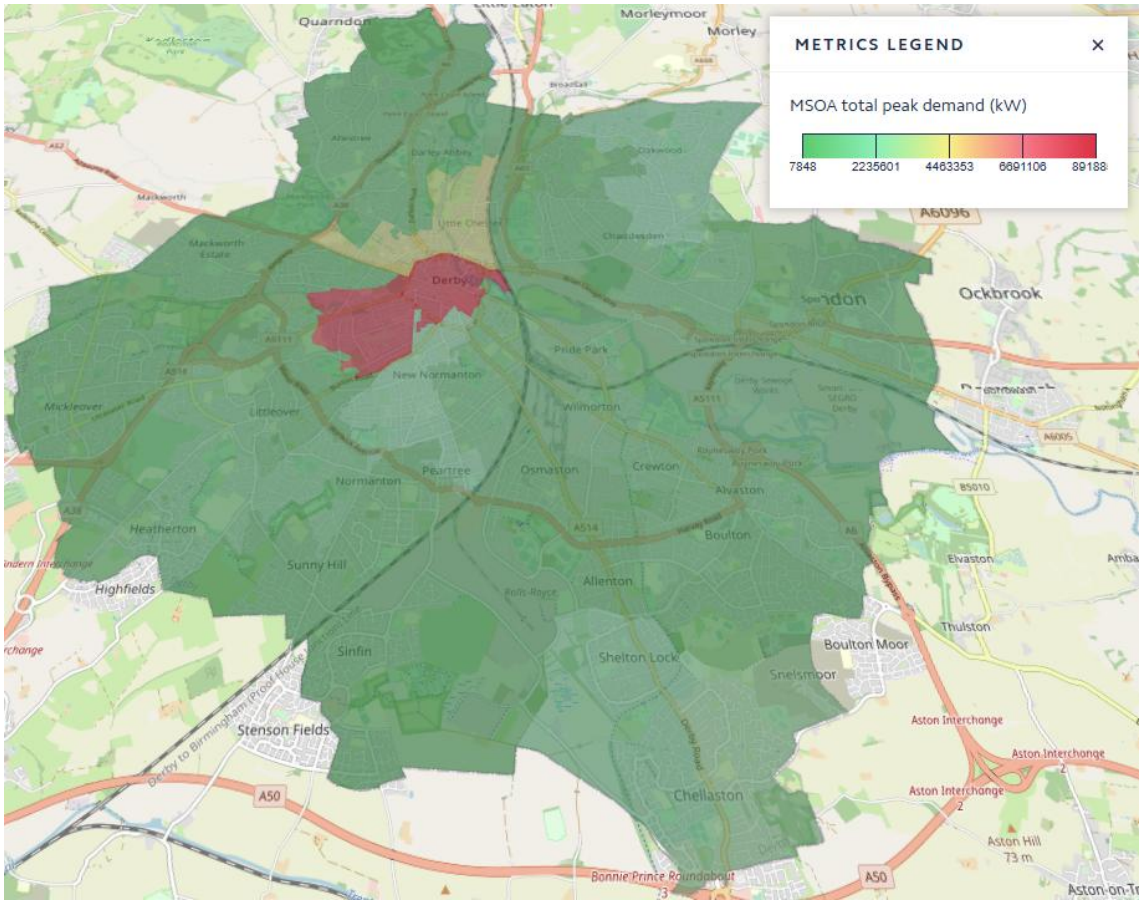
[32] Energy Consumption in the UK (ECUK) 2025 - GOV.UK

Figure 7.1: Domestic Heating split by Fuel Type for Derby City (%)



The current level of thermal demand per MSOA for domestic housing in Derby City is shown in Figure 7.2. The MSOAs of Cathedral Quarter and California record the highest peak heat demand.

Figure 7.2: Thermal Demand by MSOA

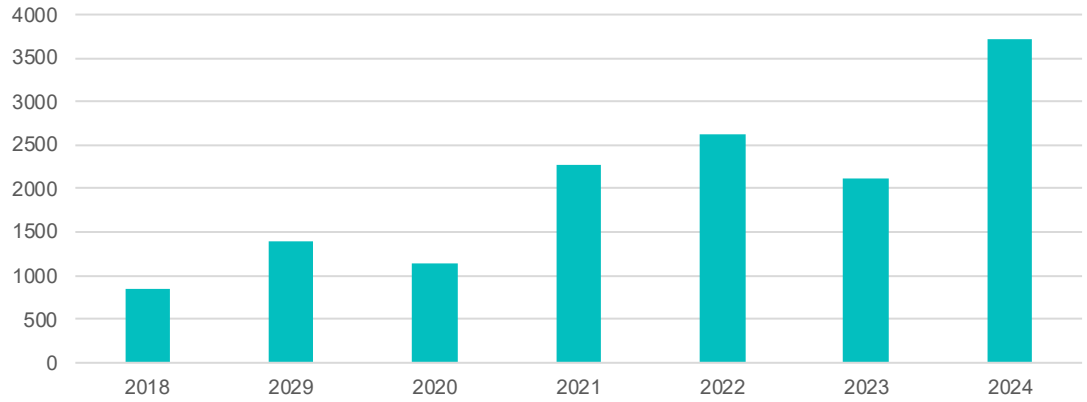


7.1.2 Low-carbon Heating System Installations

It has been assumed for this LAEP that air source heat pumps will be the primary alternative to natural gas fuelled heating systems in order to meet its net zero goals. However, given the high portion of older or listed buildings, consideration of alternative low-carbon heating measures will be required, as ASHPs are often not suitable to these building types. Historic heat pump uptake across the East Midlands is illustrated in Figure 7.3. There is a steadily growing uptake of heat pumps since 2018 in the East Midlands with 3,726 installations recorded in 2024. While this upward trend is encouraging, heat pumps still represent a small fraction of space heating compared to the total housing stock.

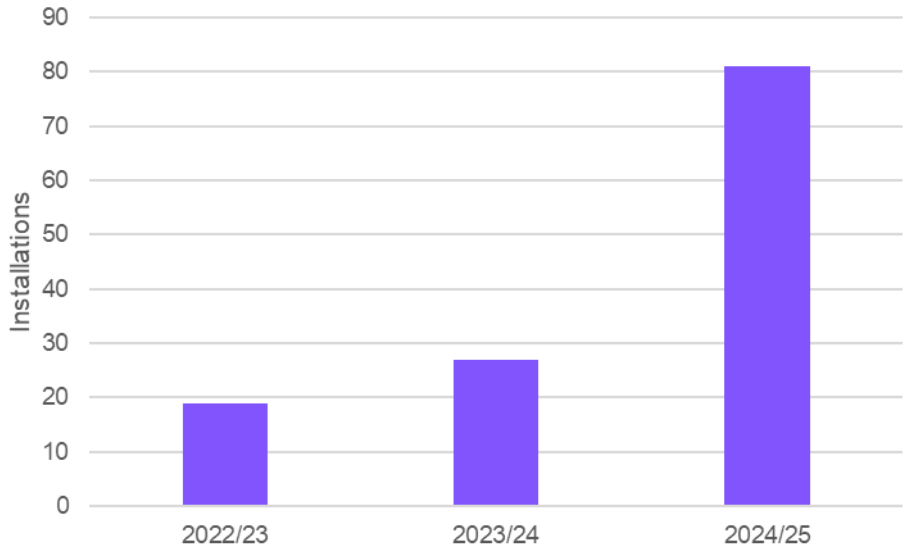
Government data also tracks heat pump installations at the local authority level through the Boiler Upgrade Scheme. Figure 7.4 shows that Derby city follows the regional trend, with an increasing trend in installation numbers.

Figure 7.3: East Midlands historical heat pump installations



Source: Heat pump deployment statistics: June 2025 - GOV.UK

Figure 7.4: Derby City Boiler Upgrade Scheme Heat Pump Installations



Source: Boiler Upgrade Scheme statistics: August 2025 - GOV.UK

In the 2024/25 financial year, Derby City recorded 81 heat pump installations through the scheme. With over 97,500 homes using natural gas and an average boiler lifespan of 15 years, Derby sees roughly 6,000 gas boiler replacements each year. However, less than 1% of these replacements are currently switching to heat pumps due to ongoing high upfront costs of installations, installation complexity and requirements for additional insulation before installations go ahead which we know to be expensive and complex in itself as per section 6.

To decarbonise domestic heating in the region, this percentage must rise sharply. Even if boiler replacements are banned in the 2030s, proactive measures are needed now to accelerate uptake in the short term.

7.1.3 Do Nothing

The Do-nothing scenario here assumes minimal policy requirements for heat decarbonisation. The only assumed policy intervention in this area is a ban on fossil fuel heating in new builds from 2030[33], with no policy implemented regarding the removal of fossil fuel heating systems from existing buildings.

While there is noticeable growth in heat pumps, most of these installations are assumed to be from the fossil fuel boiler ban in new builds, with only a small percentage occurring from existing gas boilers changing systems. Heat pump uptake is expected to be very low due to the lack of policy incentives and grant funding available. However, after 2035, gas boiler to heat pump conversions are expected to pick up slightly as per the planned phase-out of fossil fuel boilers.

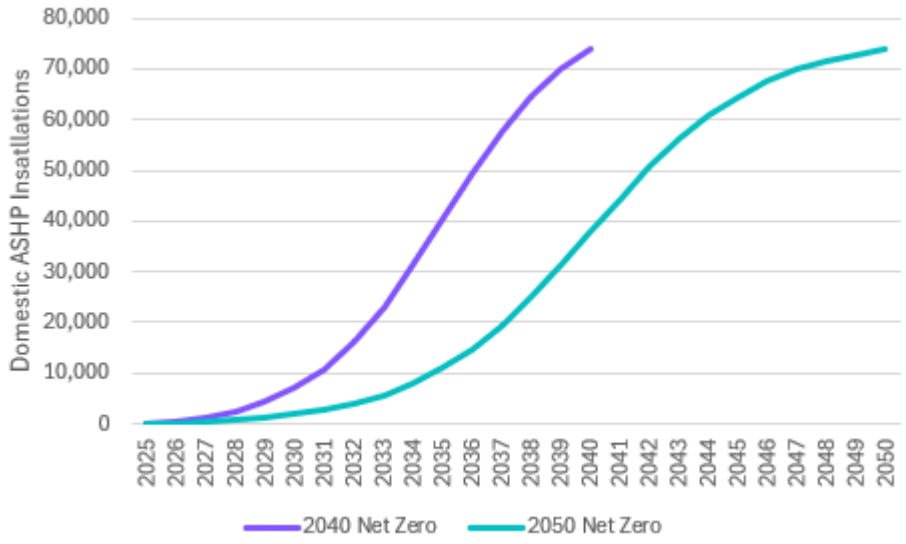
7.1.4 Intervention Methodology

We have considered feasible installation of heat pumps in all building types that are currently using any fuel type other than electricity or biomass. The digital twin has been used to model the changes in energy use and carbon emissions from the switching of fossil fuel boiler systems to heat pumps.

The additional peak electrical demand and annual electricity consumption has been built into the projected modelling for carbon emissions reduction and impacts on the local grid. Therefore, the buildings' new total electricity consumption, post heat electrification, equals their electricity consumption post retrofit, plus the demand of the ASHP. For buildings already with an electrical heat source, it has been assumed that this will stay the same.

[33] Note that the new Future Homes Standard, summarised in Section 2.1.9 now legislates for no fossil fuel heating in new builds from 2025, at the time of the DFES publication this date was still set to be 2030.

Figure 7.5: 2050 and 2040 scenario domestic heat pump uptake



7.1.5 Scenarios Overview

The two net zero scenarios developed as part of this LAEP anticipate significantly more installations to take place compared to the Do Nothing, by assuming all homes will have a low-carbon heating system by the net zero year.

Year	Annual percentage uptake	Annual uptake
2025	0%	0
2026	1%	509
2027	1%	782
2028	2%	1,195
2029	2%	1,807
2030	4%	2,670
2031	5%	3,835
2032	7%	5,288
2033	9%	6,866
2034	11%	8,275
2035	12%	9,131
2036	12%	9,204
2037	11%	8,209
2038	9%	6,859
2039	7%	5,288
2040	5%	3,835

Figure 7.6: Annual domestic ASHP installations in preferred scenario

The 2040 and 2050 scenarios assume a full electrification of space heating, with no hybrid heat pump installations. This scenario assumes a relatively consistent, steady uptake of heat pumps, which accelerates slightly in the mid-2030s. The annual uptake rates for the 2040 Net Zero scenario are set out in Figure 7.6.

All new builds are assumed to have a low carbon heating system, as per the Future Homes Standard, however the challenges lie with existing housing due to space constraints and the need for fabric upgrades in older housing stock as discussed in Section 6.

Heat pumps operate less efficiently in older buildings as they incur higher heat losses and may struggle to maintain thermal comfort in cold weather conditions. Therefore, it is important that fabric retrofit improvements are undertaken in such buildings as soon as possible to reduce the costs incurred by running them as well as achieving the necessary COP level for adequate thermal comfort.

Overall, 73,754 installations are modelled as required across the city by the net zero year. This is expected to reduce 647GWh of gas consumption and result in 207 GWh of electricity consumption.

Space constraints in existing housing, particularly flats and terraced houses, present challenges to heat pump installation due to the required hot water cylinder to go alongside it. Social housing providers may be able to install heat pumps alongside the necessary insulation upgrades.

Regulatory changes to permitted development rights for ASHPs remove barriers like the 1-metre boundary rule for ASHP, which also make installations easier for more homes and can be expected to boost uptake significantly alongside the planned phase-out of fossil fuel boilers by 2035.

Collectively, these results highlight the significant contribution that low-carbon heating technologies can make toward local and regional decarbonisation objectives, reinforcing the importance of sustained investment in retrofit support, installer capacity, and grid infrastructure to enable continued growth in heat pump deployment.

7.1.6 Modelled Interventions

The technologies considered for heating decarbonisation are set out in Table 7.1. Of these, air source heat pumps (ASHPs) are the most viable and economical option going forward due to grid decarbonisation and their high efficiencies, providing heat for the building while meeting the net zero targets.

In comparison, GSHPs offer slightly higher efficiencies than ASHPs but come with higher upfront costs and require sufficient outdoor space for ground loops. Direct electric heating, though simple to install, is far less efficient and results in higher running costs and electricity demand. Finally, district heat networks can provide low-carbon heat in dense urban areas or large developments but are generally less cost-effective or practical for dispersed and rural housing.

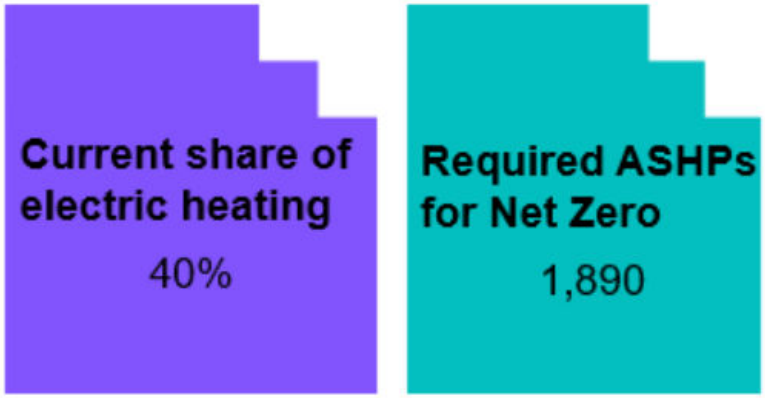
ASHPs are electrically powered and use refrigerant to extract low grade heat from the air, which is then upgraded using compression. The resulting heat is then transferred to a wet central heating system through a plate heat exchange. The efficiency of a heat pump is known as Coefficient of Performance (COP) and measures the heat output in kWh of heat produced per kWh of electricity used (i.e., a system that produces 3kWh of heat per kWh of electricity has a CoP of 3). In our modelling, anticipated demand for ASHPs was represented by the building's new electrical consumption for space heating and DHW, with an assumed COP of 2.7.

Table 7.1: Heating Technologies

Technology	Description
Fossil Fuel Boiler	Heating technology that combusts fossil fuels to heat water for space heating and DHW demands. Most of these installations currently in the City use natural gas as the fuel source, although there are some using LPG and Oil in the off gas grid postcodes. This is the most common heating system for domestic buildings in Derby.
Direct Electric	This category of heating technologies includes electric boiler, electric storage heaters, electric heat batteries and other direct electric technologies. They are typically cheaper to install than heat pumps, but more costly to run due to their lower efficiency. Any home currently with this technology is assumed to keep it in all scenarios. Some homeowners and landlords may opt to install one of these technologies instead of a heat pump.

Air Source Heat Pump (ASHP)	Electrical heating system that takes heat from the ambient air outside and delivers it internally, consuming electricity. This technology typically has significantly higher efficiencies compared to direct electric or fossil fuel boilers, of between 2.5 and 3.0. All heat pump uptake is assumed to be air source, unless otherwise specified.
Ground Source Heat Pump	Similar to an air source heat pump but extracts heat from the ground via boreholes or pipes. Will typically have a higher efficiency compared to an ASHP but usually require a garden and are costly and disruptive to install. These will likely represent an alternative to an ASHP for homes and buildings with available external space, which can front the additional capital required.
District Heat Network Connection	Some buildings in Derby City may be able to decarbonise their energy usage by connecting to a district heating network. However, the feasibility of a district heating network is exceptionally location specific, with only a few areas in early-stage assessment. District heat networks supply heat to buildings via hot water in underground pipes, from a centralised plant. See Section 7.3 for more details.
Hydrogen Boilers	Similar to a fossil fuel boiler but provides heat through burning hydrogen. If this hydrogen is considered 'green' (created via renewables) or 'blue' (created via carbon capture and storage of fossil fuel combustion) then it can be considered low carbon. This heating technology has not been considered for the regional LAEP, due to hydrogen for space heating not being considered viable as part of this programme, however it should be noted that some industrial process loads could have hydrogen as a possible alternative fuel source.

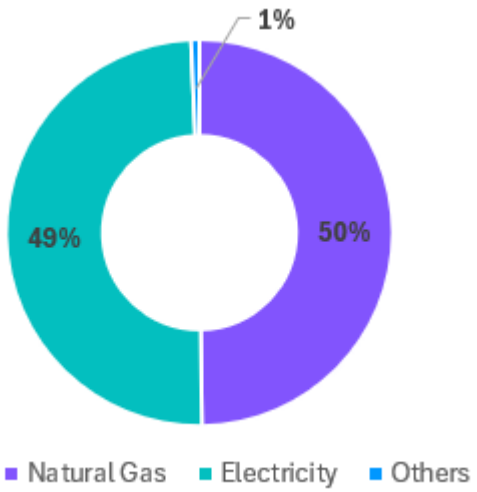
7.2 Non-Domestic Sector



7.2.1 Existing System

In comparison to the domestic sector, there is more diversity in the heating fuel types in place, as shown in Figure 7.7. Between 50% of non-domestic properties in Derby City utilise natural gas for space heating and hot water, with approximately 49% of properties using electricity. The electrically and biomass heated properties do not require replacement systems, identifying that proportionally fewer properties require interventions than domestic properties.

Figure 7.7: Non-domestic heating split by Fuel Type for Derby City (%)



Electricity consumption for heating historically caused the majority of emissions but has declined in recent years due to the decarbonisation of grid.

7.2.2 Scenarios Overview

Building on the approach applied to the domestic sector (see Section 7.1.5), the non-domestic modelling adopts consistent assumptions on technology performance, uptake rates and policy influences, while incorporating adjustments to reflect the differing characteristics of commercial, industrial and public buildings. ASHPs have been identified as the most feasible low-carbon heating option across the non-domestic stock, owing to their modular scalability, lower spatial requirements, and simpler installation compared with ground source systems.

Many non-domestic buildings also benefit from suitable external areas such as rooftops, service yards and plant enclosures that can accommodate ASHP units without major disruption. In addition, their higher and more consistent heating loads allow larger-capacity ASHP systems to operate efficiently and deliver substantial energy savings at scale. These assumptions have been applied consistently across the 2040 Net Zero and 2050 Net Zero scenarios.

The net zero scenarios assume a reduction in the total number of non-domestic properties using other types of electric heating, assuming that many will transition to heat pumps as the technology matures and funding becomes available. Given the relative early-stage consideration of potential district heat networks in the region, all properties were marked as requiring a heat pump – those buildings which are already using an older less efficient electric heating system will likely require upgrading.

Year	Annual percentage uptake	Annual uptake
2025	0%	0
2026	1%	13
2027	1%	20
2028	2%	31
2029	2%	46
2030	4%	68
2031	5%	98
2032	7%	136
2033	9%	176
2034	11%	212
2035	12%	234
2036	12%	236
2037	11%	210
2038	9%	176
2039	7%	136
2040	5%	98

Figure 7.8:Annual installations of non-domestic ASHP in the preferred scenario

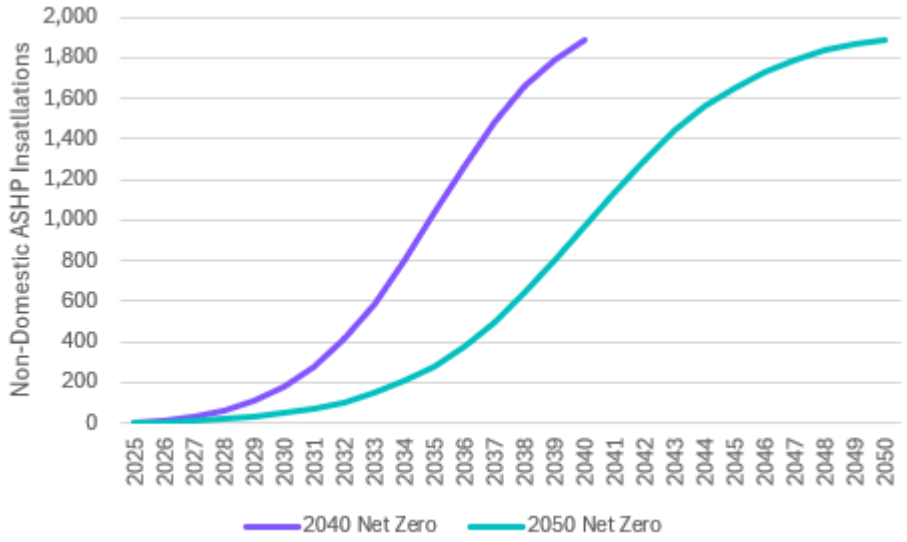
This is based on the replacement rate of boilers with a 15–20-year life span, using historic ASHP installation data to inform the rate at which heat pumps would be installed. Efficiency is assumed to be 85% for gas boilers and 270% for ASHPs, and ASHP CAPEX is £11k.

As heat pump technology improves and installation costs fall, larger scale heat pumps will become more accessible and cost effective which some non-domestic users and businesses may be suited to apply in a shared system.

Overall, the net zero scenarios require 1,890 non-domestic ASHP installations, resulting in reduced gas demand of 163 GWh, and additional electricity demand of 51GWh. The 2040 pathway delivers substantial cumulative gas savings earlier than the 2050 scenario, reflecting faster adoption under more ambitious decarbonisation timelines.

It is critical financial support is available for more non-domestic buildings which already have good capability for heat pump use, to enable these buildings to upgrade their fabric to be able to quickly adopt heat pump technology.

Figure 7.9: 2050 and 2040 scenario non-domestic heat pump uptake across Derby City



7.3 District Heating

At present, Derby City do not have an operational large-scale district heat network. Heat provision across the area is dominated by individual natural gas with limited deployment of communal systems. This reliance on decentralised fossil fuel heating remains a key driver of local carbon emissions and contributes to fuel cost volatility.

7.3.1 Emerging Heat Network Development in Derby

1Energy has successfully secured £23.2M from the Green Heat Network Fund (GHNF) to develop a major heat network in Derby, a significant step forward in the development of Derby's flagship district heating network. This scheme, which represents the first large-scale heat network in the city. Once fully built out, the network is projected to deliver an annual heat demand of approximately 134,982 MWh.

The network will be engineered to meet a diversified peak heat load of 59,114 kW, ensuring capacity to reliably supply demand during the coldest periods. To achieve this, the system will combine efficient and flexible energy generation assets with significant storage capacity, enabling both security of supply and optimisation of operational costs.

Key technical parameters of the full scheme include:

- Estimated pipework length: ~33 km, connecting multiple strategic sites and consumer clusters across Derby.
- Generation mix: A potential installed capacity of approximately 18 MW of heat pumps to harness low-carbon energy sources, supplemented by 70 MW of high-efficiency gas boilers for flexible and secure backup generation.
- Thermal storage: ~960 m³ of thermal storage, enabling the decoupling of generation and demand, smoothing peak loads, and increasing the integration of low-carbon energy sources.

This scheme has been incorporated into the LAEP as the baseline for modelling potential district heating growth. 1Energy's network plans have been replicated within the LAEP, to ensure that the outputs are grounded in real-world infrastructure and investment pipelines.

Figure 7.10: 1Energy Proposed Heat Network Cluster

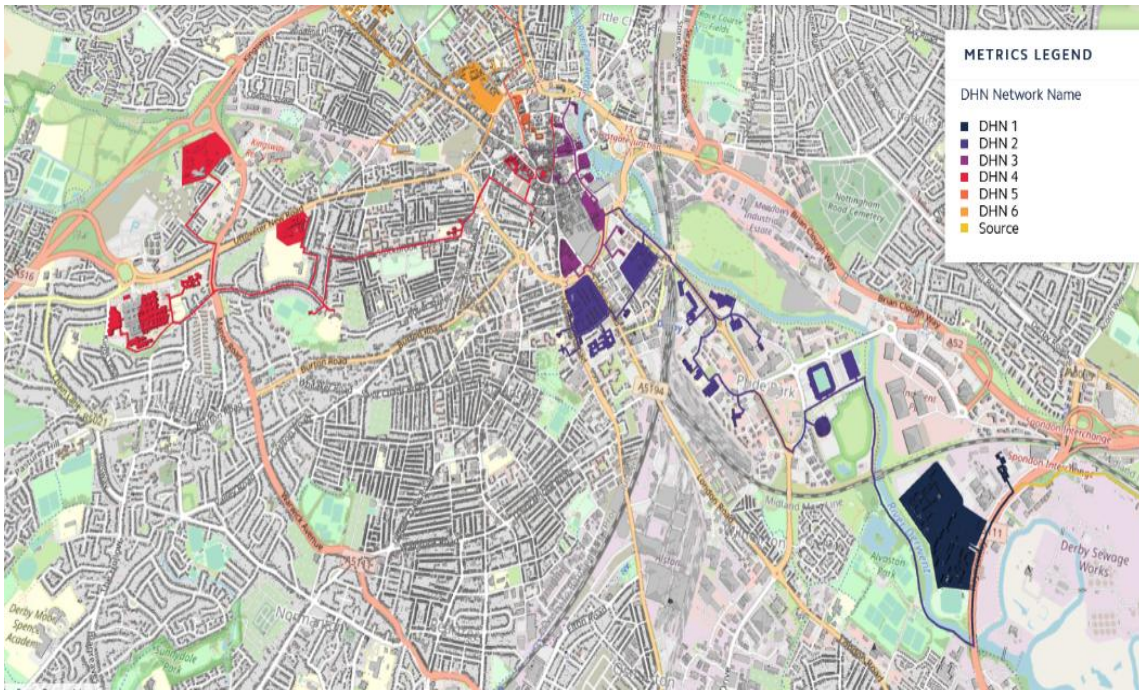


Figure 7.10 above illustrates the proposed 1Energy plan for the heat network, including the pipe route and identified anchor loads. The network will initially focus on key anchor loads such as public sector institutions and large industrial facilities, before expanding to serve private sector

and domestic housing customers. The proposed anchor load customers are expected to act as primary off-takers, and their respective proportions of total heat demand are Table 7.2 below:

Table 7.2: Proposed Key off-takers

Anchor Load	% of total Demand
Royal Derby University Hospital	12%
University of Derby	17%
Derby City Council	18%
Derby College	5%
Private Sector	29%

7.3.2 Policy and Market Drivers

The UK Heat Network Zoning (HNZ) Regulations[34], which are due for rollout out in 2026 (however, keep being pushed back) under the Energy Act 2023, could be a key catalyst for local heat network delivery across Derby City. HNZ will define areas where heat networks represent the lowest-cost decarbonisation pathway, and within these zones certain building types, such as large public, commercial, and multi-residential developments, will be required or strongly encouraged to connect.

For local authorities, zoning provides clear spatial and policy signals about where networks are technically and economically viable. Embedding this framework allows the city to align heat-demand mapping, anchor-load identification, and spatial planning policy with designated zones. This integration helps to:

- Direct investment and development activity toward areas with strongest heat network potential
- Secure anchor connections from public-estate or regeneration sites
- De-risk private-sector investment by demonstrating long-term demand certainty
- Strengthen funding bids to programmes such as the Green Heat Network Fund (GHNF)

Alongside the introduction of national consumer-protection and technical-performance standards, Heat Network Zoning will create a more stable and transparent market for heat network projects. By incorporating these policy mechanisms, Derby City can ensure that heat networks are developed as part of a coordinated, place-based energy and planning strategy, supporting net-zero targets while enabling predictable, low-carbon heat for communities and businesses.

7.3.3 Next Steps

To fully realise this opportunity, coordinated action will be essential across stakeholders. Key priorities include supporting zoning implementation, securing anchor load commitments, and aligning local planning and development policies with heat network rollout. As networks expand, they are expected to become a cornerstone of sustainable infrastructure in Derby City, enabling future connections and integration of additional renewable and low-carbon technologies.

[34] Heat network zoning - GOV.UK

8 Industrial Decarbonisation

This section examines the current industrial process loads across the area and models the expected changes in energy sources required to achieve full decarbonisation. Data from the government and Gas Distribution Network (GDN) has been used to map existing process loads. The analysis assumes that most low-temperature process loads will transition to electrification, while the majority of high-temperature process loads will require a shift to hydrogen.

8.1 Methodology

To analyse the industrial process loads currently operating in Derby City, metered gas data for the non-domestic sector was obtained from the government and Gas Distribution Network at a high level. Local knowledge and further investigations were then conducted to derive an approximate view of which organisations were most likely to be the highest gas users in the given areas. This provides information on the gas consumption of each connection to the gas network from a non-domestic building. Across the region, the top 200 non-domestic gas users were selected for further analysis, representing 68% of total non-domestic gas demand. Of these, 26 sites are within the Derby City.

The primary use of each connection is determined from their standard industrial classification (SIC) code, which is an internal numbering system used by GDN to indicate the use of each commercial and industrial connection. A description of the primary uses matched to each code has also been provided by GDN to facilitate this process. Each SIC code primary use that is present in the area is then assigned as either low temperature, or high temperature, based on information gathered directly from stakeholders or site owners during one-on-one engagements with high energy users or industrial operators. Where such stakeholder input was unavailable, an informed assessment is made of the degree of heat required for the majority of process loads for that specific industry.

From the above process, the existing low and high temperature process loads of the major gas consumers in the area can be modelled and mapped at MSOA level. These loads are then used to calculate the projected requirements for additional electricity and hydrogen demand required to decarbonise low temperature and high temperature process loads respectively, through phasing out industrial fossil fuel use.

To model the projected changes in energy consumption and the associated carbon emissions for industrial process loads, the analysis assumes that all low-temperature process loads will transition to electrification, while all high-temperature process loads will convert to hydrogen. It is important to note that the low-temperature category includes certain industries that do not currently have cost effective technology available on the market to electrify but likely will within the next ten years or so. The high-temperature category generally refers to processes requiring heat in the range of 150°C to 200°C.

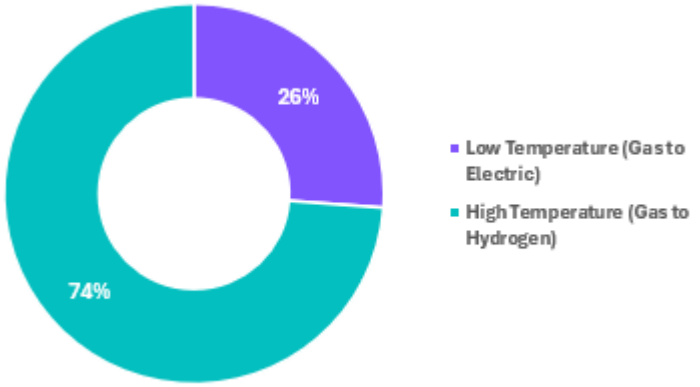
Given the level of data granularity available, the analysis should be considered most representative at the Local Authority level rather than on a site-by-site basis. Further engagement with large industrial energy users will be required over the delivery timeframe of the LAEP in order to better understand their specific requirements for low-carbon energy sources.

8.2 Overview of Key Industrial Sectors

Derby City's economy has a strong concentration of manufacturing and advanced engineering activities, alongside significant employment in wholesale and retail trade, health services, and professional and technical services. Manufacturing is one of the city's largest employment sectors, reflecting the presence of established large-scale industrial and engineering sites. The city benefits from strategic connectivity via the A52 and A38, with access to the M1 corridor supporting industrial operations and associated logistics activity. Based on Office for National Statistics local authority economic data[35]. The largest industrial gas users in Derby City are typically single-occupancy manufacturing and engineering facilities with energy-intensive processes, resulting in relatively high and concentrated gas demand profiles. However, a number of large gas connection points are associated with multi-occupancy industrial estates, which comprise a mix of manufacturing, storage, and service-based uses. This limits the ability to attribute gas consumption to specific activities and complicates assessment of underlying demand characteristics within these locations.

8.3 Existing System

Figure 8.1: Breakdown of process loads by energy demand



Source: Mott MacDonald Analysis of metered data from the government and Gas Distribution Network

Figure 8.1 above illustrates the current natural gas consumption for industrial process loads in Derby City, segmented into low-temperature and high-temperature categories. Notably, high-temperature processes dominate, accounting for 74% of total industrial gas use, while low-temperature processes make up the remaining 26%. This disproportionate share is largely driven by Derby's industrial landscape, which includes major energy-intensive operations such as Rolls-Royce, SmartParc, and Reckitt. Together, these industries represent 73% of all non-domestic process load gas consumption in the city. A detailed breakdown of the top non-domestic gas-consuming sites, including annual consumption and associated carbon emissions, is provided in Appendix B.

Given this context, the path to decarbonisation must be tailored to the nature of the thermal demand. High-temperature processes, due to their intensity and technical requirements, are less amenable to electrification and will likely require low-carbon hydrogen as a viable alternative. In contrast, low-temperature processes, which generally involve heating below 100

[35] GVA by industry by local authority - Office for National Statistics

degrees Celsius are more suitable for electrification, especially with the increasing availability of renewable electricity. This distinction is crucial for developing targeted strategies to reduce industrial emissions.

8.4 Decarbonisation Requirements

The rate of conversion for process loads from natural gas to hydrogen and electricity is based on the Climate Change Committee's 7th Carbon Budget advice to government, which sets out a pathway for the uptake of hydrogen and electrification for industrial loads that is compatible with 2050 Net Zero. The detailed uptake rates and associated demand levels for the 2050 Net Zero scenario are shown in Figure 8.2. Whilst local authorities included within the LAEP preferred the Net Zero by 2040 scenario, it was acknowledged that industrial processes largely fall into the 'hard-to-abate' category, with the means to decarbonise (e.g. East Coast Hydrogen) still in the distant future.

	Hydrogen		Electrification	
Year	Annual % Conversion	Annual Conversion (GWh)	Annual % Conversion	Annual Conversion (GWh)
2025	0%	0	1%	0
2026	0%	0	1%	1
2027	0%	0	2%	2
2028	0%	0	2%	4
2029	0%	0	4%	6
2030	2%	0	6%	10
2031	2%	6	6%	17
2032	2%	11	6%	23
2033	4%	17	8%	29
2034	4%	28	8%	38
2035	4%	39	8%	46
2036	8%	50	8%	54
2037	8%	72	8%	63
2038	8%	94	8%	71
2039	8%	116	4%	79
2040	8%	139	4%	84
2041	8%	161	4%	88
2042	8%	183	4%	92
2043	6%	205	2%	96
2044	6%	222	2%	98
2045	6%	238	2%	100
2046	4%	255	2%	102
2047	4%	266	0%	104
2048	0%	277	0%	104
2049	0%	277	0%	104
2050	0%	277	0%	104

Figure 8.2: Annual conversion rates of process natural gas demand in the Net Zero by 2050 scenario

The introduction of hydrogen as a significant low-carbon fuel is aligned to the planned timeline of the East Coast Hydrogen pipeline extension into the area, around the mid-2030s, with the opportunity for some conversion to hydrogen prior to this through the use of local delivery. It is important to note that the emissions reductions associated with conversion of processes to hydrogen depends largely on the emissions-intensity of the hydrogen production process. Additionally, hydrogen is in itself a potent greenhouse gas[36], so while it may not produce CO2 emissions in combustion, careful control and monitoring of leakage will be important to any implementation of hydrogen in processes.

Figure 8.3 shows the projected consumption of gas, electricity and hydrogen for process loads across the top industrial natural gas users.

[36] Global warming potential estimates for hydrogen vary but are around 10, meaning that over a 100-year period it would result in approximately 10 times the warming of the same mass of carbon dioxide.

Figure 8.3: Process Load Energy Consumption Projection

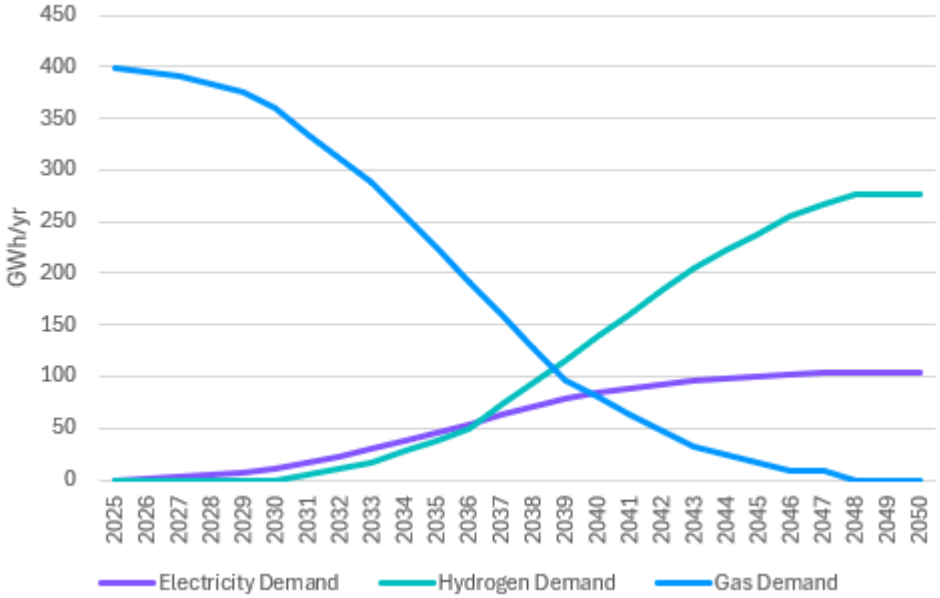


Table 8.1: Summary of Process load Emission Post Fuel Switch

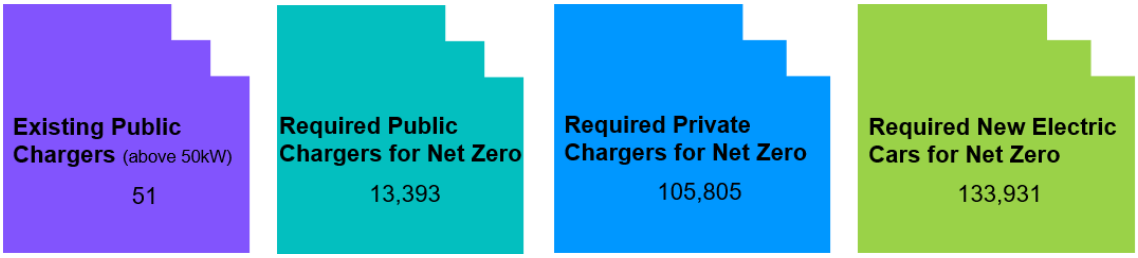
Gas Consumption for Process Use (MWh)	Total Current Process Load Emissions (tCO2e)	Electrical Emissions post fuel switch (tCO2e)	Hydrogen Emissions Post Fuel Switch (tCO2e)	Total Process load Emissions Post Fuel Switch (tCO2e)	Percentage Reduction (%)
399,244	73,022	731	21,222	21,954	70%

Table 8.1 provides a breakdown of carbon emissions from process loads after the removal of fossil fuels, showing the respective contributions of electricity and hydrogen consumption. Electrifying process loads wherever feasible is essential because electricity generally has a lower carbon intensity than green hydrogen, which is assumed here to have an emissions intensity of 0.072 kgCO2e/kWh.

To ensure a structured and timely transition, all industrial companies in Derby City should develop comprehensive decarbonisation plans. These plans should clearly specify when each fossil-fuel-based process will be phased out and identify which alternative energy source, electricity or hydrogen, will replace it. Such planning is critical for achieving cost-effective, reliable, and sustainable industrial decarbonisation, including through leveraging a coordinated approach to developing a local and regional hydrogen supply chain.

9 Electrification of Private Transport

This section outlines the current state of transport emissions in Derby City and the role electrified transport plays in reducing these. This section details the interventions modelled in the net-zero aligned scenarios to achieve decarbonisation of private vehicles.



9.1 Existing System

Transportation accounted for 40% of Derby City's emissions[37] in 2023, so supporting the decarbonisation of this sector is crucial to enable net zero achievement.

The scope of this LAEP (set out in Section 1.3) does not include transport planning, therefore this chapter focuses on the uptake of private electric vehicles only, as a key part of the transport sector decarbonisation challenge.

As of Q3 2025, the total number of licenced vehicles in Derby is 119,853[38] 96.0% of which are petrol or diesel internal combustion engine (ICE) vehicles. The number of licensed vehicles is expected to remain similar to current day volumes. Despite population growth increasing the total number of people who could have a vehicle, it is expected that future modal shifts will reduce the likelihood that an individual will own a vehicle, resulting in no material net change in overall volume.

Electric Vehicles (EVs) produce zero tailpipe emissions, which contributes to improved local air quality by not contributing to the levels of nitrogen oxides and particulate matter typically emitted by internal combustion engine vehicles. Therefore, expanding the current proportion of EVs to beyond its current level of 4% in the Derby City fleets is key to reducing the emissions from private transport.

9.2 Local Context

Derby City Council has been awarded £776,150 of funding from the Department for Transport to deliver additional active travel measures across the city as part of its Active Travel Fund – Part 2, under the Moving Derby Forward Programme. If successfully implemented, these measures can help reduce demand on the electricity grid by encouraging alternatives to EV use. The Moving Derby Forward Programme comprises four schemes that aim to promote active travel, reduce traffic congestion, and encourage cycling. These longer-term measures will be implemented at several key locations across the city

The UK's Department for Transport has support mechanisms in place for local authorities such as Derby to increase its EV charger roll-out. In September 2023, it partnered with 14 Local Authorities for a total of £40.3million as part of the government's Local Electric Vehicle

[37] UK local authority and regional greenhouse gas emissions statistics, 2005 to 2022 - GOV.UK

[38] Vehicle licensing statistics data files - GOV.UK

Infrastructure (LEVI) Fund. Research from DfT[39] shows that in a survey of 1,000 people without access to off-street parking, "requiring more deviation from current parking and refuelling behaviours… is a major barrier when thinking about transitioning to an [EV]". Of options presented to the respondents, running a cable from home or near-home on-street charging scored best, with rapid charging stations or workplace charging following closely behind.

In addition, according to Midlands Connect[40] the Midlands could have over 2 million electric vehicles (EVs) on the roads by 2030, with 32.5% of all vehicles expected to be electric. To support this growth, 58,997 new public EV charging points will need to be installed across the region by the end of the decade. This translates to 27 new charging points per day, 194 per week, and 9,832 each year until 2030.

In Derby and Derbyshire, EV adoption is projected to increase by 440%, rising from 12,216 vehicles today to approximately 65,915 by 2030. Achieving this growth will require a significant expansion of public charging infrastructure to meet increasing demand. The research forecasts showed Derby and Derbyshire requiring a further 6,949 public charging points by 2030 to support the increase in EV use over the next decade, a 1,534% increase from the 453 chargers existing across the region today.[41]

The Derbyshire Low Emission Vehicle Infrastructure (LEVI) Strategy aims to improve the regional situation by bringing particular focus to electric vehicles and setting specific targets to make EV ownership easier and less complex more affordable. The LEVI also aims to develop rapid and ultra-rapid charging hubs to support commercial and long-distance travel, and to strategically deploy infrastructure in residential, destination, and transit locations.

9.3 Do Nothing

The Do-nothing scenario represents the best estimate of outcomes before the LAEP is implemented. In terms of modal shift (people switching to more sustainable modes of travel), this scenario assumes uptake is influenced solely by current mandated policies. As of 2025, these policies in the UK include the ban on the sale of new internal combustion engine (ICE) vehicles from 2030, as well as the Zero Emission Vehicle (ZEV) mandate, which requires vehicle manufacturers to sell an increasing proportion of zero-emission vehicles each year[42].

Whilst these existing policies would lead to the continued growth in trends of EV ownership, the insufficient charging infrastructure and lacking policy support would lead to limited progress towards decarbonisation. This highlights a significant scale of action would be required to shift the region away from reliance on petrol and diesel vehicles.

To evaluate this scale of intervention required, Midlands Connect conducted modelling to examine a business-as-usual scenario (BAU) through to 2050, as illustrated below.[43]

[39] DfT (2022) Public Electric Vehicle Charging Infrastructure, Deliberative and quantitative research with drivers without access to off-street parking https://assets.publishing.service.gov.uk/media/6234a51f8fa8f540edba36f1/public-ev-charging-infrastructure-research-report.pdf

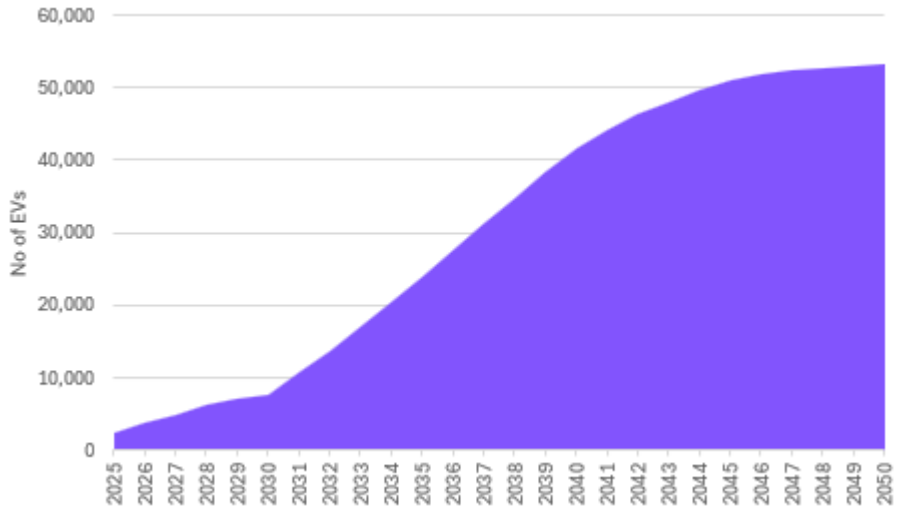
[40] Midlands Connect - Midlands still on track for EV boom, according to new research

[41] Derby and Derbyshire on track for EV boom - Derby City Council

[42] Phasing out sales of new petrol and diesel cars from 2030 and supporting the ZEV transition - GOV.UK

[43] STB EV Charging Infrastructure Visualiser

Figure 9.1: Do nothing EV Uptake Scenario



Source: Mott MacDonald analysis based on Midlands Connect Business-as-Usual and Accelerated EV uptake projections

The Do-nothing estimates that 53,276 electric vehicles will be adopted by 2050 in Derby, representing 44% of currently licensed vehicles. Demonstrating that under existing policy conditions, the region is likely to fall considerably short of transitioning its entire vehicle fleet to zero-emission alternatives.

The Midlands Connect BAU scenario reflects projections based on current government policies that are confirmed and funded, as well as exogenous factors influencing adoption rates. This scenario anticipates that growth in the electric vehicle market will largely be shaped by factors such as national legislation and the natural turnover of the vehicle fleet. As this BAU scenario aligns with the criteria of the Do-nothing scenario within this LAEP, it has been adopted as the modelled Do-nothing scenario.

For the purpose of this LAEP, net zero is a requirement under different timescales, and this will mean an EV uptake in line with net zero targets. Therefore, to represent this, separate modelling was undertaken to forecast EV uptake in Derby City by 2040 and 2050, in line with the Climate Change Committee's Seventh Carbon Budget.

9.4 Modelling Methodology

The modelling approach drew on 2021 ONS population data for Derby City's MSOAs to determine the existing number of cars per area using a cars per capita assumption derived from midlands data.[44] By apportioning this national projection according to the region's population, the analysis provides locally specific estimates of EV uptake.

The uptake trends were modelled using the Climate Change Committees seventh carbon budget[45]. The CCC pathway is slightly more ambitious than the EV mandate through to 2035, citing reductions in EV costs as making this achievable. This pathway results in 97.5% of cars being battery electric by 2050. A large portion of the remaining 2.5% of cars is covered by other zero emission vehicle types including hydrogen fuel cell and biofuels. The final 1% of current

[44] Middle layer Super Output Area population estimates (supporting information) - Office for National Statistics

[45] https://www.theccc.org.uk/wp-content/uploads/2025/02/The-Seventh-Carbon-Budget.pdf

transport emissions (made up of classic cars and 15-year-old ICE cars still in operation in 2050) is covered by nationally engineered removals like carbon capture.

To estimate the number of public EV chargers needed, a ratio of public chargers to EVs was taken from Midlands Connect 'Supercharging the Midlands' report[46] which cites 1-in-10, suitable. As chargers are seen as a necessary precursor to mass EV adoption, the uptake curve of public chargers matches the uptake in EVs. Keeping the pace of charging infrastructure roll-out in line with growth in EVs is fundamental to growing public confidence in the viability of EV ownership and therefore achieving the emissions reductions required in private transport.

Similarly, private charger projections were derived using the EV uptake and an EV to private charger ratio based on Zapmap data and an assumption that development in cross pavement charging will enable the percentage of private charger installations to remain the same at 79%, even as uptake spreads further beyond households with off-street parking[47]. Further details of the assumptions used within the modelling are provided in Appendix B.

For the 2040 scenario (2040), the same uptake curve has been used accelerating from 2032, reaching the same final total volume as the 2050 scenario, ten years earlier. The total abated emissions differ from the 2050 scenario due to the changing grid emission intensity factor, across the transition timeline.

For the Do Nothing scenario (DN) the uptake curve has utilised the Midlands Connect BAU data. The annual percentage vehicle uptake in BAU compared to their accelerated uptake, is applied to our 2050 scenario uptake. For example, for the year 2050 the BAU scenario only has 40% of the volume of EVs in the accelerated uptake scenario, thus a factor of 40% is applied to the 2050 volume of EVs in our 2050 scenario to obtain the Do Nothing 2050 uptake value.

Relevant datasets used in the EV modelling are listed in Appendix B.

9.5 Results

The EV uptake required from the present day is 133,931 vehicles to meet the 2040 and 2050 Net Zero scenarios. This level of uptake represents a significant proportion of the region's current vehicle fleet, with the 2040 scenario requiring over 82% of the existing fleet to be replaced by 2035, compared to 59% under the 2050 scenario. To provide a sense of scale a quick calculation based on SMMT[48] and government[49] data shows that there are nearly 2 million cars registered a year and ~34 million cars licensed, resulting in an expected renewal rate to 2035 of 57% of the total car fleet. As this uptake will take place before the ban of the sale of new ICE vehicles, it will require significant additional coordinated policy interventions, incentives, and investment in supporting infrastructure to reduce the amount of fossil-fuel lock-in during this period.

Figure 9.2 shows the number of public and private EV chargers required in Derby City under the modelled scenarios to support EV uptake.

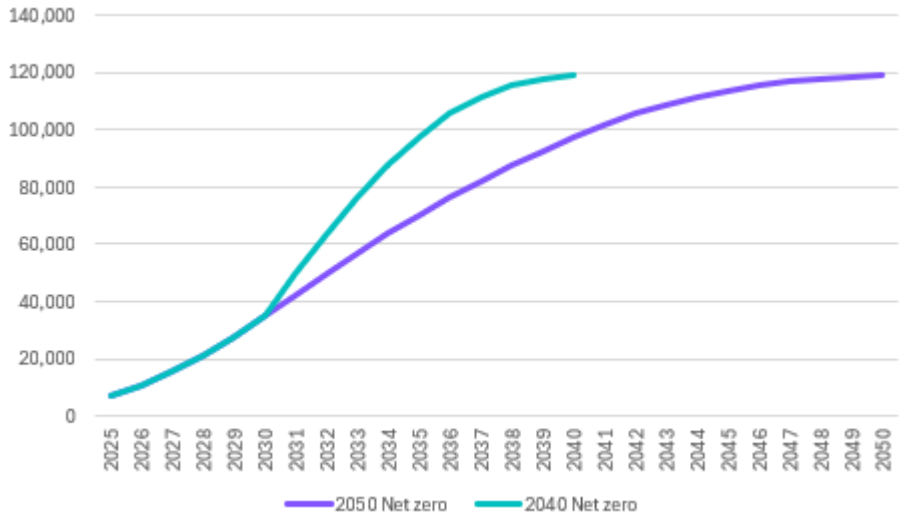
[46] https://www.midlandsconnect.uk/media/i1spcsr1/mc-supercharging-the-midlands-document.pdf

[47] Home and community EV charging stats

[48] 2024 (Full Year) Britain: New Car Market Overview and Analysis - Car Sales Statistics

[49] Vehicle licensing statistics, United Kingdom: 2024 - GOV.UK

Figure 9.2: Required Number of public and private chargers



As described in Section 9.4, this figure was derived from the 2025 ratio of EVs to private chargers, with the assumption that this proportion remains constant through to 2050. This reflects the expectation that many EV owners will prefer to have access to their own charger to ensure reliable charging.[50]

Alongside private chargers, public chargers play an important role in ensuring that charging points are accessible to all road users and giving drivers confidence in undertaking longer journeys. The LAEP pathway highlights that the rollout of public charging infrastructure must keep pace with the uptake of electric vehicles.

A total of 105,805 private and 13,393 public chargers were modelled for Derby City to support the EV uptake for the 2040 and 2050 scenarios. This indicates a vast and comprehensive charging infrastructure would be required, with a broad distribution of chargers throughout the region to meet necessary charging needs. Charging points should be placed across the region so that they are accessible within a short distance, with placement decisions based on anticipated demand.

9.6 Impacts

9.6.1 Grid Impact of EV Infrastructure

Derby City will require more electricity to power these new EVs. It is key to determine which areas should take prioritisation when selecting the areas for continued EV charge point growth. Areas with high population densities, large coverage of flats and terraced housing, correlating with low percentages of off-street parking should take priority.

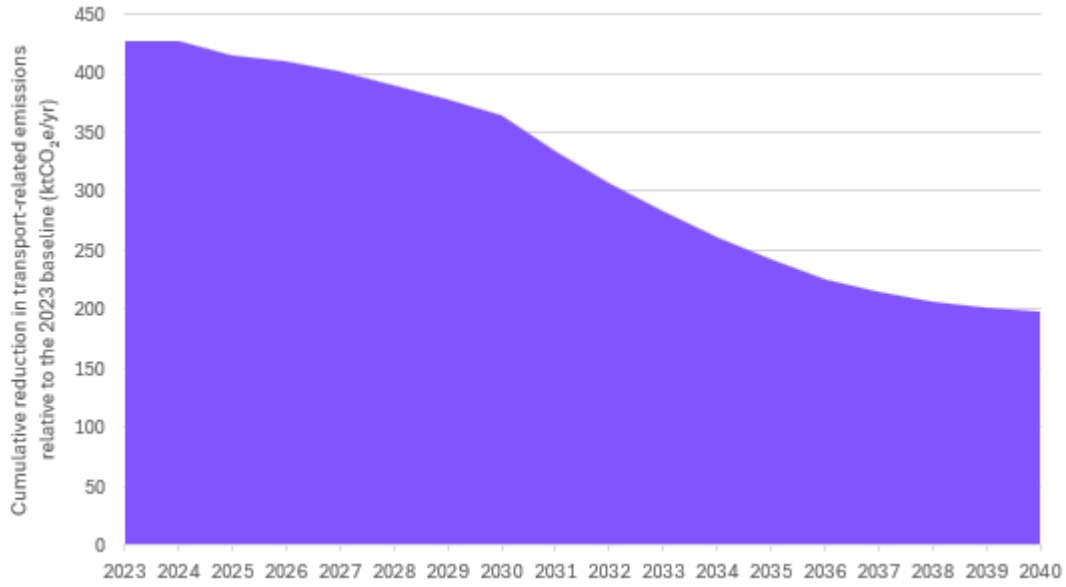
It will be crucial to work collaboratively and openly with the local Grid to ensure the region's grid is equipped to incorporate the extra demand increase EV use will bring, as well as the opportunities in Vehicle-to-Grid electricity storage flexibility. Please refer to Section 10 to find more information regarding impacts to the grid infrastructure.

[50] Electric vehicle (EV) driver behaviours and attitudes tracker - GOV.UK

9.6.2 Carbon Impact of EV Infrastructure

Figure 9.3 shows the cumulative reduction in transport-related emissions relative to a 2023 baseline, reflecting the impact of transitioning private vehicles from ICEs to electric vehicles.

Figure 9.3: Total Abated Emissions from the transition away from Internal Combustion Engines ($ktCO_2e$/year)

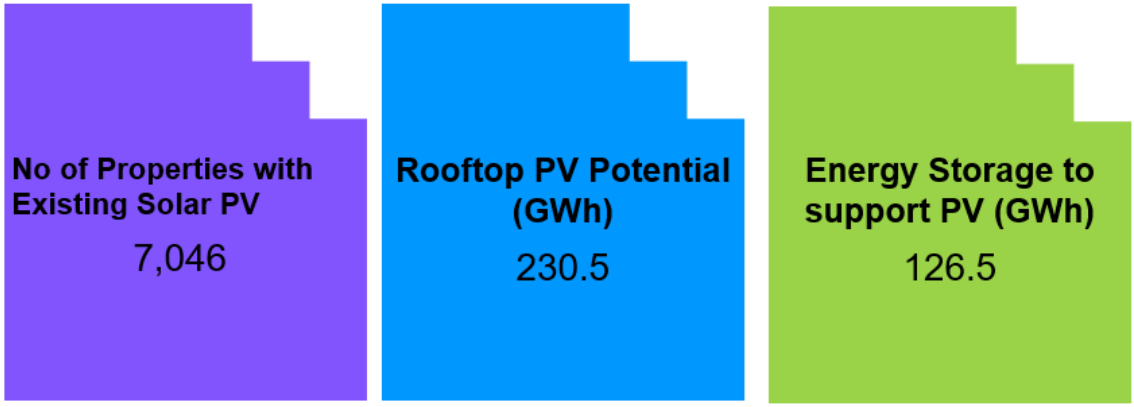


The analysis indicates that widespread uptake of electric vehicles could reduce transport related emissions by approximately 54%. Given that transport currently accounts for around 40% of Derby's territorial emissions, this reduction in private vehicle emissions alone is equivalent to approximately 21.6% of Derby's current total emissions. As the analysis does not account for decarbonisation of public, commercial, or freight vehicles, the overall emissions reduction from the transport sector would be expected to increase further as these vehicle types transition to low-carbon alternatives.

The results reflect abated emissions across the vehicle fleet and are driven by two primary factors: increased uptake of electric vehicles and the ongoing decarbonisation of the electricity grid. Under the 2040 and 2050 scenarios, average emissions per vehicle are projected to fall to 59 $kgCO_2$/year and 46 $kgCO_2$/year, respectively, from 1,641 $kgCO_2$/year in 2025. The slightly higher emissions intensity in the 2040 scenario reflects a higher assumed average electricity grid carbon intensity compared with 2050.

10 Local Generation

This section outlines the opportunity to deploy local generation to support the net zero scenarios for Derby City. Overall, the generation considered in the LAEP is that likely to have local impacts, such as behind-the-meter solar PV and community energy schemes where the output is consumed locally. Utility-scale generation, which contributes to overall electricity grid decarbonisation is not considered within this LAEP.



10.1 Existing System

Derby City's electricity demand is primarily met by the national grid, while heat demand is mostly supplied by the national gas grid, and 6% of properties are off-gas-grid.[51] Most of the energy consumed in Derbyshire is sourced from outside the region, with local generation in 2021 totalling approximately 270.5 MW, mainly from renewable sources such as solar PV (76.2%), onshore wind (10.3%), and energy from waste (10%).

Most of the energy consumed in the city is sourced externally, with limited local generation currently in operation. While granular asset-level data for Derby City is not publicly available, regional datasets provide useful proxies. Based on the Embedded Capacity Register and the Renewable Energy Planning Database (REPD), the combined local generation capacity across Derby City includes 40.3MW of solar and 15.3MW of onshore wind, however a further 20MW is under construction and 60MW in the pipeline.

While there is no policy mandating installation of rooftop solar on homes, recent trends [52] show that this has been expanding in the region, with 900 homes being fitted with rooftop solar PV panels since 2022 which has resulted in almost 2 GWh of electricity generated and 800 tonnes of carbon saved.

10.2 Do Nothing

As outlined in Section 1, opportunities for large-scale distributed generation connected at distribution and transmission levels have been excluded from this LAEP analysis. These assets contribute to the national energy supply, and their associated emissions are already accounted for in the carbon intensity factors used for electricity consumption.

[51] https://www.derbyshire.gov.uk/site-elements/documents/pdf/environment/planning/derbyshire-spatial-energy-study.pdf

[52] https://datadashboard.mcscertified.com/InstallationInsights

Derby City's LAEP therefore focuses on distribution-connected and locally influenced generation, such as rooftop solar and community-scale renewables. While there is currently no legislation mandating local generation, the government's clean power action plan does set out ambition for high level regions.

10.3 Context

Derbyshire's spatial energy strategy states that in terms of electricity supply, Derbyshire could develop between 50 and 300 MW of low carbon energy generation by 2040, including domestic and commercial solar PV, onshore wind, and supporting technologies like battery storage. This could meet up to 19% of electricity demand if deployed on domestic, commercial and industrial rooftops across the county, according to the Derbyshire Spatial Energy Strategy.

Battery Energy Storage Systems (BESS) present a promising opportunity for supporting the decarbonisation of Derby City's energy systems, particularly at the domestic and commercial scale. When paired with rooftop solar PV, BESS can help maximise self-consumption of locally generated electricity, reducing reliance on the grid and improving energy resilience.

Rooftop PV generation is expected to expand across Derby, contributing to the city's electricity capacity. According to the Derbyshire Local Energy Plan, the region may require up to 180MW of electricity storage capacity to meet future energy demands.

10.4 Intervention Methodology

A suitability assessment was undertaken using the calculated areas of rooftop space available and orientation of each building. The analysis assumes that solar PV panels could be optimally installed on 25% of feasible South, South-East, and South-West facing rooftops across Derby City. This includes both domestic and non-domestic buildings. Suitability was determined based on roof orientation, size, and shading constraints with common architectural features such as hipped/gabled roofs, chimneys, and skylights reducing the number of viable installations. This approach draws on insights from previous R&D-funded projects focused on rooftop solar feasibility.

Under these assumptions, rooftop PV could enable up to 160 GWh of generation from domestic properties and 70.5 GWh from non-domestic buildings annually.

The average efficiency of solar panels is modelled at 18%. Domestic and non-domestic buildings are categorised as either single or multi-dwelling/unit, and total energy generation is calculated for each roof orientation (south, southeast, and southwest).

Although specific battery capacities (in terms of energy and power) are not calculated, it is assumed based on UK research that 45% of the photovoltaic energy yield is used by the building, while the remaining 55% is stored for later use. This storage capacity could be provided by a mix of technologies, such as home batteries or vehicle-to-grid connections. The share of storage to PV is representative at the local authority level, rather than at the individual property level, to allow for the flexibility in consumer choice and energy usage patterns.

10.5 Scenarios

Figure 10.2 illustrate the annual yield of domestic and non-domestic rooftop solar PV installations for the 2040 Net Zero. The modelling assumes 100% uptake of eligible properties, defined as South, South-East, and South-West facing rooftops with suitable characteristics (see Section 10.4 for details). The uptake is projected to be fully realised by 2035 and 2040 for the 2040 and 2050 scenarios, aligning with the UK's anticipated grid decarbonisation and

maximising the carbon reduction potential of rooftop solar generation. The detailed uptake rates are shown in Figure 10.1.

Year	Annual percentage uptake	Annual uptake (MWh)
2025	0%	0
2026	1%	2,307
2027	2%	4,614
2028	4%	9,228
2029	9%	20,763
2030	18%	41,526
2031	25%	57,674
2032	18%	41,526
2033	13%	29,991
2034	10%	23,070
2035	0%	0
2036	0%	0
2037	0%	0
2038	0%	0
2039	0%	0
2040	0%	0

Figure 10.1: Rooftop PV annual uptake of installations in preferred scenario

Since the carbon intensity of the electricity grid is expected to decline significantly by 2035, the greatest carbon benefit from rooftop PV occurs when installations happen before full grid decarbonisation. Beyond this point, the marginal carbon savings from additional rooftop PV diminish.

Nonetheless, local expansion of grid capacity and generation capability will continue to bring benefits such as reducing grid connection and capacity constraints, particularly as electrification increases through technologies like space heating and EV charging. It also enhances demand-side response resilience, especially when paired with local storage capacity.

Recent market analyses suggest that the cost of solar PV panels and battery storage systems is continuing to decline, driven by technological advancements, economies of scale, and supportive policy frameworks. For example, capital expenditure for battery energy storage in Great Britain has fallen by 30% since 2022, and further reductions are expected over the next five years. Global forecasts also indicate that battery storage costs could drop by up to 40% by 2030[53], making solar-plus-storage systems increasingly competitive with conventional energy sources.

In the context of this modelling, these cost trends support the assumption that solar PV and battery systems may become cost-effective for a majority of households within the next 5–7 years. This assumption influences the uptake trajectory in the net zero scenarios, where widespread adoption is required to meet carbon reduction targets.

The affordability of these technologies is a key enabler for achieving Derby City's net zero targets, particularly in residential sectors where decentralised energy generation and storage can reduce grid dependency and enhance local energy resilience.

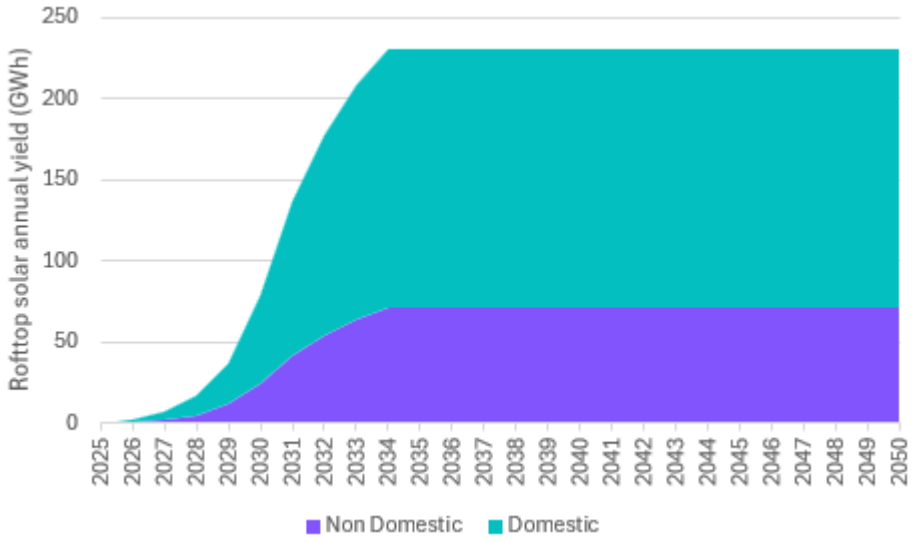
There is currently no direct funding available from the UK Government for domestic solar PV installations, which presents a significant barrier to uptake, not only for fuel-poor households, but also for middle-income families who may struggle with the upfront costs. This financial barrier risks slowing down the widespread adoption needed to meet Derby City's net zero targets.

There is scope to encourage more widespread adoption of solar PV in the short term through community-owned renewable schemes, where a group of homeowners and landlords can communally purchase solar PV panels for their street or neighbourhood together. Furthermore, relatively novel technologies such as plug-in solar PV systems could be considered for properties where structural or ownership constraints limit the deployment of conventional rooftop

[53] Outlook for battery demand and supply – Batteries and Secure Energy Transitions – Analysis - IEA

solar. This helps to reduce costs through economies of scale and has the potential to save residents upfront costs and energy bills.

Figure 10.2: Domestic and non-domestic rooftop solar annual yield



As shown in Figure 10.3, the MSOAs of Wilmorton and Alvaston show significant potential for solar rooftop installations compared to other areas. The table below presents the projected annual solar PV yield for the domestic and non-domestic sectors. This would significantly reduce reliance on grid-supplied electricity, helping to lower carbon emissions and support the region's transition to net zero. The increased availability of locally generated renewable energy enhances energy resilience by reducing exposure to national energy price fluctuations and supply disruptions. Additionally, the deployment of solar PV systems across domestic and commercial buildings can stimulate local economic activity through job creation in installation, and maintenance.

Figure 10.4 also shows the 2050 electricity demand in Derby City alongside the estimated potential annual yield from rooftop solar PV across both domestic and non-domestic sectors. Based on this analysis, it is estimated that solar PV could offset approximately 25% of the electricity demand in the regions domestic sector and around 9% in the non-domestic sector. The summer seasonal nature of solar yield should be considered here though, as significant electricity demand through to 2050 will become winter seasonal due to electrification of heating, so pursuing a higher level of solar yield in the area may not offset local consumption.

Figure 10.3: Total solar capacity in Derby City by MSOA (kW)

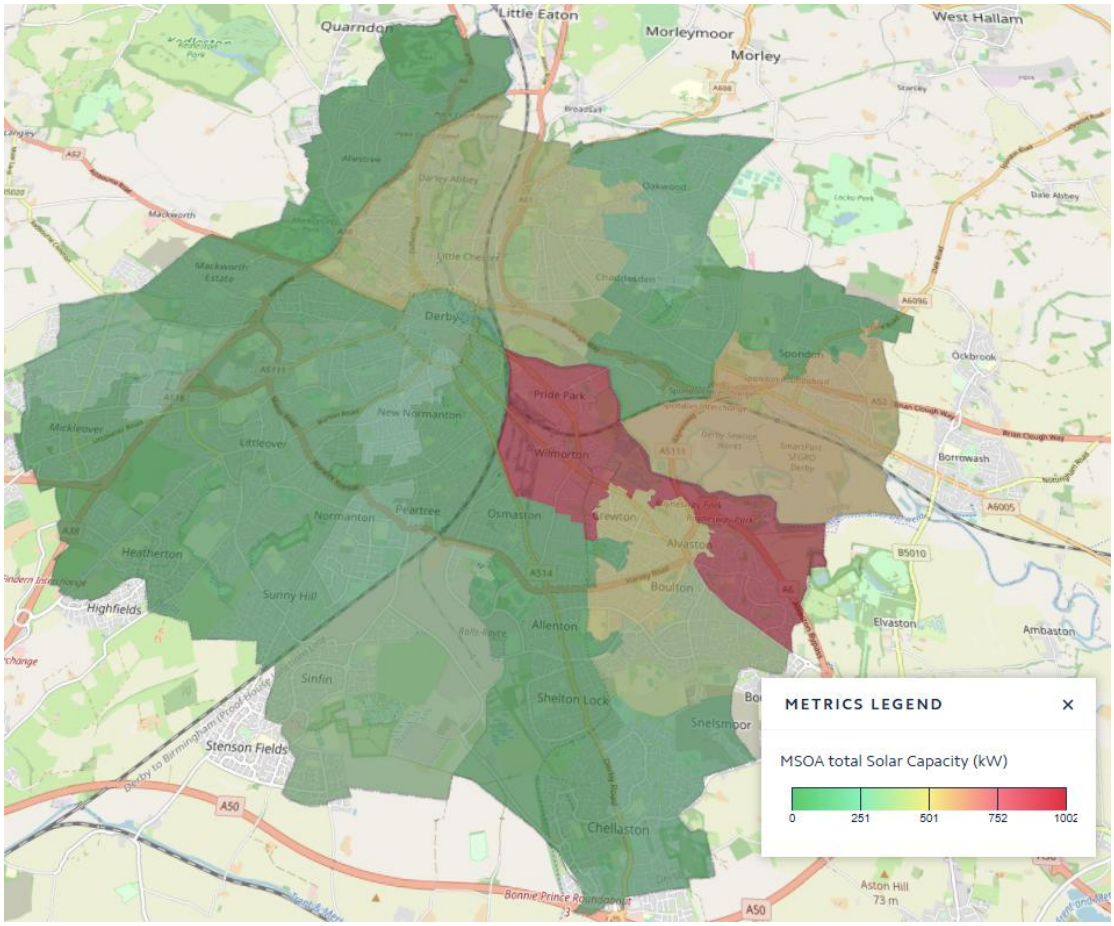
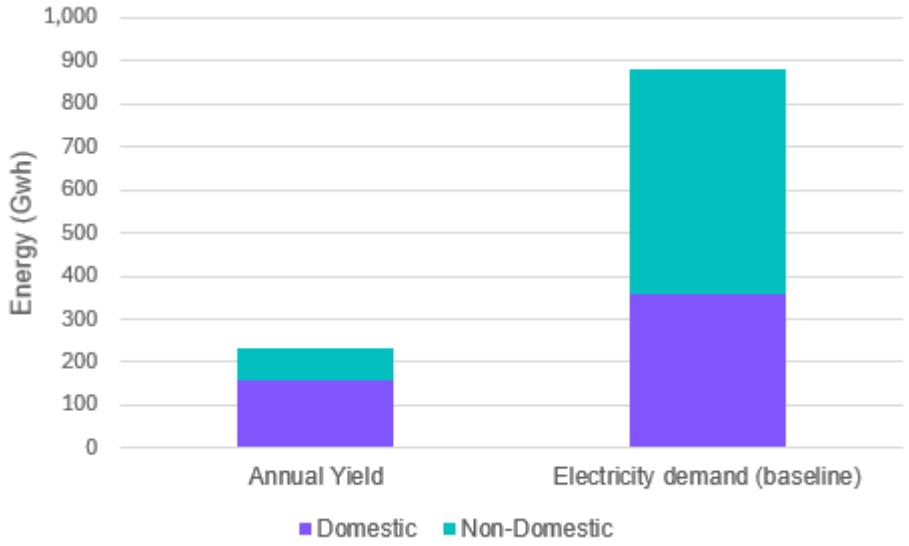


Figure 10.4: Domestic and Non-domestic Electrical Demand vs PV Potential



11 Networks, Storage and Flexibility

This section explores the current state of the electricity network in Derby City, the implications of planned infrastructure upgrades, and the impact of Low Carbon Technologies (LCTs) on local energy planning.

11.1 Existing Network Constraints

Electricity distribution across Derby City is managed by National Grid Electricity Distribution (NGED) within its East Midlands licence area. NGED is the Distribution Network Operator (DNOs) responsible for operating and maintaining the local electricity distribution network.

The local distribution network connects to the National Grid Transmission System via Grid Supply Points (GSPs), which step voltage down from 400 kV/275 kV to 132 kV. From GSPs, Bulk Supply Points (typically 132/33 kV) supply primary substations (33 kV/11 kV), which in turn distribute electricity to homes, businesses and industrial users.

The East Midlands licence area has 14 GSPs, of which the following are most relevant to Derby and South Derbyshire:

- Willington GSP: A major 400 kV/132 kV substation in South Derbyshire. It is a key node for the region and part of the proposed Chesterfield–Willington reinforcement project under the Great Grid Upgrade.
- Drakelow GSP: Located near Burton-on-Trent, serving parts of Derbyshire and Staffordshire.
- Chesterfield GSP: Important for northern Derbyshire; will connect to Willington via a new 60 km 400 kV overhead line to increase capacity for renewable energy and future demand.

Other East Midlands GSPs include Ratcliffe, Enderby, and Stoke Bardolph, which provide regional resilience. These GSPs represent critical nodes within the regional network and feature prominently in DNO Distribution Future Energy Scenarios (DFES), informing reinforcement and flexibility planning.

Demand Headroom

At secondary substation level, demand headroom can be mapped to MSOAs, as shown in Figure 11.1. Demand Headroom is an indication of the possible demand that may be connected at a substation, excluding upstream constraints, without triggering reinforcement.

Figure 11.1: Average Utilisation Factor (%)

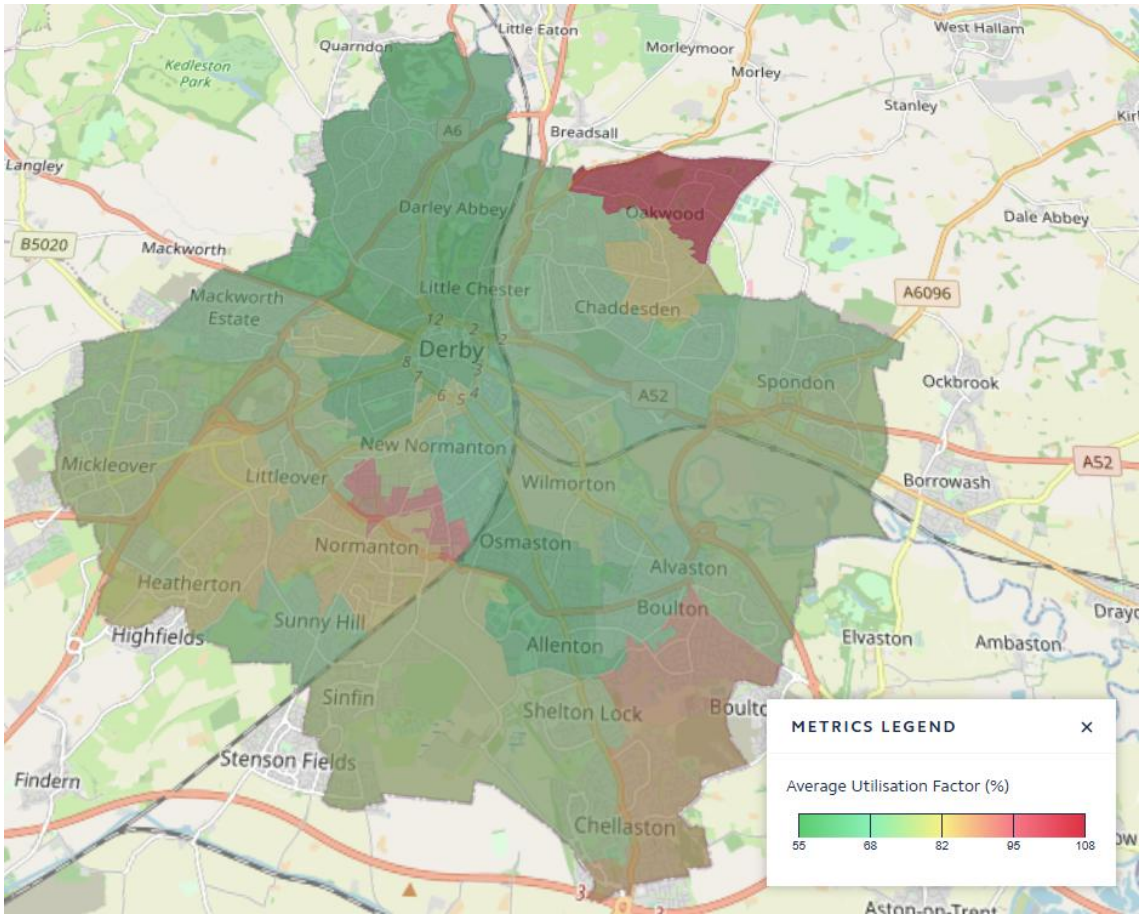


Figure 11.1 illustrates the average utilisation factor of secondary substations, representing the ratio of maximum demand to rated capacity. Higher utilisation (above 70%) indicates substations operating close to capacity and more likely to require reinforcement in the short to medium term as electrification of heat and transport accelerates.

This figure shows that on average, Derby exhibits a utilisation factor of 75%, with Oakwood and Normanton North & Peartree showing higher utilisation levels of 108% and 92%, respectively.

Areas with higher utilisation are more likely to require early reinforcement or flexibility measures. In the near term, implementation in these locations should prioritise demand reduction, including building fabric retrofit. Conversely, areas such as Little Chester show low utilisation (55%) and therefore greater capacity to accommodate early deployment of heat pumps, EV charging and distributed generation without immediate reinforcement.

Overall, this spatial variation highlights opportunities for strategic sequencing of low-carbon initiatives. Lower-utilisation areas can support early electrification, while higher-utilisation zones will require coordinated engagement with DNOs to plan reinforcement, flexibility services or demand-side management to ensure network readiness for net zero delivery.

Figure 11.2: Average Headroom (%)

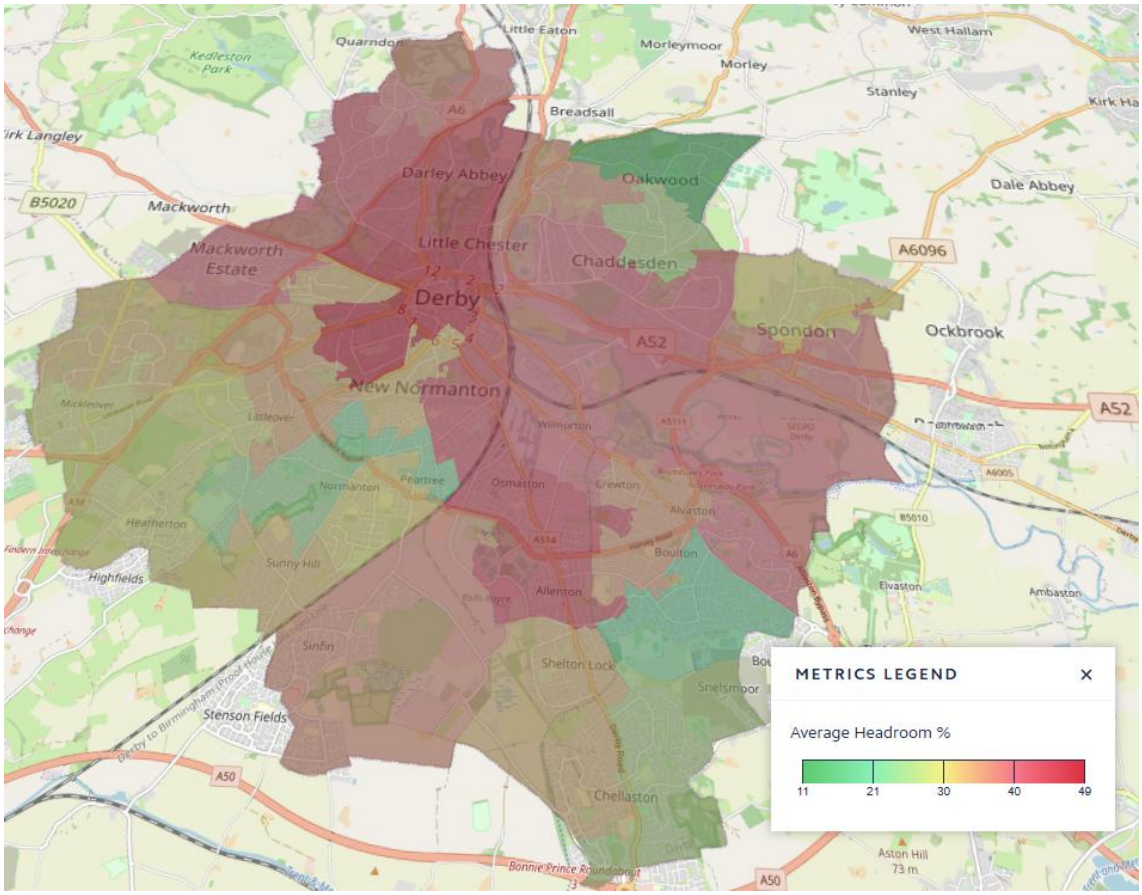
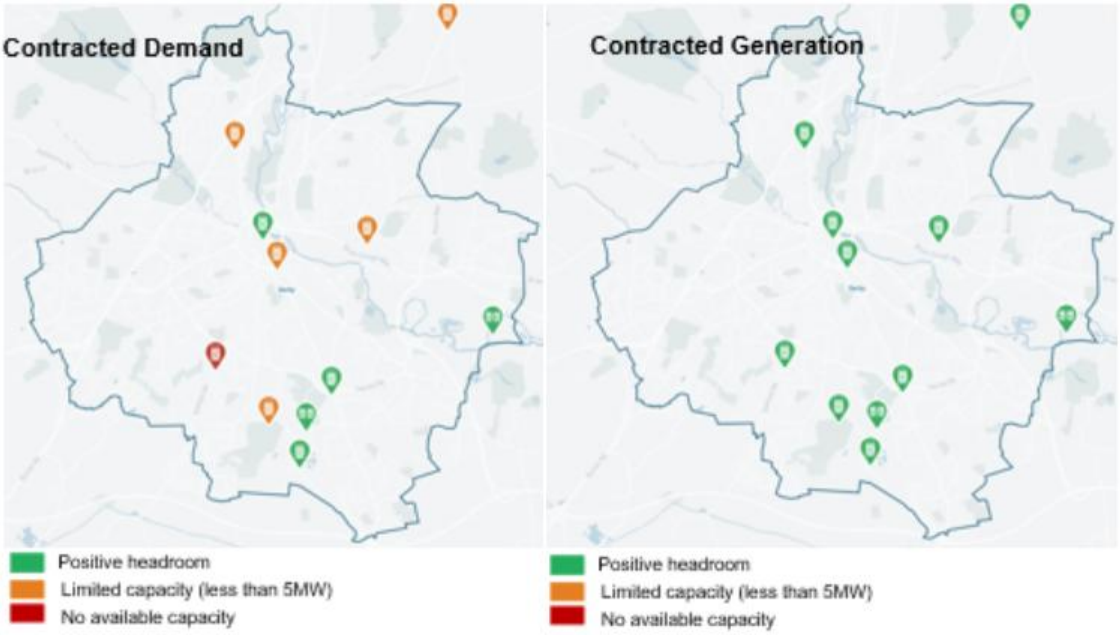


Figure 11.2 illustrates average available headroom across the network. Headroom represents the proportion of unused capacity under normal operating conditions and provides a key indicator of the network's ability to accommodate future demand growth from electrified heat, EVs and new development.

On average, Derby has a headroom of 34%, with Oakwood having the lowest at just 11%. Notably, at least 7 out of the 31 MSOAs in Derby have an average headroom below 30%, while Little Chester and Cathedral Quarter & California have the highest headroom at 49%.

These high-headroom areas are well positioned to support early electrification and distributed energy schemes without immediate reinforcement. Conversely, lower-headroom zones will require targeted engagement with DNOs to plan reinforcement, flexibility solutions or smart demand management ahead of widespread electrification.

Figure 11.3: Network Map: NGED Primary demand and generation headroom



Source: National Grid Network Opportunity Map

Green indicates more than 5% spare capacity,
Amber represents a positive headroom of less than 5%, and
Red signifies negative headroom, where demand exceeds available capacity.

Figure 11.3 illustrate contracted demand and generation headroom at primary and BSP substations across the DNO area. These maps indicate the capacity that could be connected without triggering reinforcement, excluding upstream constraints.

Collectively, these figures identify existing network pinch points and reinforce the need for targeted reinforcement to accommodate future demand and enable deployment of low-carbon technologies.

Looking ahead, Derby City are projected to experience significant growth in electricity demand driven by housing development, population growth, and expansion of commercial and industrial activity. The transition to low-carbon technologies will further increase consumption and peak loads, placing additional pressure on network capacity and resilience. Targeted reinforcement, flexibility solutions and smart energy management will therefore be essential to maintain security of supply while enabling decarbonisation.

Substations with more headroom will be able to accommodate large amounts of heat pumps, direct electric heating systems and EV chargers before requiring an upgrade. The substations with lower headroom percentages such as those in Oakwood may require upgraded within the next few years.

For generation, the largest absolute headroom is in Darley Abbey, (18.4MW), Normanton (30.5MW) and Allenton (14.9MW)). Generation headroom is most constrained around Derby South, and Spondon, where generation headroom is as low as 0MW and new projects are likely to face significant connection delays or require reinforcement. Early and proactive engagement with the DNO is critical to identifying suitable sites, appropriate connection configurations and opportunities for collaboration, as discussed further in Section 13.

11.2 Network Impact

After Diversity Maximum Demand (ADMD) represents the maximum expected electrical demand, accounting for the fact that not all customers use peak load simultaneously. This diversity enables more efficient network design while maintaining reliability and is a critical metric for assessing substation capacity requirements.

ADMD modelling has been applied across Derby City to assess the impact of LCT adoption, particularly air source heat pumps (ASHPs) and EV charging. The modelling covers domestic and non-domestic installations and applies scenario-based uptake rates with diversity factors reflecting usage patterns.

Table 11.1 summarises the estimated increase in ADMD attributable to LCT adoption under net zero scenarios.

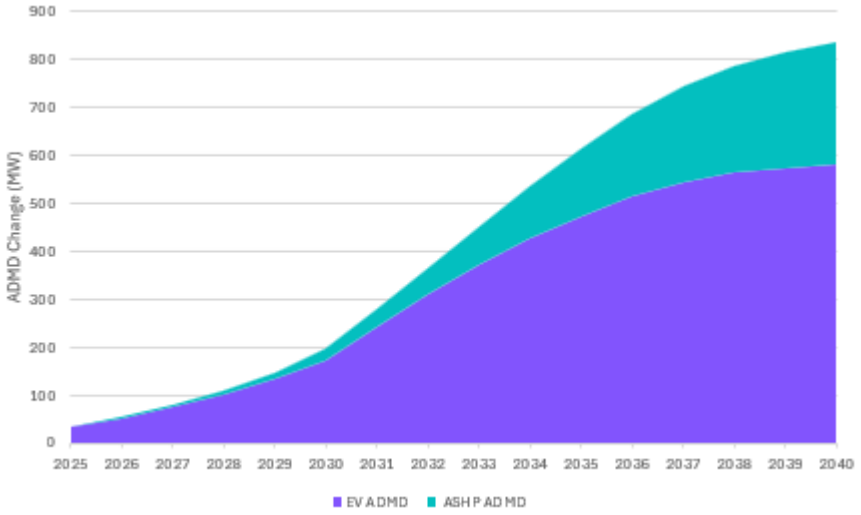
Figure 11.4 illustrates the annual increase in demand from LCTs across the region. As secondary substations do not align perfectly with MSOA boundaries, restrained areas represent a high-level estimate based on spatial overlap.

The modelling demonstrates a clear need for proactive investment in distribution network upgrades. Under all net zero-compliant scenarios, ADMD growth exceeds the capacity of the existing network. Without timely reinforcement, substations are likely to breach headroom limits, delaying new connections and constraining the pace of electrification.

Table 11.1: Estimated increase in ADMD across Derby City attributable to adoption of LCTs (EV charging and ASHPs)

Scenario	2030	2035	2040	2050	Average annual growth (MW)
2040 Net Zero	195	613	835		56
2050 Net Zero	177	379	604	835	33

Figure 11.4: ADMD increase (MW)



11.2.1 Impact of Negative Headroom on Net Zero

Under all net zero scenarios, projected ADMD exceeds available network capacity, resulting in negative headroom at the substation level. This indicates that existing infrastructure will be insufficient to accommodate future demand without intervention.

Breaches of headroom signal the need for reinforcement or flexibility measures to maintain reliability and enable continued connections. In constrained areas, connection requests may be delayed until upgrades are completed, potentially slowing electrification, development and decarbonisation.

From a cost perspective, customers are typically responsible only for connection-specific costs, while upstream reinforcement is funded by the DNO and recovered through network charges. However, capacity constraints can still result in delays depending on network availability and delivery timescales. In persistently constrained areas, flexibility services, storage and demand-side management may offer alternatives to defer capital investment. Effective deployment will require coordination, digital capability and regulatory support. The LAEP findings should therefore be reviewed in detail by NGED and NESO to support proactive, system-level planning and ensure network investment keeps pace with regional decarbonisation.

11.3 Storage and Demand Side Response

DSR involves adjusting electricity consumption in response to network signals such as price incentives, time-of-use tariffs or requests to reduce demand during peak periods. DSR improves system flexibility by better aligning demand with available supply.

Across Derby City, DSR combined with stationary energy storage, particularly alongside solar PV, offers a practical mechanism to manage network constraints and enhance local energy resilience. Battery storage enables surplus generation to be captured and discharged during peak periods, reducing pressure on the network.

This coordinated flexibility can lower peak demand, mitigate breaches of headroom and defer costly infrastructure upgrades. While financial benefits will vary, the combined use of DSR and storage presents a viable opportunity to support electrification, reduce network costs and contribute to a more resilient and sustainable energy system, subject to digital readiness, regulatory support and effective collaboration between DNOs, aggregators and end users.[54]

[54] Energy Institute. Introduction to Demand Side Response.

12 Economic Assessment

12.1 Overview of economic assessment

The high-level assessment of costs and benefits for decarbonising the area under the two transition scenarios, 2040 and 2050, indicates that investment in the local energy transition could deliver significant benefits relative to the 'Do nothing' scenario. Although the required investment is substantial and the pace of transition will depend on sustained policy and grant support, it is expected to generate benefits through lower energy bills, carbon reduction, improved air quality, and employment stimulation in the local economy.

This analysis estimates indicative capital expenditure (capex) and cash and non-cash costs and benefits[55] for the interventions within scope. This reflects the strategic, early-stage nature of the LAEP and aligns with other LAEPs developed across the UK. If this capex is spent, then significant benefits can be realised, summarised in Table 12.1 for both scenarios.

- **Total estimated capex to 2050 in both scenarios is £3.7 billion in 2025 values, before the impact of discounting.** This is the gross cost without considering the contribution from government subsidy programmes, therefore the cost of investment to the local economy is likely to be significantly lower given existing grant support and national government commitment enshrined in law to achieve Net Zero by 2050. The success of the transition under current market conditions is dependent on sustained grant support, which will strongly influence the scale and pace of action.
- **Deep fabric retrofit and domestic and non-domestic air source heat pumps account for 62% of the total investment (£2.3 billion**). This investment is expected to be funded through a combination of public sector support and household/organisation contributions.

Benefit estimates from deploying technologies in the two net zero scenarios include:

- **Carbon savings:** £980 million for 2040 and £761 million for 2050 (discounted) in carbon reduction driven primarily driven by the installation of domestic air source heat pumps.
- **Air quality improvements:** £15 million for 2040 and £10 million for 2050 (discounted) of benefits to human health, productivity, wellbeing, and the environment due to improvements in air quality.
- **Impact on bills:** £535 million for 2040 and £557 million for 2050 (discounted) of savings from utility bills which are a result of self-generation (rooftop solar), fuel switching to lower-cost technologies, and reduced energy demand through retrofit measures. Sensitivity analysis suggestions this could vary to bill savings of £443 million and £785 million under the 2050 scenario, depending on energy price trends.
- **Substantial economic activity could be generated from the transition.** Assuming installation and fitting of these technologies are carried out by workers, the average economic contribution per year could be between £54 million and £57 million, with an aggregate impact of £1.5 billion to 2050.
- **Transition to EVs enabled by charging infrastructure could generate significantly greater benefits,** most notably additional £672 million - £786 million of carbon reduction benefits. These enabled benefits are always shown separately in the subsequent analysis.

[55] Cash benefits reduce actual expenditure or release cash that can be reallocated elsewhere such as direct financial savings, revenue generation, and avoided costs.

non-cash benefits do not result in direct financial savings but still contribute to public or social value – for example carbon savings.

Table 12.1: Estimated capex and associated benefits, vs do nothing, £' m

£m (2025)	2040 (£' m)	2050 (£' m)
Discounted values		
Capex (discounted)	2,853	2,551
Carbon savings	980	761
Air quality improvements	15	10
Impact on bills (ex VAT)	535	557
Capex (financial)	3,687	3,687
Average annual economic contribution (GVA)	57	54
Aggregated economic contribution (GVA) to 2050	1,483	1,412

Source: Mott MacDonald

12.2 Approach to analysis and key considerations

For the two transition scenarios (2040 and 2050), costs and benefits from the scenarios are estimated. These cover capital expenditure (both undiscounted and discounted) and welfare enhancing benefits and economic contribution, which are derived from the following core inputs:

- Modelled installation volumes for net-zero technologies
- Modelled changes in gas and electricity consumption
- Unit costs for technology purchase and installation, based on published sources (e.g., DESNZ), as well as internal data from Mott MacDonald cost consultants.
- Published assumptions on carbon appraisal values, air quality damage costs, and the economic value of net zero transition activities.

This assessment quantifies and presents capital expenditure (CAPEX) to 2050 - both discounted and undiscounted - for net zero technologies deployed under two scenarios: delivery by 2040 and delivery 2050, each assessed relative to a 'do minimum' counterfactual.

Undiscounted CAPEX is provided to show the total financial outlay required to 2050, in 2025 prices, without adjustments for risk, inflation or the time value of money.

Discounted CAPEX is presented to show the adjusted CAPEX value reflecting the time value of money, for economic analysis and in line with HM Treasury Green Book best practice. This applies the Green Book social time preference of money.

In addition to capital costs, the analysis considers associated cash and noncash benefits, including carbon savings, air quality improvements. In addition, a high-level estimate of economic contribution from employment associated with capex is presented.



CAPEX (cash)



Valuation of carbon impacts (non-cash)



Impact on bills (cash)



Improvement in air quality (non-cash)



Valuation of economic contribution (non-cash)

When interpreting the analysis, several key considerations should be considered around:

- The scope of analysis
- Price base, discounting and appraisal period
- Cost base assumptions
- Bill impacts
- Benefits associated with EV charger deployment
- Assumptions and sources.

12.2.1 Scope of the analysis

While we have estimated capex and outlined indicative benefits that might result from investment, some costs and benefits fall outside the scope of this exercise (e.g., operational expenditure). Accordingly, this is not a full Cost Benefit Analysis (CBA) and the analysis is not presented as an aggregate Net Present Social Value (NPSV).

However, the analysis provides a clear foundation for understanding capital investment requirements and associated benefits. A comprehensive assessment capturing operating expenditure and wider societal benefits to derive a Net Present Social Value would be a valuable next step.

12.2.2 Price base, discounting and time horizon

All costs and benefits are presented in constant 2025 prices (real terms). Historic and nominal inputs are converted to 2025 using the Office for Budget Responsibility (OBR) GDP deflator. Discounting follows the HM Treasury Green Book (2026) social discounting schedule to convert future streams into present values, reflecting time preference. To capture the full operational lifespan of all assets, the model extends beyond 2050 by the longest asset life.

12.2.3 Cost base assumptions

Capital costs in this assessment are based on unit costs derived from Mott MacDonald's internal cost benchmarking, supplemented by published sources such as DESNZ and other relevant industry data. To reflect uncertainty at this stage of appraisal, the Association for the Advancement of Cost Engineering (AACE) Class 4 accuracy ranges (–20% to +50%) are applied to show possible ranges, which are appropriate for early-stage, high-level estimates. This approach ensures the cost base is robust, transparent, and aligned with best practice for strategic economic assessment.

12.2.4 Bill impacts

Bill impacts reflect changes in energy consumption gas and grid electricity, only. Household expenditure on maintenance, servicing, or replacement is excluded. Bill impacts are presented in economic appraisal terms (net of tax, and discounted).

12.2.5 Benefits associated with EV ChargePoint investment

EV charge points have the potential to generate benefits through enabling the displacement of Internal Combustion Engine (ICE) vehicles, thereby generating reductions in carbon emissions, improvements in air quality, and lower energy bills. However, the extent to which the provision

of charge points directly drives EV uptake is highly uncertain. As a result, the potential benefits associated with enabling EV adoption are not included in the core assessment.

12.2.6 Treatment of gross value added (GVA)

High level estimates of the potential economic contribution from the direct creation of jobs associated with fitting and installation of decarbonisation measures is estimated based on publicly sourced type 1 multipliers[56], assuming that there is no leakage i.e. those employed to support the transition are locally employed. This is a high level estimate of Gross Value Added (GVA).

12.2.7 Scenarios

Three scenarios are modelled in this appraisal: the Do nothing, 2040, and 2050. The results are presented with the 2040 and 2050 in comparison to the Do nothing to show the relative costs and benefits versus a minimum/baseline scenario

12.3 Assumptions

12.3.1 Use of published sources

Where available, assumptions from HM Treasury's Green Book (2026) have been applied including for the discount rate, forecast energy retail price movements, and carbon emission factors. All inputs are set to 2025 prices using the Office for Budget Responsibility's (OBR) GDP Deflator[57], to reflect the 2025 base year of the model for benefits and costs. All benefits and costs are measured in millions of pounds (£m). Key assumptions used in this analysis are set out in Table 12.2.

12.3.2 Key assumptions

Table 12.2 lists the key assumptions used in the Economic appraisal.

Table 12.2: Key assumptions used in the Economic appraisal

Assumption	Description
Discount rate	A social time preference discount rate of 3.5% and a health discount rate of 1.5% per the HM Treasury's Green Book (2026).
Carbon price	The HM Treasury's Green Book (2026) 'Medium' carbon price profile escalated to 2025 values using OBR's GDP deflator.
Domestic utility prices (electric, gas)	Ofgem energy price cap with future prices aligned to HM Treasury's Green Book (2026) price forecast escalated to 2025 values using OBR's GDP deflator.
Non-domestic utility prices (electric, gas)	HM Treasury's Green Book (2026) long run variable cost (LRVC) price forecast escalated to 2025 values using OBR's GDP deflator.
Road fuel prices	The HM Treasury's Green Book (2026) 'Medium' road fuel price Long Run Variable Cost profile escalated to 2025 values using OBR's GDP deflator.
Carbon emission factors	The HM Treasury's Green Book (2026) long run marginal carbon emission factors.
Gross value added (GVA)	**Output per job figure for the construction industry provided by ONS escalated to 2025 values using OBR's GDP deflator.**

Source: UK GOV, Ofgem, ONS, OBR

[56] Sustainable Transition Effects on Labor Market, Sustainable Development Solutions Network, Available at: https://www.jstor.org/stable/pdf/resrep29195.3.pdf

12.4 Detailed results

12.4.1 Capital expenditure

Capital expenditure (capex) is presented in two ways:

- Undiscounted capex is provided to show the total financial outlay required to 2050 in today's prices, without adjustments for risk or the time value of money.
- **Discounted capex is presented to show the adjusted capex value reflecting the time value of money**, for economic analysis and in line with HM Treasury Green Book best practice. This applies the Green Book social time preference of money discount rate.

All capex is presented as the additional spend above the Do Nothing scenario, which assumes minimum building fabric improvements to achieve MEES EPC compliance and minimal levels of electric vehicle uptake.

12.4.2 Undiscounted capex

Undiscounted capex informs how much might be needed to be invested in today's prices, without reducing future spend for the time value of money (discounting) or increasing for inflation. These values are referenced in the Funding and Finance section below. Table 12.3 below shows the total undiscounted capex, which is identical between the two scenarios.

- **£3.7 bn in today's prices is required** to deliver both net-zero scenarios.
- All capex figures are shown as incremental to the Do-nothing scenario, representing the additional investment required over and above a baseline.
- **The only difference between the two scenarios is the timing of the installations:** while the total number of installations remains the same, the 2040 scenario assumes significantly earlier installations. This will require rapid scale up of supply chains, high levels of consumer adoption and ongoing policy support.
- **The largest areas of expenditure are deep fabric retrofit and air source heat pumps:** These account for 62% of total capital expenditure. To achieve this level of investment the benefits of these measures must be clearly articulated and supported by continued government grants.

Table 12.3: Undiscounted capex vs Do nothing, £' m (2025, undiscounted)

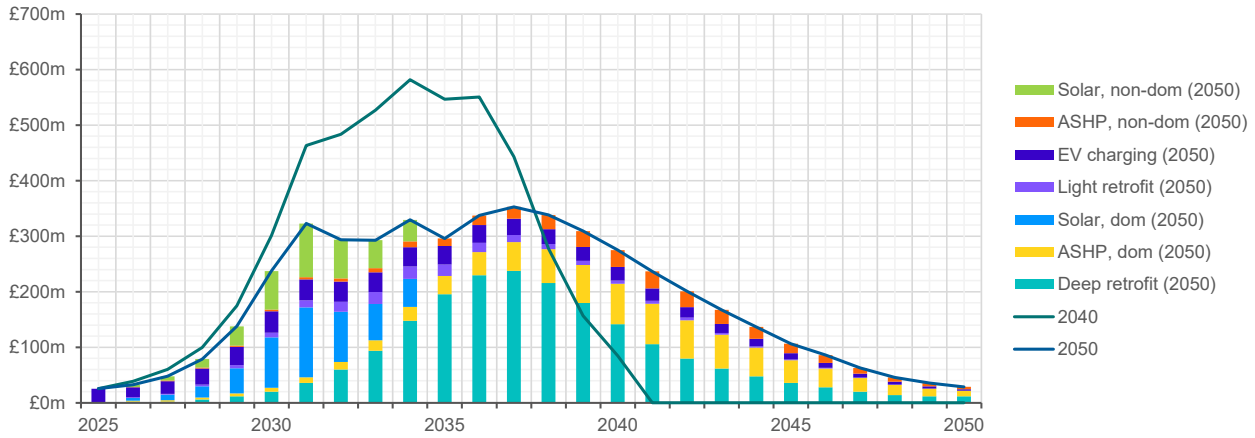
	2040 (£' m)	2050 (£' m)	% of total (2050)
Light fabric retrofit	153	153	**4%**
Deep fabric retrofit	1,428	1,428	**39%**
Domestic solar PV	504	504	**14%**
Non-domestic solar PV	386	386	**10%**
Domestic air source heat pumps	541	541	**15%**
Non-domestic air source heat pumps	312	312	**8%**
EV chargers	363	363	**10%**
Total	**3,687**	**3,687**	**100%**

Figure 12.1 illustrates the capex timing profiles for the 2040 and 2050 scenarios. In the 2050 scenario, capital expenditure is broken down by intervention, showing the deployment timeline

for each technology. This allows for a direct comparison with the 2040 scenario, which is presented as a single aggregated capex curve.

- **The 2040 scenario assumes much faster deployment rates:** all investment is concluded by 2040, compared to 2050. This assumes all investment over the next 14 years, rather than the next 24 years.
- **The acceleration and peak of investment is much greater in the 2040 scenario:** to achieve the earlier targets, the 2040 scenario assumes rapid scale up of investment with a peak at £581m per year, compared to a slower scale up and peak at £353m a year in the 2050 scenario.
- **Solar and EV chargers lead investment in early years** under both scenarios, with retrofit and ASHP gathering momentum through the 2030s.
- **Achievement of the 2040 scenario relies on accelerating investment in ASHPs and retrofit:** this will be aided by sustained grant support, reduction in electricity prices, and supply chain maturity.

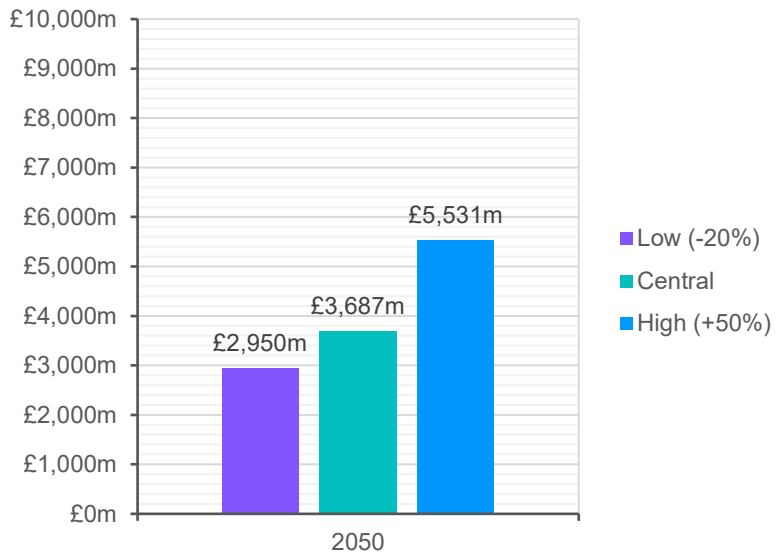
Figure 12.1: Capex, £' m, real, 2025, undiscounted



Early strategic assessments have uncertainty over future costs, therefore interval ranges have been applied to illustrate a possible range of investment, reflecting the AACE Class 4 expected accuracy ranges:

- **An upper confidence interval of +50%**, reflecting the potential for cost escalation due to unforeseen scope changes, market volatility, or design evolution.
- **A lower confidence interval of -20%**, accounting for potential cost efficiencies or scope reductions.

Figure 12.2: 2050 Capex, vs Do nothing with confidence intervals, £' m, real, undiscounted, 2025



12.4.3 Discounted capex

Discounted capex illustrates how timing impacts the value of capex and should be considered when appraising capital costs against other costs and benefits. The further the spend occurs in the future, the lower its valuation for the purposes of economic appraisal. This is presented in Table 12.4.

The effect of discounting reduces the present value of capital expenditure to £2.9 bn (2040) and £2.6 bn (2050). This is the relevant basis for comparing to other discounted of costs and benefits.

While the 2050 capital expenditure is lower, the potential benefits from this spend will also be valued lower due to the impact of discounting.

The slower pace of investment in the 2050 scenario reduces the valuation of capital costs by 11%, with slower deployment in all categories resulting in a lower valuation of cost.

Table 12.4: Discounted capex, vs Do nothing £' m (2025, discounted)

	2040 (£' m)	2050 (£' m)	% total (2050 scenario)
Light fabric retrofit	122	110	4%
Deep fabric retrofit	1,054	930	36%
Domestic solar PV	409	409	16%
Non-domestic solar PV	313	313	12%
Domestic air source heat pumps	419	325	13%
Non-domestic air source heat pumps	227	187	7%
EV chargers	309	277	11%
Total	**2,853**	**2,551**	**100%**

12.4.4 Carbon impacts

The value of carbon savings is calculated by multiplying the value of carbon saved per intervention by carbon valuation rates per tonne of CO2e per the HM Treasury Green Book[58]. Both scenarios deliver significant carbon savings compared to the counterfactual. These are presented in Table 12.5 and Figure 12.3, with the following key findings:

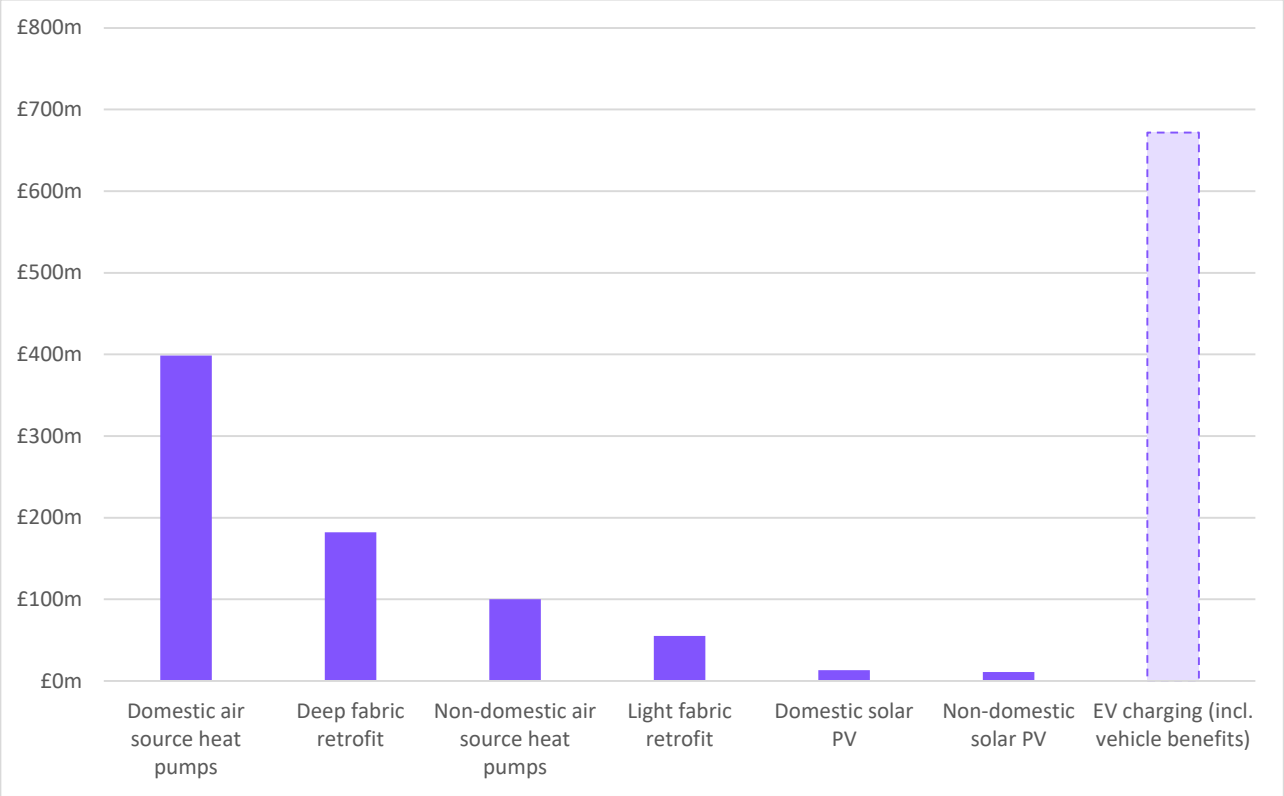
- **Early action drives greater carbon savings.** The 2040 scenario delivers greater carbon savings than the 2050 scenario (£980 million versus £761 million), largely due to earlier deployment of key technologies like air source heat pumps and deep fabric retrofit. This means that accelerating implementation can yield stronger environmental benefits.
- **Domestic and non-domestic air source heat pumps are the most impactful intervention:** heat pumps are responsible for 66-71% of carbon savings in both scenarios, contributing between £499 million and £695 million in benefits.
- **EV charging could enable substantial carbon savings.** Even though installation of chargers does not directly create carbon savings, the vehicle emission reductions that could be enabled are very significant. When vehicle benefits are included, EV charging could become the largest contributor to carbon savings (£786 million in 2040 and £672 million in 2050).
- **Solar PV has very low impact on carbon reduction,** as the electricity grid is assumed to decarbonise through the coming decade. The benefits of PV will come through impact on bills and energy security, not through carbon reduction.

Table 12.5: Carbon impacts, vs Do nothing £m (2025, discounted)

	2040 (£' m)	2050 (£' m)	% total (2050 scenario)
Light fabric retrofit	60	55	7%
Deep fabric retrofit	201	182	24%
Domestic solar PV	13	13	2%
Non-domestic solar PV	11	11	1%
Domestic air source heat pumps	555	399	52%
Non-domestic air source heat pumps	140	100	13%
EV charging (excl. vehicle benefits)	-	-	-%
Total	**980**	**761**	**100%**
EV charging (incl. vehicle benefits)	**786**	**672**	

[58] Department for Energy Security and Net Zero, 2023, Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal available at: Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal - GOV.UK

Figure 12.3: Valuation of carbon benefits, 2050 scenario vs Do nothing, £' m (2025, real, discounted)



12.4.5 Air quality improvements

Air quality improvements are assessed considering the change from fossil fuel heating and transport to electric sources. The change in fuel use is valued as an air quality improvement applying HM Treasury indices for air quality[59]. Air quality improvements carry less significant benefits for both scenarios compared to other types of impacts. These are shown in Table 12.6.

- **Air source heat pumps deliver small air quality gains:** air source heat pumps improve air quality a modest amount, with improvements increasing the earlier ASHPs are installed.
- **Enabling EV uptake could stimulate further air quality improvements.** Although EV charging infrastructure does not directly cause EV displacement of ICE vehicles, the vehicles supported could create benefits of a further £42 million to £50 million in improvement in air quality.
- **Many of the technologies were not assessed for air quality improvements**, as their impact on local emissions is negligible, as their installation does not directly impact human exposure to airborne pollutants, in the LAEP area. For instance, rooftop solar PV replaces grid electricity, which is often generated outside the region. As a result, any potential air quality benefits would not directly apply to the area.

[59] Department for Energy Security and Net Zero, 2023, Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal available at: Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal - GOV.UK

Table 12.6: Air quality improvements, vs Do nothing £m (2025, discounted)

	2040 (£' m)	2050 (£' m)	% total (2050 scenario)
Light fabric retrofit	N/A	N/A	N/A
Deep fabric retrofit	N/A	N/A	N/A
Domestic solar PV	N/A	N/A	N/A
Non-domestic solar PV	N/A	N/A	N/A
Domestic air source heat pumps	12	8	80%
Non-domestic air source heat pumps	3	2	20%
EV charging (excl. vehicle benefits)	N/A	N/A	N/A
Total	15	10	100%
EV charging (incl. vehicle benefits)	**50**	**42**	

12.4.6 Impact on bills

Substantial energy bill savings could result from the transition. Discounted values are presented Table 12.7, excluding VAT and tax.

The 2050 scenario delivers a slightly greater reduction in bills (£557 million) compared to the 2040 scenario (£535 million) due to the timing of asset installations. While there are lower savings from generation in the 2050 scenario, there are also lower additional costs from ASHPs.

- **Generation technologies deliver significant bill savings:** Rooftop solar PV installations are projected to deliver bill savings of £316 million for domestic and £190 million for non-domestic. These savings represent the avoided purchase of electricity from the grid.
- **Heating technologies risk increasing bills:** if consumers switch to ASHPs with flat rate tariffs at current average and forecast prices, they risk increasing energy bills on aggregate because the cost of electricity over gas outweighs efficiency gains. These are shown as a bill increase in the table below.
- **Air source heat pump bills can be reduced by use of bespoke tariffs** linked to the hours of use (time-of-use tariffs). This impact is not reflected below but is a key enabler to make the case for the adoption of ASHPs, alongside pairing with renewable generation.
- **Cost of EV charging is sensitive to tax impacts and method of purchase of fuel:** adoption of electric vehicles enabled by public infrastructure yields higher bills valued at £82 million to £96 million. However, this cost is likely to change into a saving if the impact of the significant taxes on petrol and diesel fuel is also considered. These are excluded in this analysis, to reflect Green Book guidance on economic benefits valuation.

Table 12.7: Impact on bills, vs Do nothing, £m (2025, discounted)

Note – figures in black are a bill saving. Figures in (red) are a bill increase.

	2040 (£' m)	2050 (£' m)	% total (2050 scenario)
Light fabric retrofit	39	35	6%
Deep fabric retrofit	100	89	16%
Domestic solar PV	316	316	57%
Non-domestic solar PV	190	190	34%
Domestic air source heat pumps	(99)	(65)	(12%)

	2040 (£' m)	2050 (£' m)	% total (2050 scenario)
Non-domestic air source heat pumps	(10)	(6)	(1%)
EV charging (excl. vehicle benefits)	-	-	-%
Total	**535**	**557**	**100%**
EV charging (incl. vehicle benefits)	(96)	(82)	

12.4.6.1 Impact on bills sensitivity analysis

Sensitivity analysis assesses the impact of energy price volatility, which is an important consideration given the unpredictable nature of energy markets. The analysis involves adjusting gas and grid electricity prices using the low, medium, and high trajectories outlined in HM Treasury's Green Book. Two scenarios are assessed, and presented in Table 12.8:

- **Favourable scenario (A):** High gas price, and a low grid electricity price
- **Unfavourable scenario (B):** Low gas price, and a high grid electricity price

Results

- **The favourable scenario leads to further bill savings of £228m** (+41%) for the 2050 scenario. Under this scenario, total savings reach £785 million.
- Under the favourable scenario, ASHPs and EV chargers now save bills, due to lower electricity prices.
- **Under the favourable scenario, solar PV savings are lower,** as savings vs retail prices are lower. However, these reductions are offset by the bill savings from ASHPs.
- **The unfavourable scenario leads to lower bill savings, by £114m** (-20%) for the 2050 scenario. Total savings are still positive, but lower at £443 million.
- **In the unfavourable scenario, the dynamics reversed.** A high electricity price made rooftop solar PV more beneficial. However, air source heat pumps suffered a significant decline in performance due to both higher running costs and the reduced benefit of offsetting now cheaper gas.

Table 12.8: Impact on bills sensitivity analysis, 2050 vs Do nothing, £m (2025, discounted)

Intervention	Impact on bills (£' m)			Variance to central assumptions (£' m)	
	Central	A	B	A	B
Light fabric retrofit	35	54	24	20	(11)
Deep fabric retrofit	89	138	61	50	(27)
Domestic solar PV	316	297	337	(19)	20
Non-domestic solar PV	190	179	207	(11)	17
Domestic air source heat pumps	(65)	73	(150)	139	(84)
Non-domestic air source heat pumps	(6)	43	(36)	49	(30)
EV charging (excl. vehicle benefits)	-	0	0	-	-
Total	**557**	**785**	**443**	**228**	**(114)**

Intervention			Impact on bills (£' m)		Variance to central assumptions (£' m)	
EV charging (incl. vehicle benefits)	(82)	360	(330)	442	(248)	

12.4.7 Employment contribution – Gross Value Added (GVA)

The creation of employment from investment delivers substantial benefits across both scenarios. These figures are indicative for the benefit across the economy as a whole. Results are presented in Table **12.9** and key findings include:

- Economic contribution has an average annual value of £54 million to £57 million, with aggregated figure to 2050 of £1.5 billion.
- **The 2040 scenario generates slightly more benefit due to the earlier installation of assets.** As these assets require ongoing maintenance and eventual replacement up to 2050, the overall volume of installation and upkeep activity is higher, resulting in increased job creation.
- **The assets that require the most investment generate the greatest employment contribution**: deep fabric retrofit and heat pumps account for 66% of employment contribution benefits, which mirrors the similar proportion of investment required for these assets.

Table **12.9: Cumulative value of employment contribution, vs Do nothing, £'m (2025, undiscounted)**

	2040 (£' m)	2050 (£' m)	% total (2050 scenario)
Light fabric retrofit	53	53	4%
Deep fabric retrofit	491	491	35%
Domestic solar PV	162	162	11%
Non-domestic solar PV	124	124	9%
Domestic air source heat pumps	317	281	20%
Non-domestic air source heat pumps	171	156	11%
EV chargers	165	146	10%
Total	**1,483**	**1,412**	**100%**
Average per year (2025 – 2050)	57	54	

12.5 Capex - who might pay?

This section provides a view of how different capital interventions could be financed or funded to indicate where the cost of delivery may be borne by mapping interventions to funding mechanisms. The information provided is illustrative, based upon typical project examples and market dynamics.

Table 12.10 outlines the capital interventions identified by funding type and intervention category. It summarises probable sources of finance whether private capital, self-funding by residents or building owners, or reliance on government grants.

Table 12.10: Potential funding and financing sources

Who pays	Undiscounted capex[60]	Net Zero measure /technology	Potential funding/financing mechanisms
Private developers	£363m	EV Chargers (shared public)	Cost borne by private investment based on commercial viability
Self-funded, residents	£504m	Rooftop solar PV, domestic Private EV chargers	Self-funded Smart Export Guarantee (SEG) EV chargepoint grant Warm Homes Plan
Grant-reliant, residents	£2,122m	Light fabric retrofit Deep fabric retrofit Air source heat pumps, domestic	Boiler Upgrade Scheme (BUS) Warm Homes Plan (ECO4)
Self-funded, public and private building owners	£386m	Rooftop solar PV, non-domestic	Self-funded Smart Export Guarantee (SEG) Local Power Plan
Grant-reliant, public and private estates	£312m	Air source heat pumps, non-domestic	Local authority and regional grants
Total	**£3,687m**		

The categorisation above is based upon experience of current market conditions and typical project performance. The categories are expanded on below for the relevant interventions:

Private developers

These technologies are assumed to be commercially viable for private developers and offer a sufficient profit incentive to attract investment. Investment is expected to come from energy developers, infrastructure funds, and private sector partnerships, with planning and grid coordination supported by local authorities.

Self-funded, residents

These interventions are considered financially viable at the household level, with market evidence that residents are investing their own capital. This is supported currently by zero VAT on solar panels and batteries, access to Smart Export Guarantee tariffs and actions for reduced capital installation costs. The financial resources available to residents is variable, (e.g. variation in household income), therefore additional support in the form of grants is likely required for some households.

Grant-reliant, residents

These interventions are considered reliant on existing grants for residents to install the intervention, as the payback is either uncertain or not significant enough to justify the capital. Existing grants could cover full or partial costs of insulation upgrades and low-carbon heating systems. Depending on the intervention, grant eligibility can be based on income, benefits, and property energy performance.

Self-funded, public and private building owners

These interventions are considered financially viable, with evidence that the public sector and businesses are investing their own capital. Rooftop solar PV installations on non-domestic

[60] Undiscounted capex refers to the net capex required under the 2040 and 2050 scenario vs the counterfactual. Undiscounted capex has been used to reflect the real-world cost of the intervention.

buildings including commercial premises, industrial facilities, and public sector assets could be self-funded by the building owners or operators.

Grant-reliant, public and private estates

These interventions are considered reliant on existing grants for residents to install the intervention, as the payback is either uncertain or not significant enough to justify the capital. Funding is expected to come from national schemes. These measures are capital-intensive and often not commercially viable without subsidy, particularly in older or energy-intensive buildings.

12.6 Funding and financing

This section explores the mechanisms available to cover upfront and ongoing costs, from non-repayable grants that reduce capital burdens to repayable finance options that leverage future revenues, as well as models that transfer risk and responsibility to third parties. It also considers the role councils can play in enabling businesses and residents to invest their own capital, ensuring that local energy projects are financially viable, equitable, and aligned with net zero objectives.

12.6.1 Non-repayable funding sources for project costs

Non-repayable funding mechanisms are typically used when projects face financial barriers that make traditional debt or equity financing impractical. They help reduce overall capital costs, making projects more affordable and attractive to investors or communities. These funds are also critical for projects where the expected financial return cannot cover full life-cycle costs, ensuring essential low-carbon or social value initiatives can proceed. Additionally, they provide upfront capital to avoid drawing heavily on reserves or savings, enabling local authorities, businesses, and residents to launch projects without compromising financial stability.

Non-repayable sources of funding are presented below, split by those available to local authorities, and businesses and residents.

12.6.1.1 Local authority

Community Infrastructure Levy (CIL)[61]

The CIL is a planning charge by local authorities in England and Wales on new developments to fund infrastructure such as transport, schools, parks, and public amenities. CIL funds can only be used for infrastructure supporting development and must comply with strict statutory regulations.

Section 106 (S106)[62]

S106 agreements are legally binding planning obligations between developers and local authorities, used to mitigate the impact of new developments by funding infrastructure, affordable housing, or community facilities. Unlike CIL, S106 is negotiated case-by-case, subject to meeting statutory tests, and can include both financial contributions and in-kind provisions tied to specific planning permissions. They remain a key tool for delivering site-specific benefits and ensuring developments are sustainable and aligned with local needs.

Great British Energy Community Fund (GBECF)[63]

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[61] Community Infrastructure Levy, GOV.UK, available at: Community Infrastructure Levy - GOV.UK

[62] Section 106, GOV.UK, available at: Planning obligations - GOV.UK

[63] Great British Energy Community Fund, Community Energy England, available at: Great British Energy Community Fund - Community Energy England

The GBECF is a £5 million UK government-backed grant scheme by regional Net Zero Hubs to support feasibility and development costs for community-owned renewable energy projects. It offers up to £40,000 for Stage 1 feasibility studies and up to £100,000 for Stage 2 development work. Proposals require at least 50% community ownership and generating local benefit. The scheme was extended in 2025 for one year, and while funds are likely now allocated, it is possible that the scheme will be extended with further grant available in future years.

Public Works Loan Board (PWLB)

The PWLB is a UK government facility that provides low-cost loans to local authorities for capital projects, funded through the National Loans Fund, repayable from the overall council budget but not from the project. Councils use PWLB borrowing to finance infrastructure such as housing, transport, and regeneration, with rates typically linked to gilt yields plus a margin. It offers flexible repayment terms but requires compliance with prudential borrowing rules and restrictions on debt-for-profit activities.

Offsetting/insetting[64]

Retrofit Credits allow organisations to offset their emissions by funding energy-efficiency upgrades in social housing, generating verified carbon credits. For councils, this offers two opportunities: they can purchase credits to compensate for residual emissions and meet net zero targets, or, if they own housing stock, they can implement retrofit projects, generate credits, and sell them to corporates. The revenue can then be reinvested into further retrofits, creating an insetting effect and accelerating decarbonisation of their own assets.

12.6.1.2 Businesses and residents

Warm Home Plan[65]

The Warm Home Plan is a UK government initiative announced in 2025 to accelerate home energy efficiency and heat decarbonisation, backed by £13.2 billion of funding. It focuses on upgrading insulation, installing low-carbon heating systems, and supporting vulnerable households to reduce energy bills and emissions. The plan complements existing schemes like the BUS and ECO, aiming to deliver large-scale retrofits.

Local Power Plan[66]

The UK Government's Local Power Plan, announced in 2026, outlines £1 billion of investment for community owned energy projects through grants, loans and advice. This support is being delivered by DESNZ, Great British Energy and the National Wealth Fund through to 2030, with the purpose to support community energy groups to develop energy generation and storage projects that deliver benefits to the local area.

Great British Energy Community Fund (GBECF)

Refer to above.

Boiler Upgrade Scheme (BUS)[67]

The BUS is a government grant program in England and Wales that offers households and small businesses up to £7,500 toward replacing fossil fuel heating systems with low-carbon alternatives like air-source heat pumps. It aims to accelerate heat decarbonisation by reducing

[64] Retrofit Credits, Housing Associations' Charitable Trust, available at: Retrofit Credits - HACT

[65] Warm Homes Plan, GOV.UK, available at: Apply for the Warm Homes: Local Grant to improve a home - GOV.UK

[66] Local Power Plan, GOV.UK, available at: Local Power Plan

[67] Boiler Upgrade Scheme, GOV.UK, available at: Apply for the Boiler Upgrade Scheme: Overview - GOV.UK

upfront costs, with installers applying on behalf of customers and funding available until March 2028. The end date of this scheme poses a risk to the sustained uptake of heat pumps, and a replacement scheme or change in the capex and running costs of heat pumps is required for continued rates of adoption.

Electric Vehicle Chargepoint Grant[68]

The EV Chargepoint Grant, available to March 2027, is a UK government scheme that provides funding for installing electric vehicle chargepoints at homes and workplaces. For homeowners and renters with off-street parking as well as households with on-street parking, the grant provides up to £500 towards the cost of installing a chargepoint. Businesses, workplaces and landlords can access grants for multiple chargepoints up to a limit of £500 per socket. Under the Workplace Charging Scheme businesses can apply for grants for up to 40 sockets across all their sites with landlords able to apply for grants for up to 200 sockets across all their sites. A separate Workplace Charging Scheme is also outlined for state-funded education institutions, with grants of up to £2,000 available per chargepoint socket.

12.6.2 Repayable funding sources for upfront project costs

Repayable funding mechanisms are used when projects have a clear revenue stream but need capital upfront to bridge the gap between construction costs and future income. They provide financing where the project's financial return is sufficient to cover third-party finance costs, making them suitable for commercially viable schemes. This approach is common when the organisation retains ownership and operational responsibility for assets, ensuring control while leveraging external capital to deliver net zero infrastructure without delaying implementation.

12.6.2.1 Local authority

National Wealth Fund (NWF)[69]

The NWF is a UK government investment vehicle launched in 2024 to accelerate the transition to a green economy and boost economic growth. It channels public and private capital into strategic sectors such as clean energy, green steel, carbon capture, and advanced manufacturing, aiming to crowd in private investment and create high-quality jobs. Managed by the UK Infrastructure Bank, the fund supports projects that align with net zero goals and regional development priorities.

Local Climate Bonds[70]

Local Climate Bonds are a UK municipal investment mechanism that allows councils to raise funds for local net zero and climate projects by issuing bonds to residents and investors. They offer a low-risk, fixed-return investment, and proceeds are earmarked for projects such as renewable energy, EV infrastructure, and building retrofits. This approach promotes community engagement in climate action while providing councils with affordable finance for sustainability initiatives.

Green Bonds[71]

Green bonds are fixed-income instruments issued to raise capital specifically for projects with environmental benefits, such as renewable energy, energy efficiency, or sustainable transport. They work like traditional bonds but are earmarked for green projects. This financing tool helps

[68] Electric Vehicle Chargepoint Grant, GOV.UK, available at: Electric vehicle chargepoint grants - GOV.UK
[69] National Wealth Fund, available at: National Wealth Fund | National Wealth Fund
[70] Local Climate Bonds, Green Finance Institute, available at: Green Finance Institute
[71] Green Bonds, IMCA, available at: green-bonds-principles-june-2018-270520.pdf

governments, companies, and institutions attract investors committed to sustainability while supporting the transition to a low-carbon economy.

UK Municipal Bonds Agency (UKMBA)[72]

The UKMBA is a financing platform created to help local authorities access cheaper borrowing by issuing bonds collectively rather than individually. It pools councils' borrowing needs to achieve economies of scale and better rates compared to traditional sources like the PWLB. This approach aims to diversify funding options for infrastructure and regeneration projects while reducing reliance on central government lending.

12.6.2.2 Business and residents

Community share offers

Community share offers are a way for local people to invest in and own a stake in community-led projects, such as renewable energy, local services, or social enterprises. They raise capital by selling shares directly to individuals, often with modest financial returns and strong social or environmental benefits. This model promotes democratic ownership and keeps profits within the community while funding projects that deliver local impact.

12.6.3 Financing through third party delivery

Financing through third-party delivery is used when a private or external organisation takes responsibility for developing, funding, and operating an asset on behalf of the public or community sector. This approach transfers the need for upfront project finance and shifts operational and financial performance risks away from the commissioning body to the third party.

12.6.3.1 Local authority

Service or Concession Agreement

A service or concession agreement typically allows a private provider to finance, install, and operate low-carbon infrastructure. Examples include heat networks, EV charging hubs, or renewable generation under a long-term contract with a public authority. The provider recovers costs through user tariffs or availability payments, while the authority sets performance standards to ensure carbon reduction goals are met.

Heat as a Service (Haas)[73]

HaaS is an emerging business pilot model where customers pay for the outcome including warmth and comfort, rather than for units of energy like gas or electricity. It typically involves smart controls and service agreements that guarantee a set temperature or heating schedule, enabling providers to optimize energy use and integrate low-carbon technologies. This approach shifts incentives toward efficiency and decarbonisation, making heating more affordable and sustainable for households. Models for heat as a service are in development for both domestic and non-domestic sectors.

12.6.3.2 Businesses and residents

Heat as a Service (Haas)[74]

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[72] UK Municipal Bonds Agency, available at: Home - UK Municipal Bonds Agency - UKMBA

[73] Energy as a Service Pilot Phase Evidence Report, EON, available at: Energy as a Service: final report

[74] Energy as a Service Pilot Phase Evidence Report, EON, available at: Energy as a Service: final report

As above.

Pay As You Save (PAYS)[75]

PAYS is a financing model that enables households or businesses to install energy efficiency or low-carbon technologies such as insulation, heat pumps, or solar panels without paying upfront. The cost is repaid over time through a charge on the energy bill, with repayments designed to be lower than the savings achieved, so customers see immediate net benefits.

12.6.4 Council actions to enable business and resident investment

To help businesses and residents invest their own capital in local energy projects, councils can play a vital enabling role by reducing barriers and creating confidence in returns. This often involves providing clear information on opportunities, offering technical guidance, and facilitating access to trusted suppliers or installers. Councils can also support through measures such as aggregating demand, coordinating bulk purchasing, and promoting financial incentives or accreditation schemes, all of which make investment more attractive and lower perceived risk for individuals and businesses.

Group purchase

A group purchase scheme is a collective buying model where residents/organisations pool demand for clean solutions like solar or heat pumps to secure lower costs and accelerate adoption. It reduces upfront barriers and sends strong market signals to scale decarbonisation.

The leading scheme, Switch Together, previously known as Solar Together, has recently extended from solar to also include heat pumps. Switch Together is a group purchasing scheme, coordinated by local authorities, which enables residents to install technologies at reduced rates. Suppliers compete in a reverse auction to offer the lowest price, and participating households benefit from costs typically lower than those available individually. At present, Switch Together is the only established provider of this model, but similar group purchasing approaches could be explored for other technologies such as heat pumps or battery storage.

Revolving Loan funds[76]

Revolving loan funds allow councils to provide low-cost loans for energy efficiency and renewable projects, using an upfront capital pool that is replenished as loans are repaid. These funds are typically administered by third parties such as community finance institutions or banks. While arrears are around 1%, risk can be mitigated through affordability checks and legal safeguards, making this a viable option for councils to support the able-to-pay market.

Accredited supplier lists

The council could seek to collect and publish a list of known suppliers with suitable accreditation.

Facilitate events and forums for suppliers and interested parties

The council could seek to facilitate events and forums where residents and businesses could meet with potential suppliers. The council could maintain a neutral stance by allowing all suppliers to attend who meet certain accreditation levels.

Innovation mechanisms

Council can run pilots/support innovation mechanisms such as blended finance.

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[75] Pay As You Save, UK Green Building Council, available at: Microsoft Word - GBC PAYS exec sum_FINAL.doc

[76] Lendology, available at: Accessible Finance for Home Energy Improvements

12.7 Next Steps

This chapter provides a high-level assessment of the economic implications of decarbonising the area, focusing on capital investment, benefits, and funding pathways across two transition scenarios. The analysis offers a foundation for understanding the scale and impact of net-zero interventions.

To build on this work for deeper strategic decision-making, we recommend the following next steps:

Expand to a Full Cost-Benefit Analysis (CBA): Building on the current capital expenditure and benefit assessment, the next stage should incorporate operational expenditure (OPEX) and wider societal benefits, enabling calculation of aggregate Net Present Social Value (NPSV). Undertaking a full CBA will provide a more holistic and transparent view of the long-term value and trade-offs associated with net-zero investments, strengthening the evidence base for investment decisions and policy development.

Deep dive on funding and financing pathways: While this chapter sets out funding and finance pathways at a high level, a more detailed review is required. This should include in-depth modelling of funding mechanisms, sources, and delivery models for each intervention. Achieving a clear and actionable approach will require proactive stakeholder engagement working with local authorities, residents, developers, and industry partners to validate assumptions, clarify roles, and co-design effective funding solutions.

These next steps will ensure the economic case for decarbonising the area is robust, comprehensive, and tailored to local needs, providing a strong foundation for future investment and delivery.

13 Prioritisation

This section details the recommended framework for prioritising decarbonisation interventions within the Derby City LAEP. It identifies projects for short-term and long-term action, outlines key focus zones, and addresses dependencies and uncertainties. A diagram of the overarching combination of activities is set out in Figure 13.3.

13.1 Prioritisation methodology

Interventions have been prioritised through a structured analysis that integrates both quantitative and qualitative considerations. This process has been further strengthened by insights derived from stakeholder engagement sessions, ensuring that the prioritisation reflects not only technical feasibility but also local context and stakeholder aspirations. The combined approach provides clarity on the categorisation of actions into “quick wins,” which deliver immediate and visible benefits, “enablers,” which create the necessary conditions for future progress, and longer-term strategic investments that underpin systemic transformation.

Table 13.1 summarises the core criteria applied in this analysis and how they have been ranked relative to each other by the local authorities and other stakeholders. Overall, near-term implementations have been agreed to focus on the impact to levels of fuel poverty, use of existing funding streams that can be leveraged in the short term and taking into account the local grid readiness. The system carbon impact of implementations was not considered to be a priority as the measures collectively are set out to achieve net zero, so the feasibility of implementation in the short term was considered to be more relevant in determining short-term actions.

Table 13.1: Summary of Prioritisation Criteria

Core Criteria	Definition	Why it matters	Ranking
Equity and fuel poverty	Extent the measure impacts on levels of fuel poverty.	Supports a just transition by ensuring vulnerable groups benefit from decarbonisation efforts	Higher
Funding Availability	Access to public or private finance for implementation	Determines the likelihood of implementation and scalability, especially in resource-constrained environments.	Higher
Local grid readiness	Likelihood of DNOs being able to facilitate implementation at the local level in the short term	Contributes to stable operation of the electricity network and allows time for DNOs to plan and execute necessary upgrades in constrained areas	Higher
Cost effectiveness (WLC)	Net present value of an intervention, as a proxy for affordability for end users	LAEP requires robust cost inputs and standardised assumptions to identify “most cost-effective combination of options”	Medium
Deliverability & readiness	Consenting, supply chain readiness, ease of installation	Ensures practical feasibility and timely deployment of measures to a high standard of quality	Medium

Local economic & health co-benefits	Job creation and improvements to air quality	Considers wider benefits associated with energy decarbonisation and how these can be realised locally	Lower
Risk & uncertainty exposure	Technology maturity, future-proofing, interoperability	Reduces exposure to technology uncertainty and focusses on long-term viability of investments	Lower
Carbon impact	Carbon abatement potential, including lifetime tCO_2e savings per project	Acknowledges the time-value of emissions by pursuing steep decarbonisation in the early years	Lower

13.2 Dependencies and uncertainties for interventions

Delivery of the interventions identified in the LAEP is influenced by a set of dependencies and uncertainties that shape its feasibility, timing, and overall impact. Dependencies refer to the enabling conditions or prerequisite actions that must be in place for successful delivery. These may include the availability of supporting infrastructure, alignment with regulatory frameworks, readiness of supply chains, and access to skilled labour. For example, the rollout of heat pumps may depend on grid capacity upgrades, installer training programmes, and consumer incentives.

Uncertainties, on the other hand, arise from factors that are difficult to predict or control, such as fluctuations in technology costs, changes in policy direction, market behaviour, and the pace of innovation. These uncertainties can influence both the cost-effectiveness and deliverability of interventions, requiring adaptive planning and risk mitigation strategies. Recognising these dynamics is essential for sequencing actions effectively, as interventions with high dependency or uncertainty may need to be phased later or supported by enabling measures.

Table 13.2 summarises the key dependencies and uncertainties relevant to the successful delivery of this LAEP and provides a clear reference point for understanding the conditions that underpin successful implementation and the risks that must be managed to maintain progress toward long-term objectives.

Table 13.2: Summary of dependencies and uncertainties

Dependency / Uncertainty	Why it matters	Suggested mitigation
Funding	Funding availability is essential for project delivery and scalability	Identify and align with existing funding streams. Coordinate with EMCCA to explore alternative funding mechanisms and partnership opportunities. Explore public-private sector partnerships to enable access to wider expertise and funding, to accelerate delivery. Leverage the ‘able to pay’ market through education around the benefits associated with interventions.
Electricity network capacity & connection queues	PV, ASHPs, EV projects depend on headroom; connection delays can defer benefits	Ongoing detailed engagement with NGED with regard to the outcomes of this LAEP and with regard to any projects that are taken forward off the back of the LAEP. Ensure relevant parties

		have information to establish targeted grid reinforcement to enable delivery of priority projects.
Energy price volatility	Operating costs (ASHP vs Gas vs Heat network)	Adopt a fabric first approach to minimise demand when switching to lower carbon solutions. Adopt local renewable generation and energy storage systems to help shift demand and reduce exposure to pricing risk. Smart local energy systems can also be considered to help manage this. Ensure energy consumers are educated on the opportunities and risks associated with prosumer behaviours, such as use of time-of-use tariffs for ASHP.
Supply chain & skills	Heat pump, insulation, delivery capacity may constrain pace	Policy considerations such as training programmes, funding and incentives, including focus on quality over pace to address public perceptions. Strategic partnerships between public and private sector.
Public trust & uptake	Public acceptance is essential to drive uptake	Community engagement and communication programmes to share good news stories. Undertake demonstration/pilot projects to enable delivery of and showcase best practice.
Policy evolution	Changes to boiler phase out, tax incentives, market design or zoning rules could shift the plan.	Ensure policy tracking is in place, i.e. through a framework to monitor national and regional policy developments and regularly review the LAEP or subsequent project to align with these. Engage with or create local energy forums to enable collaborative adaptation of plans and projects to policy changes.
Hydrogen availability/cost	The industrial decarbonisation pathway for Derby City is highly sensitive to hydrogen price, hydrogen emissions intensity and technology availability.	Detailed engagement with key stakeholders in this space such as East Midlands Hydrogen to advise on potential hydrogen needs in the area. Maintain focus on hard-to-treat high temperature loads with more readily available technologies utilised for wider decarbonisation.

13.3 Focus zones

Given the large scale of interventions required to achieve a net zero energy system at the local level, it is important to determine where to start the roll-out. Based on the priorities set out, ‘focus zones’ can be identified that will meet the criteria for short-term implementations. Within these focus zones, specific schemes can then be developed by the local authorities to move towards delivery.

13.3.1 Areas With High Fuel Poverty

Fuel poverty remains a significant challenge for Derby City, although the areas report a high proportion (12.5%) of fuel-poor households compared to the East Midlands regional average (11.7%). For reference, the national average is 11.4%.[77]

The Low-Income Low Energy Efficiency (LILEE) definition of fuel poverty was introduced in 2019 and it defines a household as being fuel poor if it has a Fuel Poverty Energy Efficiency Rating (FPEER) of D or lower, and the household income falls below the poverty line after spending the necessary amount to heat their home to an adequate level. Prior to the LILEE, the Low Income High Costs (LIHC) indicator was used, which classified a household as fuel poor if the cost to heat the home was above the national median and, if those costs were met, the household would be left with a residual income below the poverty line.[78] This is far more likely in a home rated EPC E or below due to lack of insulation and poor thermal retention capability.

Fuel poverty currently contributes to around 155 excess winter deaths across EMCCA annually. Retrofitting homes can have a huge impact on this, alongside reducing health inequalities and reducing absences from school and work arising from damp and cold air related illnesses.[79]

The spatial distribution of fuel poverty within Derby City is uneven, illustrated in Figure 13.1, with certain neighbourhoods experiencing disproportionately high rates. The analysis of percentage average risk of fuel poverty is equivalent to the percentage of households within the MSOA that are classed as being fuel poor. This disparity underscores the urgent need for targeted interventions that address energy affordability and thermal comfort. Analysis at the MSOA level shows the four areas with the highest proportion of households in fuel poverty in each local authority area, which are set out in Table 13.3.

Table 13.3: MSOAs with highest levels of fuel poverty in Derby City

MSOA	Total Number of Fuel Poor Households	Proportion of Fuel Poor Households
Derby 016 - New Normanton	816	21.5%
Derby 020 - Normanton North & Peartree	552	21.0%
Derby 011 - New Zealand	613	20.7%
Derby 013 - Cathedral Quarter & California	923	20.4%

Focusing retrofit programmes on these zones offers significant benefits. Fabric-first measures, including improved insulation, airtightness, and glazing upgrades, can substantially reduce heat loss, lower energy bills, and improve indoor comfort. Beyond carbon reduction, these interventions deliver critical social co-benefits: alleviating fuel poverty, improving health outcomes, and reducing financial stress for vulnerable households.

[77] Sub-regional Fuel Poverty, England 2024 (2022 data), available at: Sub-regional fuel poverty in England, 2024 report (2022 data) - GOV.UK

[78] Fuel poverty methodology handbook 2025: Low Income Low Energy Efficiency (LILEE)

[79] 3997_EMCCA RETROFIT STRATEGY_1.pdf

Figure 13.1: Percentage average risk of fuel poverty for households per MSOA

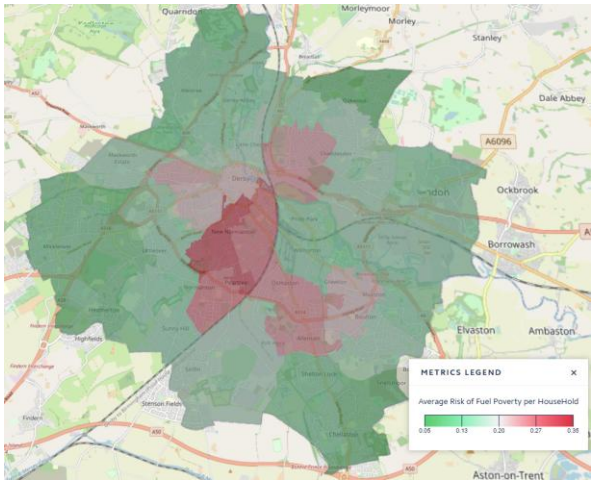
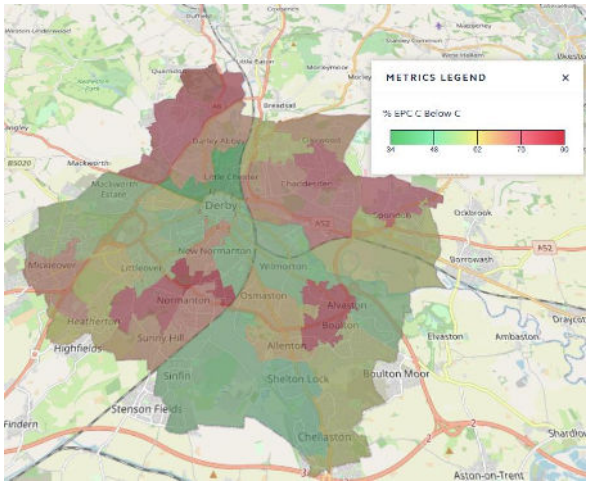


Figure 13.2: Percentage of properties below EPC rating C per MSOA



Within the areas with high fuel poverty, implementation can be further focused on properties with an EPC rating below C. The spatial distribution of these properties across the area is shown in Figure 13.2. The number of these properties within each of the MSOAs is shown in Table 13.4. Within these identified properties, the local authorities can have the most influence over housing association properties, however, the majority of the small portion of social housing within this region is managed by independent housing associations. Given the availability of funding, privately-owned homes therefore present the immediate opportunity for retrofit.

Through combining these characteristics, we can determine the number of private properties in each MSOA that are suitable for a “light + deep” retrofit package, and those that are suitable for a light retrofit only. These are summarised in Table 13.4.

Table 13.4: Fuel-poverty led domestic retrofit implementation quantification

MSOA	% Homes in fuel poverty	Homes below EPC C	No. Owner occupied or privately rented	Homes Requiring Light Retrofit	% light retrofit homes requiring deep retrofit	Homes Requiring Deep Retrofit	Potential for PV (MWh)
Derby 016 - New Normanton	21.5%	3,092	2,870	2,094	92%	3,164	4,624
Derby 020 - Normanton North & Peartree	21.0%	653	587	338	78%	584	3,691
Derby 011 - New Zealand	20.7%	3,118	2,866	2,102	92%	3,245	2,963
Derby 013 - Cathedral Quarter & California	20.4%	3,631	3,317	2,436	83%	3,464	5,886

Based on the implementation rates set out in the Net Zero 2040 pathway, and factoring in non-social housing these focus zones could achieve the pathway implementation of light retrofit for 2025 – 2031/2032 and implementation of deep retrofit for 2025 – 2035/2036.

In addition, a large portion of the privately-owned houses in these focus zones have been identified as suitable for ASHP, which could be implemented at the same time, in a ‘touch the property once’ approach. It should be noted, though, that in order to achieve the fuel poverty alleviation benefits of ASHP in these properties, education of the residents on how to realise the benefits through appropriate electricity tariffs and operation of the system is likely to be required to avoid unintended outcomes.

13.3.2 Electricity Headroom Pockets

Electricity network capacity is a key determinant of where electrification measures, such as heat pump deployment and EV charging, and electricity generation, can be accelerated and scaled. Analysis of grid utilisation and headroom across Derby City, in Section 11, identifies pockets of available headroom for both demand and generation, where additional electrical systems can likely be accommodated without immediate reinforcement. These areas represent prime opportunities for early roll out of ASHP, PV and EV charging, as they are likely to be able to be delivered with minimal infrastructure upgrades, reducing cost and complexity.

Demand Headroom

Based on Analysis in section 11 focus zones for the early roll-out of ASHPs and EV charging hubs could be delivered in many areas of Derby City as there is capacity for additional demand.

Mackworth, Allestree South, Darley Abbey, Little Chester, Cathedral Quarter & California, Rosehill and Castleward, Allenton & Osmaston, and Chaddesden Park all have more than 40% headroom availability, making them ideal for early deployment.

Conversely, areas with high grid utilisation require a different approach. In these zones, DSR strategies should be prioritised to manage peak loads and defer costly reinforcements. DSR measures may include PV paired with battery system. These interventions enhance flexibility, as we prepare the network for future electrification. Figure 11.2 provides a spatial representation of average grid headroom, supporting evidence-based decision-making. Oakwood currently has the highest utilisation, with less than 11% headroom available.

Further detailed engagement with local DNOs will be required to determine viable timescales for delivery as projects are developed in more detail, ensuring that planned interventions align with network reinforcement schedules and operational constraints and support a coordinated and efficient rollout of electrification measures. The analysis undertaken here is based on MSOA boundaries, which do not directly match with the electricity network operational boundaries, so verification of headroom with the relevant DNOs will be key in the early stages of defining delivery schemes.

Table 13.5: ASHP potential in high absolute demand headroom MSOAs

MSOAs with highest demand headroom	Number of homes above EPC D (1)	Of (1), number occupied for private housing (2)	Of (2), number suitable for ASHP
Derby 008 - Little Chester	861	604	604
Derby 013 - Cathedral Quarter & California	1,261	812	803
Derby 005 - Darley Abbey	549	488	269

Generation Headroom

At the Primary substation level, we can also look at the effect of contracted generation, which is due to connect in the near future. For generation, largest absolute headroom at the primary substation level is in Normanton with 30.6MW contracted headroom available.

These areas can be used as a basis for focus zones for the early roll-out of PV. It will be necessary to engage with NGED to establish a ‘connections surgery’ for the proposed areas of PV deployment, in order to discuss the level of roll-out that can be accommodated and any restrictions below the primary substation level which may influence the focus zone selection.

13.3.3 Heat Network Zones

Potential heat network zones have been identified in Section 7.3, clustering around key anchor loads and off-takers that provide a strong foundation for network viability. Developing these zones as a priority intervention offers multiple benefits: it alleviates grid constraints in surrounding areas by reducing reliance on electricity for heating, supports rapid decarbonisation at scale, and delivers lower-cost, and potentially lower-carbon, heat compared to the alternative scenario of widespread ASHP deployment in these zones.

This approach leverages existing infrastructure and demand clusters to create a strategic, cost-effective pathway for heat decarbonisation.

13.4 Quick win projects

Quick wins represent a category of interventions that can be implemented immediately with minimal complexity and high confidence in successful delivery. These actions are often described as “no regrets” because they rely on existing evidence, proven technologies, and established funding routes, making them low-risk and highly practical. They deliver immediate carbon savings, are highly cost-effective, and offer visible progress that builds momentum for more complex programmes. Quick wins also generate wider benefits such as reduced operational costs, improved system efficiency, and enhanced social and economic outcomes. Their prioritisation is underpinned by high scores for system carbon impact, cost-effectiveness, and deliverability, while also addressing equity and co-benefits where possible.

13.4.1 Rooftop Solar PV on Public Estate Buildings

Installing rooftop solar PV systems on suitable public buildings, such as leisure centres, depots, libraries, schools, and community centres, paired with battery storage where viable, presents an immediate opportunity to decarbonise public sector operations. This intervention focuses on sites with consistent daytime energy loads, making effective use of existing roof space for on-site renewable generation. By reducing grid dependency and lowering operational costs for public services, it delivers strong technical and economic benefits. The measure scores highly on carbon impact, cost-effectiveness, and deliverability, while also performing well on network impact by optimising grid flexibility. In addition, it offers local economic co-benefits through job creation in installation and maintenance and demonstrates visible leadership that can encourage wider adoption.

It is worth noting that the largest commercial energy users within Derby City are predominantly privately-owned restaurants, offices, retail stores and hotels. Therefore, engaging with these organisations and raising awareness within the community on the benefits of deploying solar PV should be considered.

Table 13.6: Summary of public estate buildings with estimated baseline electricity demand and anticipated generation potential

Primary Use Type	Number	Total Energy demand Baseline (MWh/yr)
Community Centre	59	3,632
Primary School	309	11,973
Public Administration Building	7	1,220
Secondary School	38	3,089

13.4.2 Fuel poverty led private housing retrofit

Targeting fuel-poor households through housing retrofit programmes, such as the Warm Homes Local Grants Fund, supports both climate and social equity objectives. These initiatives focus on areas of greatest need by improving building fabric and thermal efficiency. This intervention not only reduces emissions but also improves energy affordability, lowers household bills, and enhances health outcomes for vulnerable residents. Within Derby City, council-owned and social housing accounts for a relatively small proportion of the overall housing stock; however, a significant share of these dwellings are rated EPC D or below. Furthermore, most of these homes are managed by private housing associations, largely separate to council operations. As such, engagement with these housing associations was identified as an additional quick win. Retrofit of privately-owned buildings reflects the group where the lowest EPC ratings are seen, as well as the availability of funding currently. The opportunity to deploy deep and light retrofit measures simultaneously with ASHPs was also noted as an option to reduce disruption. Areas with high private housing fuel poverty include New Normanton, Normanton North & Peartree and Normanton North & Peartree.

13.4.3 Light retrofit measures

Light retrofit measures, including cavity wall insulation and loft insulation top-ups, represent low-cost, high-deliverability actions that can be implemented relatively quickly across the able-to-pay market. These measures improve energy efficiency, reduce running costs, and create immediate co-benefits such as improved comfort and lower energy bills. However, the speed of rollout depends on addressing common barriers such as homeowner awareness, upfront costs, and trust in installers. While these measures are technically straightforward, homeowners and landlords may choose not to invest without clear incentives or support.

To enable rapid uptake, the council can play a proactive role in creating an environment that encourages action. This could include launching targeted awareness campaigns to highlight the benefits of retrofit and the availability of funding or incentive schemes, as well as providing a centralised one-stop shop for advice and guidance on retrofit options, costs, and potential savings. Establishing and promoting a list of council-approved installers would help build consumer confidence and reduce perceived risks associated with quality and reliability. In addition, signposting to financing options such as grants, low-interest loans, or national schemes can help overcome concerns about upfront costs.

13.4.4 Small roof-mounted PV and battery storage installs on suitable homes

Small roof-mounted PV installations on suitable homes offer a scalable solution for household-level renewable generation. We modelled the uptake and estimated costs of these systems alongside domestic battery storage, assessing their potential contribution to local energy generation and flexibility.

This measure empowers residents to participate in the energy transition, reducing reliance on fossil fuels and enhancing energy resilience. It performs strongly on system carbon impact and cost-effectiveness and deliverability. Co-benefits include increased energy independence and potential local economic gains through installation activity.

As with other homeowner-led measures, uptake depends on motivation and overcoming barriers such as upfront costs, lack of awareness, and trust in installers. The example enabling actions outlined in 13.4.3, including council-led awareness campaigns, a one-stop shop for retrofit advice, and maintaining a list of approved installers, are also relevant here. These can be complemented by PV-specific initiatives such as signposting funding schemes and exploring group-buying or community solar programmes to reduce costs and increase participation.

13.4.5 Local EV Charging Hubs and on-street charging infrastructure

The rollout of public EV charging infrastructure through local charging hubs at council-owned premises, complemented by on-street charging in high-demand residential zones, offers a scalable and inclusive approach to supporting transport decarbonisation. This measure focuses on areas with limited off-street parking and prioritises neighbourhoods experiencing high fuel poverty, where access to private charging is constrained. We assessed the potential deployment, costs, and utilisation of these assets, considering their contribution to emissions reduction and equitable access to low-carbon mobility.

This measure enables residents without driveways to participate in the transition to electric vehicles, reducing transport costs over time and cutting reliance on fossil fuels. It performs strongly on carbon impact and social equity, with co-benefits including improved air quality, reduced noise, and the potential to catalyse local economic activity through installation, operation, and maintenance of charging infrastructure. Co-locating hubs at council assets (e.g. car parks, leisure centres, depots) can also unlock opportunities for smart charging and integration with local renewable generation.

Delivery depends on overcoming barriers such as upfront capital costs, grid capacity constraints, and public confidence in availability and pricing. Enabling actions include council-led spatial planning to identify priority zones, aggregation of demand to improve commercial viability, and the use of concession or partnership models with charge point operators. These actions can be supported by targeted engagement in fuel-poor communities, transparent tariffs, and coordination with wider parking and street-works programmes to minimise disruption and accelerate rollout.

13.5 Enabling Actions

Enabling actions are interventions that do not directly deliver physical assets but are critical to unlocking future opportunities and accelerating delivery at scale. They establish the institutional, technical and market conditions required for the successful implementation of physical interventions.

Unlike quick wins, which focus on immediate and visible outcomes, enablers address systemic barriers through strategic investment in capability, infrastructure, coordination and market readiness. By resolving these issues early, enabling actions reduce delivery risk, improve efficiency and cost-effectiveness, and create the conditions for subsequent programmes to proceed at pace.

Delivery of these actions typically requires collaboration across multiple stakeholders, including local authorities, industry, community organisations and regional bodies. In many cases, coordination with Distribution Network Operator (DNO), the East Midlands Combined County Authority (EMCCA) and private sector actors will be essential to align technical, regulatory and financial requirements.

13.5.1 Organisational Capacity and Delivery Resourcing

Delivery of the LAEP is contingent not only on capital availability but on the capacity of Derby City Council to initiate, coordinate and manage programmes at the required pace. The Council has identified that current staffing and resource levels are insufficient to deliver the full set of actions within the timescales implied by the net zero target, particularly where initiatives require

extensive project development, stakeholder engagement, procurement, and ongoing contract management.

To enable effective implementation, the LAEP recommends allocation of internal resource to support delivery, including officer time across project management, partnership development, funding and grant administration, commercial and procurement processes, and contract oversight. This may include creation of dedicated net zero delivery roles, temporary programme management support, or shared resource arrangements where appropriate.

13.5.2 Electricity grid capacity outlook

Targeted grid reinforcement is a fundamental enabler for large-scale electrification and deployment of distributed renewable generation. Rising demand from heat pumps, electric vehicles and solar PV is already placing pressure on local networks, with capacity constraints presenting a material barrier to delivery. Strategic reinforcement in areas with lower existing constraints can improve efficiency, reduce costs and better align investment with future demand growth.

Local authorities have an important convening role in supporting effective planning. At a strategic level, the LAEP should be submitted to the DNO to inform regulatory submissions, longer-term forecasting and annual updates to the Distribution Future Energy Scenarios (DFES), ensuring visibility of future demand, community energy activity and renewable ambitions.

In the short term, particularly within focus zones, local authorities should facilitate early engagement with DNOs through ‘Connections Surgeries’. These sessions enable early verification of connection feasibility at neighbourhood level, helping to manage expectations and identify potential constraints before formal applications are submitted and costs incurred. They can also help identify areas with available capacity to inform subsequent phases of delivery.

Connections Surgeries are publicly accessible and provide an opportunity to discuss technical requirements, timescales, consents and constraints with network planners. Holding these sessions at an early stage supports informed decision-making and reduces the risk of abortive work.

Developers and delivery partners should also be encouraged to use publicly available tools, including NGED’s Network Opportunity Map. Given the number of grid-related challenges raised during the LAEP process, ensuring awareness of these resources across local authority teams, commercial developers and community energy groups will be particularly valuable.

To support longer-term coordination, the establishment of a local grid connections ‘Roundtable’ is recommended. Chaired by Derby City council and involving NGED, this forum would provide a structured mechanism to address city-specific challenges. It would convene industrial and commercial users, community energy groups and residents to collaborate on solutions that support electrification, innovation and wider decarbonisation.

Addressing these challenges will require coordinated, place-based solutions. A roundtable approach provides a practical mechanism for developing shared understanding and collective responses, particularly where traditional reinforcement may be complex or costly.

13.5.3 Education and Demonstrator Projects

Successful delivery of the LAEP will depend on building public understanding, confidence and capability around low-carbon technologies and retrofit. Education, skills development and demonstrator projects are therefore critical enabling actions.

One opportunity is the development of an online LAEP ‘hub’, potentially coordinated at a regional level through EMCCA. This would provide a single point of reference for residents and businesses, drawing together existing guidance, analysis and signposting rather than duplicating content. A coordinated approach would support consistency, efficiency and scale, recognising local authority resource constraints.

A one-stop-shop advice hub would reduce complexity for households, businesses and community groups by providing region-specific guidance on technologies, costs, funding and practical next steps. Consistent advice on eligibility and support would improve equity of access, while benefits-led campaigns, advice sessions and supplier engagement could further build confidence. A low-carbon heating marketplace could also connect communities with vetted regional suppliers, supporting local supply chains.

Beyond information provision, the hub would play a strategic role in coordinating demand and feeding real-world insights into infrastructure and network planning. By convening residents, SMEs, suppliers and the council, it supports informed decision-making and improves deliverability across measures.

Targeted education initiatives should complement rollout in focus zones, addressing common concerns around cost, disruption and reliability, and helping to maximise uptake and benefits.

Demonstrator projects provide visible examples of successful delivery and allow residents to engage with technologies first-hand. These may include retrofit exemplars in council-owned stock, pilot deployments of heat pumps and solar PV, and open-home events hosted by early adopters. Existing initiatives such as ‘Visit a Heat Pump’ can be leveraged to reduce resource requirements while increasing impact.

13.5.4 Local bulk procurement frameworks

Local bulk procurement frameworks for retrofit measures, solar PV and heat pumps are a strategic enabler that can address cost, delivery risk and supply-chain capacity. Aggregating demand across projects and stakeholders unlocks economies of scale, reduces unit costs and provides suppliers with greater confidence to invest.

Well-designed frameworks can improve quality assurance, accelerate market readiness and support local economic development by providing smaller contractors with access to larger programmes. Delivery will require coordinated action between local authorities, housing providers and private sector partners to ensure procurement processes are transparent, efficient and aligned with long-term decarbonisation objectives.

These frameworks could also support the development of an ‘approved supplier’ list hosted through the LAEP hub, improving consumer confidence and establishing minimum quality standards. Lessons from initiatives such as the Nottingham Energy Partnership could inform governance and oversight arrangements, while procurement criteria could also be used to deliver wider social value outcomes.

In parallel, opportunities for collective power purchase agreements could be explored, including negotiated offtake from large-scale solar or future community energy projects. Pairing technology procurement with favourable tariffs may offer additional benefits, although this would require significant community participation and supplier engagement.

13.5.5 Heritage Forum

Energy efficiency improvements across Derby City are constrained by the presence of designated conservation areas, associated heritage assets and the application of Article 4 Directions in certain locations. These designations typically require site-specific appraisal of

retrofit measures to ensure that fabric, appearance and historic character are preserved, increasing delivery complexity and cost.

While standardised retrofit approaches may be appropriate for newer housing stock, a tailored strategy is required for heritage and hard-to-treat properties. Higher upfront costs and planning constraints frequently exclude these homes from funding programmes, creating a risk that some of the least efficient buildings are left behind.

A strategic partnership between local authorities focused on hard-to-treat properties would provide an important enabling mechanism. As an initial step, the LAEP hub could offer targeted advice, specialist signposting and resources for owners of designated buildings.

Dedicated advice sessions led by heritage retrofit specialists would further empower residents by clarifying what is feasible and how to navigate planning requirements. Over time, regional collaboration could support development of standardised retrofit ‘packages’ for different building typologies and help identify properties unsuitable for certain technologies, enabling alternative area-based solutions.

13.5.6 Workforce training programmes

Workforce training programmes are critical to ensuring that the transition to net zero is supported by a skilled and capable labour force. The scale of retrofit and low-carbon technology deployment required over the coming decade far exceeds current workforce capacity, creating a risk of delivery delays and cost escalation. Investing in training programmes now will build the necessary skills base for installing heat pumps, delivering high-quality retrofits, and integrating renewable energy systems.

These programmes should be developed in partnership with industry bodies, vocational training providers, and regional authorities to ensure alignment with market needs and future demand. Workforce development not only supports decarbonisation objectives but also delivers wider economic benefits through job creation and skills enhancement.

The presence of Community Energy groups in Derby City, in addition to existing partnerships between local authorities and organisations which specialise in providing energy advice (e.g. Marches Energy Advice) and local manufacturers of low-carbon technologies provides the foundations on which to upskill the broader community. This could be kick-started through creating, or supporting an existing, skills forum between energy specialists such as those mentioned above and local businesses.

13.5.7 Financing mechanisms for low-income households

A key consideration regarding funding mechanisms is starting by maximising uptake of existing central government schemes. Through keeping up to date with central government policy, such as the recent expansion of the Boiler Upgrade Scheme to include air-to-air ASHPs and taking responsibility for sharing the appropriate information with relevant residents and businesses, uptake of supported interventions could be increased in the near future.

In addition to this, developing innovative financing mechanisms for low-income households is essential to ensure an equitable and inclusive transition. Many households face significant financial barriers to adopting energy efficiency measures or low-carbon technologies, even when long-term savings are substantial. Enabler actions in this area for the local authorities in partnership with other stakeholders include the creation of accessible loan schemes, targeted grant programmes, and blended finance models that reduce upfront costs and spread repayments over time. These mechanisms should complement existing national schemes while addressing local gaps in provision.

13.5.8 Funding opportunities

The suspension of the Public Sector Decarbonisation Scheme (PSDS) has created an urgent need to identify alternative funding streams for public sector organisations. Many local authorities and public institutions operate under severe financial constraints, limiting their ability to invest in energy efficiency and renewable energy projects. An alternative funding model is urgently needed to maintain momentum in public sector decarbonisation. These should prioritise projects that deliver high-impact carbon reductions and operational savings, such as building retrofits, heat decarbonisation and renewable energy installations. Some suggested alternative funding routes have been outlined in Session 12.6.

Furthermore, Derby City are currently in the early stage of deploying retrofit at privately-owned homes within each region through the Warm Homes Local Grants Funding programme. However, due to high demand from local residents, this funding opportunity is largely oversubscribed already. Local authorities are subsequently faced with the challenge of developing a prioritisation approach to allocating funding. In conjunction with the large number of properties within Derby City which require some level of retrofit, this reinforces the need for additional funding to supplement existing, limited retrofit programmes.

13.5.9 Industrial Decarbonisation & Hydrogen Readiness

Industrial decarbonisation is essential to achieving net zero while maintaining competitiveness. Limited data availability and variable decarbonisation pathways mean further engagement is required, particularly with large emitters not engaged through the LAEP process.

An initial step could include establishing an industrial electrification showcase to connect businesses with suppliers and address perceptions around cost and feasibility. Awareness of mechanisms such as the British Industrial Supercharger will be important in supporting uptake. This approach complements a fabric-first and electrification-first strategy while retaining optionality for hydrogen where appropriate.

Where electrification is not feasible, hydrogen readiness represents a critical enabling action. Coordinated preparation across demand, infrastructure, skills and governance reduces delivery risk and supports timely adoption when supply becomes viable.

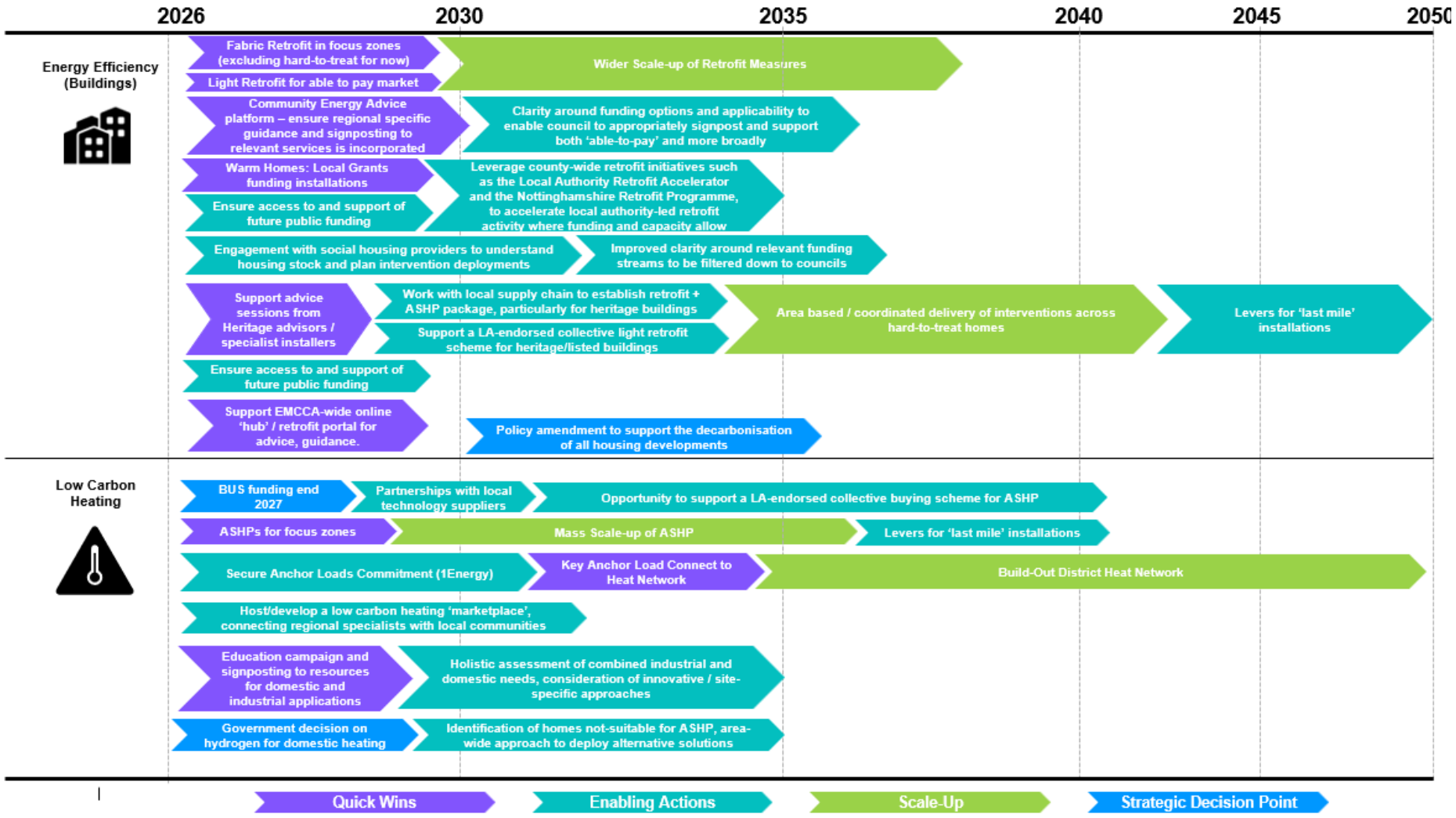
Improving understanding of industrial and commercial energy demand and decarbonisation intentions will also support more effective infrastructure planning. Integrating this insight into DFES processes will help NGED align reinforcement with combined residential and industrial demand and may unlock opportunities for cross-sector collaboration, such as waste heat use in heat networks.

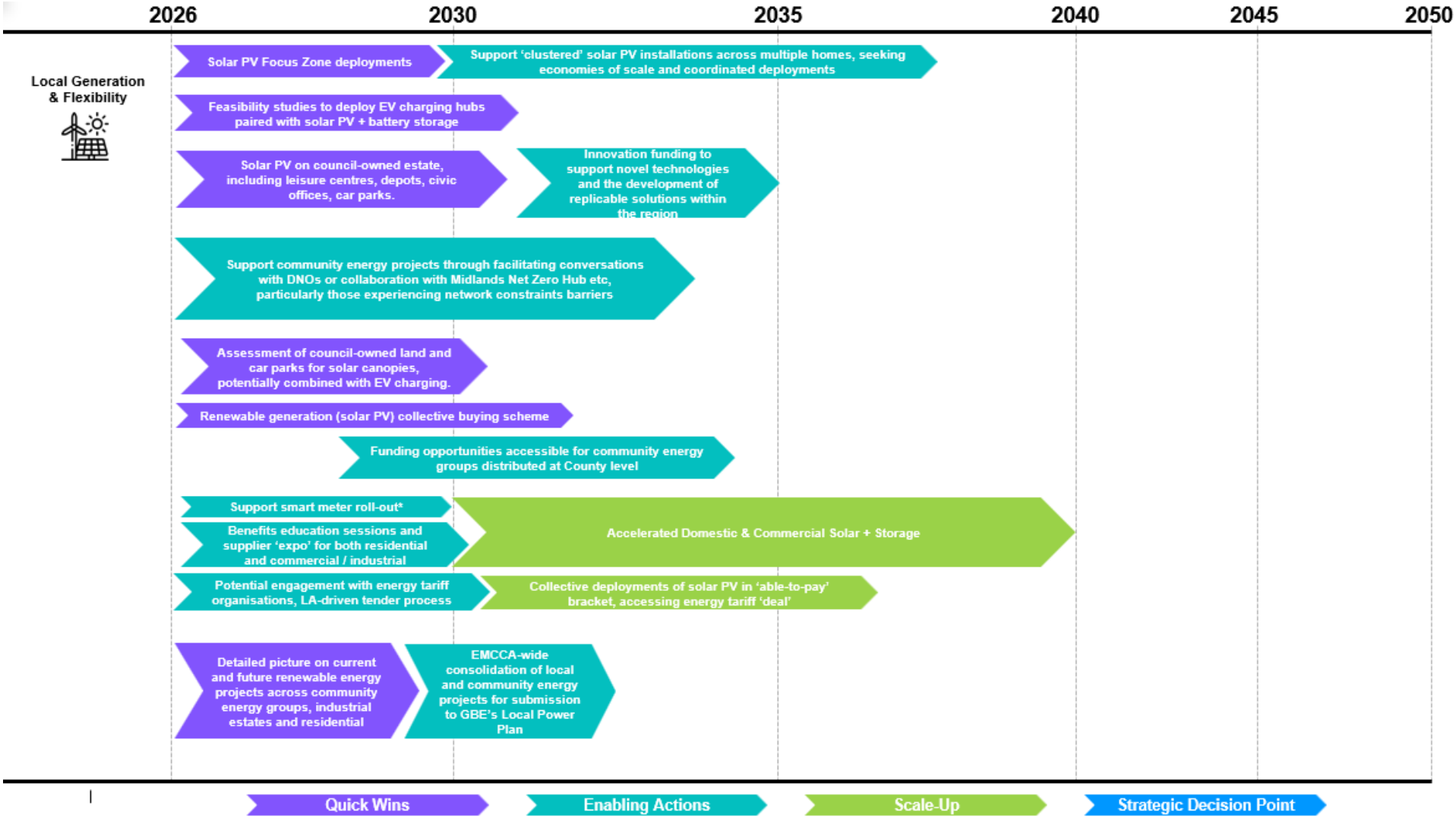
13.6 Phased Pathway

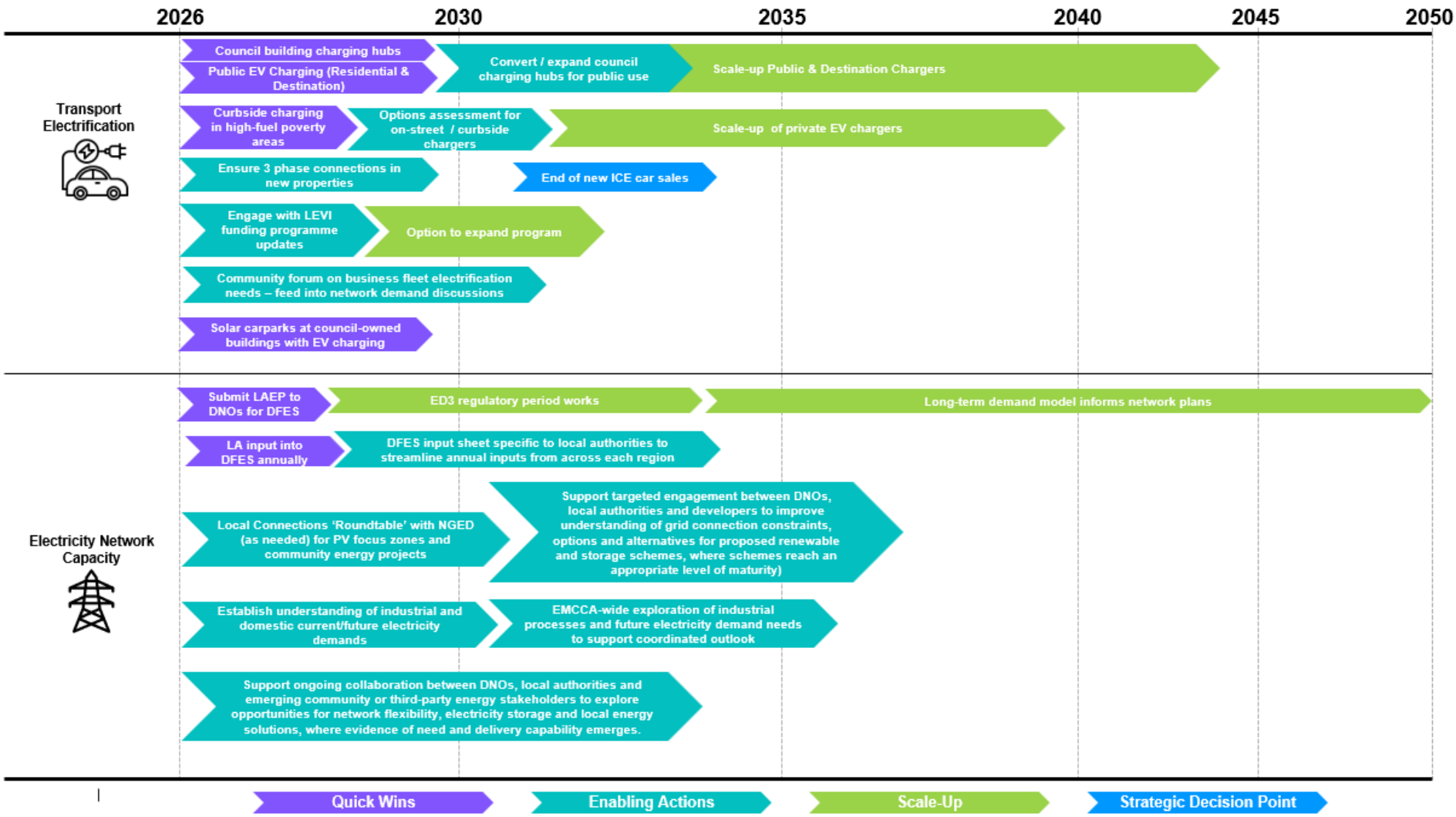
Figure 13.3 sets out a sequence for Derby City's net zero interventions and enabling actions, in line with the analysis set out in Section 13. The level of detail is necessarily higher in the short term, with longer-term actions referring to wider scaling of the identified interventions.

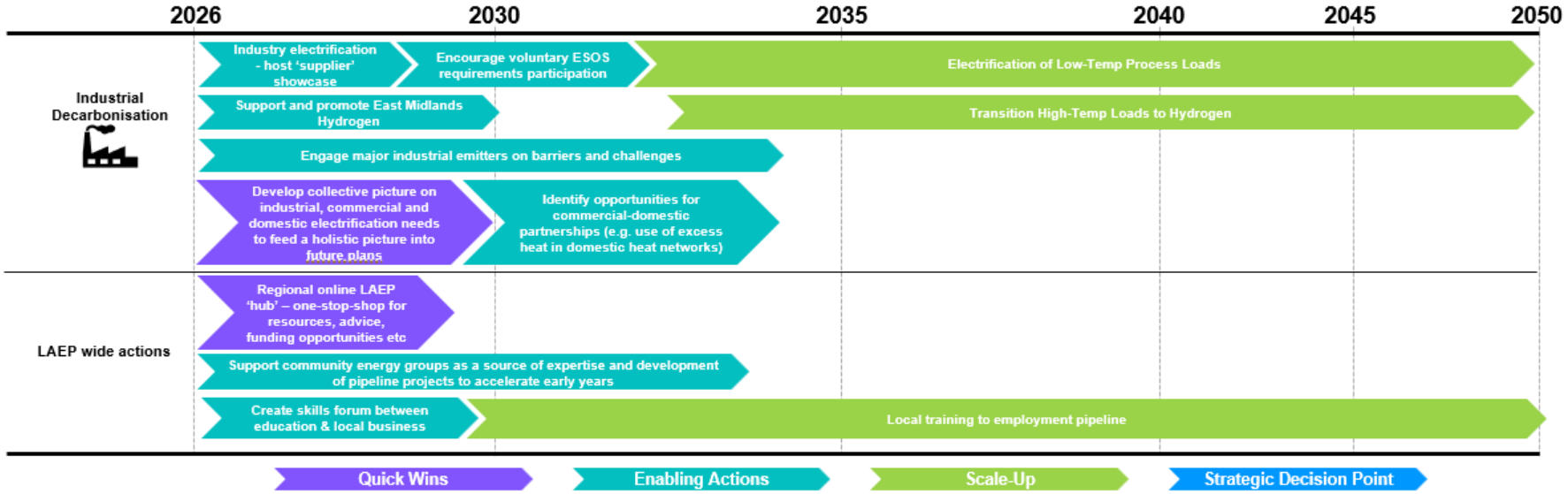
In general, most of the actions set out in this phased pathway can be undertaken, or initiated, by the local authorities but will draw on the input of many stakeholders, in particular EMCCA, the Midlands Net Zero Hub, local distribution network operator and broader government.

Figure 13.3: Derby City Phased Pathway




2026
2030
2035
2040
2045
2050
Local Generation & Flexibility
Solar PV Focus Zone deployments
Support 'clustered' solar PV installations across multiple homes, seeking economies of scale and coordinated deployments
Feasibility studies to deploy EV charging hubs paired with solar PV + battery storage
Solar PV on council-owned estate, including leisure centres, depots, civic offices, car parks.
Innovation funding to support novel technologies and the development of replicable solutions within the region
Support community energy projects through facilitating conversations with DNOs or collaboration with Midlands Net Zero Hub etc, particularly those experiencing network constraints barriers
Assessment of council-owned land and car parks for solar canopies, potentially combined with EV charging.
Renewable generation (solar PV) collective buying scheme
Funding opportunities accessible for community energy groups distributed at County level
Support smart meter roll-out*
Benefits education sessions and supplier 'expo' for both residential and commercial / industrial
Accelerated Domestic & Commercial Solar + Storage
Potential engagement with energy tariff organisations, LA-driven tender process
Collective deployments of solar PV in 'able-to-pay' bracket, accessing energy tariff 'deal'
Detailed picture on current and future renewable energy projects across community energy groups, industrial estates and residential
EMCCA-wide consolidation of local and community energy projects for submission to GBE's Local Power Plan
Quick Wins
Enabling Actions
Scale-Up
Strategic Decision Point


2026
2030
2035
2040
2045
2050
Transport Electrification
Council building charging hubs
Public EV Charging (Residential & Destination)
Convert / expand council charging hubs for public use
Scale-up Public & Destination Chargers
Curbside charging in high-fuel poverty areas
Options assessment for on-street / curbside chargers
Scale-up of private EV chargers
Ensure 3 phase connections in new properties
End of new ICE car sales
Engage with LEVI funding programme updates
Option to expand program
Community forum on business fleet electrification needs – feed into network demand discussions
Solar carparks at council-owned buildings with EV charging
Electricity Network Capacity
Submit LAEP to DNOs for DFES
ED3 regulatory period works
Long-term demand model informs network plans
LA input into DFES annually
DFES input sheet specific to local authorities to streamline annual inputs from across each region
Local Connections 'Roundtable' with NGED (as needed) for PV focus zones and community energy projects
Support targeted engagement between DNOs, local authorities and developers to improve understanding of grid connection constraints, options and alternatives for proposed renewable and storage schemes, where schemes reach an appropriate level of maturity)
Establish understanding of industrial and domestic current/future electricity demands
EMCCA-wide exploration of industrial processes and future electricity demand needs to support coordinated outlook
Support ongoing collaboration between DNOs, local authorities and emerging community or third-party energy stakeholders to explore opportunities for network flexibility, electricity storage and local energy solutions, where evidence of need and delivery capability emerges.
Quick Wins
Enabling Actions
Scale-Up
Strategic Decision Point


2026
2030
2035
2040
2045
2050
Industrial Decarbonisation
Industry electrification - host 'supplier' showcase
Encourage voluntary ESOS requirements participation
Electrification of Low-Temp Process Loads
Support and promote East Midlands Hydrogen
Transition High-Temp Loads to Hydrogen
Engage major industrial emitters on barriers and challenges
Develop collective picture on industrial, commercial and domestic electrification needs to feed a holistic picture into future plans
Identify opportunities for commercial-domestic partnerships (e.g. use of excess heat in domestic heat networks)
LAEP wide actions
Regional online LAEP 'hub' – one-stop-shop for resources, advice, funding opportunities etc
Support community energy groups as a source of expertise and development of pipeline projects to accelerate early years
Create skills forum between education & local business
Local training to employment pipeline
Quick Wins
Enabling Actions
Scale-Up
Strategic Decision Point

14 Conclusions and Next steps

The Derby City Local Area Energy Plan provides a robust, data-driven, and spatially informed framework for delivering an equitable and economically efficient transition to net zero. It aligns Derby City's local ambitions with regional and national policy objectives while tailoring interventions to the area's unique socioeconomic, infrastructural, and industrial characteristics.

The analysis presented throughout this plan confirms that Derby City can significantly decarbonise its energy system by accelerating progress on energy efficiency, heat decarbonisation, and transport electrification while expanding local generation and enhancing system flexibility. The modelling outcomes demonstrate that these interventions, when coordinated effectively, deliver measurable benefits in emissions reductions, cost efficiency, and community well-being.

14.1 Key Outcomes

The modelling and analysis confirm that Derby City can achieve substantial emission reductions across buildings, transport, and industry by following a sequenced and place-based approach. The emissions reductions are supported by strong co-benefits in fuel poverty alleviation and energy resilience.

Energy efficiency forms the cornerstone of the transition. Retrofit measures particularly in pre-1929 solid-wall homes and poorly insulated estates can significantly reduce space heating demand and operational costs while improving indoor comfort. A fabric-first approach is not only the most immediate means of reducing carbon emissions but also the foundation for cost-effective heat decarbonisation and grid stability. Targeting deep retrofit in focus zones with high fuel poverty risk ensures that the social benefits of net zero are distributed fairly.

Heating system transformation is equally central. The deployment of air-source heat pumps, heat networks, and supporting controls will replace the area's reliance on natural gas. Ensuring access to available funding and appropriate education for residents will be key to realising the benefits, alongside working with local business and skills institutions to establish the supply chain to keep the economic benefits of the installation pipeline in the local area.

Transport electrification presents the single largest emissions reduction potential. The LAEP scenario requires approximately 133,931 electric vehicles by 2050, supported by an accessible charging network. Starting from a low level of charging infrastructure, the area needs to progress this at a fast pace in the early years to avoid long-term impacts from a delayed start. Smart charging integration and uptake of time-of-use tariffs are essential for minimising strain on the grid and unlocking flexibility as well.

Local renewable generation, particularly rooftop solar, serves as an economic driver. The rollout will need to be planned in conjunction with the local electricity distribution networks in order to deliver in line with changes to network capacity. Integration with storage and smart systems enables households and organisations to participate actively in a flexible, low-carbon energy market.

Economic appraisal indicates that the 2050 Net Zero scenario requires approximately £3.7 billion in additional undiscounted capital investment. Although this represents a substantial commitment, the system-wide benefits, including bill savings, improved health outcomes, job creation, and reduced fuel poverty, position the transition as an economically rational long-term investment.

14.2 Strategic Implications

Delivering the LAEP will require coordinated action, stable policy support, and institutional readiness. The plan identifies the need for a dedicated Derby City LAEP Delivery Partnership, specifically designed to address the unique challenges of decarbonising these areas, acknowledging the additional complications which a high prevalence of heritage or listed buildings in combination with rural / edge of the network presents. This Steering Group could comprise of representatives from Derby City Council, EMCCA, the local Distribution Network Operator, local housing providers, industry specialists and community energy organisations. This governance structure would ensure that delivery of projects within the broader LAEP programme is sequenced, resourced, and monitored effectively across multiple actors, whilst drawing on the required expertise.

Funding and finance remain critical enablers. Leveraging national mechanisms such as the Warm Homes Plan, and Great British Energy programmes will be essential. However, innovative local financing models, including community energy investment, public–private partnerships, and aggregated purchase schemes, will also be needed to bridge funding gaps.

Integration with spatial planning and infrastructure investment is also key. Embedding LAEP outputs into the councils' Local Plans and infrastructure pipeline will help ensure that energy considerations shape new housing developments, regeneration projects, and industrial growth corridors. Similarly, early engagement with NGED will be necessary to align reinforcement schedules with the forecast growth of low-carbon technologies, ensuring that energy and electrification of industrial demands is considered.

Derby City's transition to net zero is both an environmental necessity and an opportunity to create a fairer, healthier, and more prosperous area. The LAEP demonstrates that with clear priorities, place-based planning, and coordinated governance, it is possible to achieve deep decarbonisation while delivering tangible local benefits.

The next decade will be decisive. By acting early on energy efficiency, low-carbon heat, and electrified transport, Derby City can capture the economic and social advantages of the transition ahead of national timelines. Regular monitoring, transparent reporting, and adaptive management will ensure that progress remains on track and that interventions continue to deliver value for money.

14.3 Next Steps

To ensure the timely and effective delivery of the LAEP, the following immediate and critical steps are recommended:

- **Establish a Derby City LAEP Delivery Partnership**: Create a dedicated cross-sector partnership chaired by Derby City Council, and supported by EMCCA, the local Distribution Network Operator, local housing providers, industry specialists and community energy organisations. This body should oversee programme coordination of key actions within the LAEP delivery roadmap, track progress, and identify funding opportunities. This dedicated Partnership would be specifically designed to establish mechanisms and design programmes for navigate wide-scale retrofit deployments at 'hard-to-treat' homes (e.g. heritage or listed buildings), both of which present complexities and are currently barriers to deployments. This partnership would also support innovative trial projects which may emerge to accelerate decarbonisation. Furthermore, this party should facilitate engagement with industrial and commercial energy users, to pursue a holistic picture on future network demands – supplementing the analysis included in this LAEP on domestic EV and ASHP demands with estimates of business fleet and process load electrification needs.

- **Launch Public Uptake and Engagement Programme with online 'hub':** Implement the recommended community engagement and communication strategy with urgency. An EMCCA wide LAEP hub – a one-stop-shop for trusted advice, guidance, applicable grant funding as well as a council-approved list of installers/specialists to support retrofits, ASHPs, solar PV and battery installations for the 'able-to-pay' market. This programme is vital to build public confidence, uplift community knowledge, empower residents and businesses with the understanding of 'how' to deploy retrofits and drive the necessary adoption of low-carbon technologies like heat pumps. Resources and knowing where/who to reach out to seek advice on energy assessments and deploying solar PV was reinforced by stakeholders throughout the LAEP development. Priority should be given to demonstration and pilot projects that showcase best practice and real-world results. It will also be important to ensure that the 'hub' provides resources for local industry and commercial businesses – providing appropriate advice on the electrification technologies available and the potential funding routes to support economic viability.
- **Develop a Delivery Roadmap and Investment Plan**: Prioritise the short-, medium-, and long-term interventions identified in Chapter 13, including both quick wins and enabling actions. Ensure that LAEP evidence is embedded into Derby City Council strategies where relevant to the subject matter included in the LAEP (e.g. planning policy, housing policy).
- **Secure Early-Stage Funding and Demonstrator Projects**: Identify and secure initial funding mechanisms (local, regional, and national) to kick-start demonstrator projects and intervention uptake in focus zones that can showcase tangible early benefits and build public support.
- **Monitor, Review, and Update:** Establish a monitoring framework with key performance indicators (KPIs) aligned to emissions reduction, energy demand, and social outcomes. The LAEP should be reviewed on a five-year cycle to reflect policy developments, technological advances, and local progress.

A. Data Types and Validation

Energy Savings Trust building attributes

Table 14.1: List of attributes available from Energy Savings Trust for domestic and non-domestic buildings

Attribute	Domestic	Non-domestic
UPRN	✓	✓
Council Ward	✓	✓
LSOA	✓	×
Postcode	✓	✓
Address	✓	✓
Property Type	✓	×
Property Tenure	✓	×
Property Age band	✓	×
Number of Storeys	✓	×
Property Class	×	✓
Primary Use	×	✓
Mixed Use	×	✓
Building storey height	×	✓
Asset rating band	×	✓
Listed Building	✓	×
Wall Construction Type	✓	×
Wall Insulated	✓	×
In Conservation Area	✓	×
Flood Risk	✓	×
Floor Construction	✓	×
Floor Insulated	✓	×
Loft Insulation Prediction	✓	×
Glazing Type Prediction	✓	×
Heating System	✓	×
Fuel Type	✓	✓
EPC Rating	✓	×
SAP Score	✓	×

Roof Orientation	✓	×
Off gas grid	✓	×
Probability of fuel poverty	✓	×
ECO funding eligibility	✓	×
LAD funding eligibility	✓	×

B. EV Modelling Datasets

Datasets

Modelling has been undertaken using the following publicly available statistics and datasets:

B.1.1 ONS Middle layer Super Output Area population estimates (supporting information)[80]

B.1.2 Research on East Midland cars[81] and people[82] per household

B.1.3 CCC 7th Carbon Budget[83]

B.1.4 Midlands Connect 'Supercharging the Midlands' report[84]

B.1.5 ZapMap[85] and government private charger research[86]

Socioeconomic Parameters

To perform modelling, socioeconomic parameters have been retrieved from available statistics and datasets:

B.1.6 Population of Derby City = 274,149 (ONS, 2024)

B.1.7 Average number of cars per household in the East Midlands (2023) = 1.23

B.1.8 Average number of people in an East Midlands household, (2023) = 2.4

Assumptions and Exclusions

B.1.9 Not all ICE vehicles are decommissioned within the 2040 and 2050 scenarios.

B.1.10 The CCC EV uptake projection is assumed proportionate across the UK.

B.1.11 The model only includes the uptake of Battery Electric Vehicles (BEVs) and therefore does not account for Plug-in Hybrids (PHEVs), Hybrid Electric Vehicles (HEVs), Fuel Cell Electric Vehicles (FCEVs), Range-Extended EVs (REEVs), biofuel/biodiesel or other transitional technologies, which are assumed negligible by 2050.

B.1.12 The model only considers private transport and therefore does not account for public transport, freight transport, or heavy-duty vehicles.

B.1.13 Motorcycles, mopeds, and other forms of micro-mobility are excluded.

B.1.14 Behavioural changes such as modal shift, car-sharing, or reductions in private car ownership are assumed to match the relative increase in population resulting in an equal volume of private cars in 2050 compared to today.

[80] Middle layer Super Output Area population estimates (supporting information) - Office for National Statistics
[81] https://www.nimblefins.co.uk/cheap-car-insurance/number-cars-great-britain
[82] https://www.statista.com/topics/12526/families-in-the-uk/#topicOverview
[83] https://www.theccc.org.uk/wp-content/uploads/2025/02/The-Seventh-Carbon-Budget.pdf
[84] https://www.midlandsconnect.uk/media/i1spcsr1/mc-supercharging-the-midlands-document.pdf
[85] https://www.theccc.org.uk/wp-content/uploads/2025/02/The-Seventh-Carbon-Budget.pdf
[86] https://www.gov.uk/government/publications/electric-vehicle-drivers-attitudes-and-behaviours

C. Baseline Validation by MSOA

MSOA	Domestic metered energy (GWh)	dhw & heating to be removed from total (MWh)	Total Energy (MWh) [exc oil, LPG & biomass and inc floor area correction]	Validation
Allestree North	44,901	13	44,767	**1%**
Allestree South	49,369	152	49,217	**-8%**
Oakwood	59,388	75	59,313	**-1%**
Breadsall Hilltop	39,309	75	39,234	**8%**
Darley Abbey	54,019	304	53,714	**6%**
Chaddesden North	48,737	61	48,676	**11%**
Chaddesden West	46,937	79	46,858	**11%**
Little Chester	35,331	62	35,269	**-16%**
Mackworth	51,540	84	51,456	**6%**
Spondon North	38,025	103	37,923	**-0.27%**
New Zealand	38,260	610	38,199	**7%**
Chaddesden Park	52,757	83	52,674	**2%**
Cathedral Quarter & California	60,719	144	60,575	**-18%**
Spondon South	38,004	74	37,930	**-5%**
Mickleover North	53,731	345	53,386	**-9%**
New Normanton	55,303	80	55,223	**-2%**

Littleover East	58,346	205	58,141	**12%**
Rose Hill & Castleward	54,169	111	54,058	**-14%**
Mickleover South	46,073	48	46,025	**-4%**
Normanton North & Peartree	45,574	87	45,486	**5%**
Littleover West & Heatherton	50,295	22	50,273	**-16%**
Normanton West	40,313	82	40,231	**1%**
Normanton South	44,860	85	44,775	**11%**
Wilmorton & Alvaston Village	40,002	577	39,944	**-9%**
Alvaston & Crewton	61,892	160	61,731	**6%**
Allenton & Osmaston	63,729	627	63,666	**5%**
Sunny Hill	38,639	60	38,579	**-2%**
Boulton	41,288	70	41,218	**-3%**
Sinfin	46,666	107	46,558	**-6%**
Chellaston West & Shelton Lock	45,853	84	45,769	**-6%**
Chellaston East	38,194	88	38,105	**-5%**

D. Non-domestic top gas users

Local Authority	Site Electricity Consumption for Building Use (MWh)	Site Gas Consumption for Building Use (MWh)	Site Gas Consumption for Process Use (MWh)	Site Total Gas Consumption (MWh)	Site Total Carbon Emissions (tonnes)
Derby	118,991	60,680	399,245	459,925	116,635

E. Summary of all Intervention by MSOA

MSOA	Intervention	CAPEX (£,000)	Annual Energy Savings (MWh/y)	Annual Carbon Savings (tCO2e)
Allestree North				
	Light Retrofit	3,009	1,043	206
	Deep Retrofit	17,342	2,110	420
	Domestic ASHP	4,626	1,873	
	Non-Domestic ASHP	2,939	370	
	Domestic Solar PV	12,754	4,792	992
	Non-Domestic Solar PV	1,319	539	112
Allestree South				
	Light Retrofit	4,638	1,660	333
	Deep Retrofit	16,220	2,898	571
	Domestic ASHP	4,593	1,616	
	Non-Domestic ASHP	2,969	411	
	Domestic Solar PV	15,779	6,017	1,246
	Non-Domestic Solar PV	3,812	1,557	322
Oakwood				

	Light Retrofit	3,006	1,318	265
	Deep Retrofit	14,548	1,515	283
	Domestic ASHP	88,811	41,611	
	Non-Domestic ASHP	930	121	
	Domestic Solar PV	20,194	7,695	1,593
	Non-Domestic Solar PV	1,064	435	90
Breadsall Hilltop				
	Light Retrofit	5,506	2,254	452
	Deep Retrofit	17,976	2,387	464
	Domestic ASHP	58,744	30,886	
	Non-Domestic ASHP	17,458	2,257	
	Domestic Solar PV	7,887	3,019	625
	Non-Domestic Solar PV	11,501	4,698	973
Darley Abbey				
	Light Retrofit	1,882	659	132
	Deep Retrofit	23,350	2,375	471
	Domestic ASHP	6,572	2,585	
	Non-Domestic ASHP	11,963	4,510	934
	Domestic Solar PV	11,804	4,434	918
	Non-Domestic Solar PV	4,960	2,026	419
Chaddenston North				
	Light Retrofit	10,454	4,200	842

	Deep Retrofit	115,665	8,141	1,325
	Domestic ASHP	72,382	44,194	
	Non-Domestic ASHP	14,817	1,593	
	Domestic Solar PV	11,347	4,315	893
	Non-Domestic Solar PV	1,286	525	109
Chaddenston West				
	Light Retrofit	8,972	2,496	503
	Deep Retrofit	126,819	16,918	3,370
	Domestic ASHP	70,106	36,414	
	Non-Domestic ASHP	22,967	3,549	
	Domestic Solar PV	9,676	3,732	773
	Non-Domestic Solar PV	13,915	5,685	1,177
Little Chester				
	Light Retrofit	5,677	1,155	226
	Deep Retrofit	124,954	12,897	2,578
	Domestic ASHP	44,524	21,860	
	Non-Domestic ASHP	23,097	3,109	
	Domestic Solar PV	13,007	4,967	1,028
	Non-Domestic Solar PV	15,825	6,465	1,338
Mackworth				
	Light Retrofit	9,127	4,186	840
	Deep Retrofit	20,655	2,052	405

	Domestic ASHP	75,518	38,840	
	Non-Domestic ASHP	7,709	904	
	Domestic Solar PV	10,350	3,887	805
	Non-Domestic Solar PV			
Spondon North				
	Light Retrofit	10,327	4,144	830
	Deep Retrofit	65,602	6,775	1,352
	Domestic ASHP	52,329	25,728	
	Non-Domestic ASHP	2,977	363	
	Domestic Solar PV	7,242	2,683	555
	Non-Domestic Solar PV	2,049	837	173
New Zealand				
	Light Retrofit	7,291	1,310	263
	Deep Retrofit	177,899	18,604	3,696
	Domestic ASHP	54,313	28,646	
	Non-Domestic ASHP	10,338	1,348	
	Domestic Solar PV	14,749	5,663	1,172
	Non-Domestic Solar PV	2,022	826	171
Chaddesden Park				
	Light Retrofit	9,034	1,012	204
	Deep Retrofit	127,230	12,189	2,435
	Domestic ASHP	70,187	34,052	

	Non-Domestic ASHP	1,817	190	
	Domestic Solar PV	14,368	5,385	1,115
	Non-Domestic Solar PV	4,061	1,659	343
Cathedral Quarter & California				
	Light Retrofit	7,179	1,104	222
	Deep Retrofit	235,447	18,421	3,661
	Domestic ASHP	69,693	34,616	
	Non-Domestic ASHP	41,315	6,280	
	Domestic Solar PV	9,497	3,574	740
	Non-Domestic Solar PV	7,225	2,952	611
Spondon South				
	Light Retrofit	10,349	3,634	728
	Deep Retrofit	57,995	6,401	1,253
	Domestic ASHP	55,366	27,404	
	Non-Domestic ASHP	14,286	2,232	
	Domestic Solar PV	13,292	4,937	1,022
	Non-Domestic Solar PV	50,792	20,749	4,295
Mickleover North				
	Light Retrofit	13,801	4,516	900
	Deep Retrofit	31,462	3,445	665
	Domestic ASHP	77,117	36,527	

	Non-Domestic ASHP	1,469	157	
	Domestic Solar PV	11,156	4,225	875
	Non-Domestic Solar PV	16,807	6,866	1,421
New Normanton				
	Light Retrofit	7,083	1,156	230
	Deep Retrofit	263,996	14,316	1,983
	Domestic ASHP	73,899	37,385	
	Non-Domestic ASHP	14,892	1,982	
	Domestic Solar PV	12,943	4,969	1,029
	Non-Domestic Solar PV	1,274	521	108
Littleover East				
	Light Retrofit	11,666	5,527	1,108
	Deep Retrofit	90,759	12,444	2,464
	Domestic ASHP	69,218	31,282	
	Non-Domestic ASHP	22,181	4,746	
	Domestic Solar PV	14,360	5,700	1,180
	Non-Domestic Solar PV	7,695	3,144	651
Rosehill and Castleward				
	Light Retrofit	4,405	745	149
	Deep Retrofit	77,039	8,183	1,437
	Domestic ASHP	4,115	2,052	

	Non-Domestic ASHP	22,181	4,746	
	Domestic Solar PV	14,911	5,725	1,185
	Non-Domestic Solar PV	13,643	5,573	1,154
Mickleover South				
	Light Retrofit	4,621	1,513	304
	Deep Retrofit	13,649	1,701	334
	Domestic ASHP	49,807	24,701	
	Non-Domestic ASHP	7,361	1,038	
	Domestic Solar PV	8,643	3,120	646
	Non-Domestic Solar PV	22,439	9,167	1,898
Normanton North & Peartree				
	Light Retrofit	1,163	362	73
	Deep Retrofit	30,120	2,886	573
	Domestic ASHP	11,426	5,613	
	Non-Domestic ASHP	6,354	918	
	Domestic Solar PV	19,539	7,414	1,535
	Non-Domestic Solar PV	2,949	1,205	249
Littleover West & Heatherton				
	Light Retrofit	2,903	1,028	206
	Deep Retrofit	16,000	2,438	479
	Domestic ASHP	15,729	6,024	

	Non-Domestic ASHP	3,781	491	
	Domestic Solar PV	12,730	4,927	1,020
	Non-Domestic Solar PV	3,017	1,232	255
Normanton West				
	Light Retrofit	4,564	1,545	309
	Deep Retrofit	31,274	4,619	919
	Domestic ASHP	39,832	19,137	
	Non-Domestic ASHP	3,506	402	
	Domestic Solar PV	8,570	3,151	652
	Non-Domestic Solar PV	3,246	1,326	275
Normanton South				
	Light Retrofit	3,482	1,118	226
	Deep Retrofit	53,441	3,818	567
	Domestic ASHP	2,805	1,445	
	Non-Domestic ASHP	9,077	1,291	
	Domestic Solar PV	11,440	4,371	905
	Non-Domestic Solar PV	1,099	449	93
Wilmorton and Alvaston Village				
	Light Retrofit	4,142	1,266	255
	Deep Retrofit	32,438	4,038	800
	Domestic ASHP	42,569	21,573	

	Non-Domestic ASHP	80,694	8,754	
	Domestic Solar PV	13,522	5,122	1,060
	Non-Domestic Solar PV	2,939	1,200	248
Alvaston and Crewton				
	Light Retrofit	6,468	1,695	342
	Deep Retrofit	76,679	10,165	2,025
	Domestic ASHP	62,650	32,651	
	Non-Domestic ASHP	20,121	2,290	
	Domestic Solar PV	13,503	5,188	1,074
	Non-Domestic Solar PV	32,291	13,191	2,731
Allenton & Osmaston				
	Light Retrofit	7,739	2,367	475
	Deep Retrofit	74,772	11,486	2,277
	Domestic ASHP	6,641	3,075	
	Non-Domestic ASHP	15,950	2,310	
	Domestic Solar PV	10,235	3,957	819
	Non-Domestic Solar PV	5,087	2,078	430
Sunny Hill				
	Light Retrofit	2,362	997	201
	Deep Retrofit	9,044	1,109	213
	Domestic ASHP	36,969	18,215	
	Non-Domestic ASHP	3,206	522	

	Domestic Solar PV	12,032	4,566	945
	Non-Domestic Solar PV	19,105	7,804	1,616
Boulton				
	Light Retrofit	4,577	1,728	347
	Deep Retrofit	22,531	2,636	521
	Domestic ASHP	30,312	21,632	
	Non-Domestic ASHP	171	11	
	Domestic Solar PV	11,772	4,364	903
	Non-Domestic Solar PV	1,416	579	120
Sinfin	Light Retrofit	3,688	1,147	231
	Deep Retrofit	14,093	1,417	256
	Domestic ASHP	1,334	1,817	
	Non-Domestic ASHP	15,712	2,899	
	Domestic Solar PV	16,196	6,231	1,290
	Non-Domestic Solar PV	2,545	1,040	215
Chellaston West & Shelton Lock				
	Light Retrofit	3,551	1,332	267
	Deep Retrofit	11,176	1,373	267
	Domestic ASHP	17,807	7,712	
	Non-Domestic ASHP	456	67	

	Domestic Solar PV	16,196	6,231	1,290
	Non-Domestic Solar PV	1,922	785	162
Chellaston East				
	Light Retrofit	3,277	1,832	367
	Deep Retrofit	7,324	1,082	212
	Domestic ASHP	13,270	6,193	
	Non-Domestic ASHP	1,138	110	
	Domestic Solar PV	11,913	4,559	944
	Non-Domestic Solar PV	1,332	544	113

